INSTRUCTIONS FOR CCU (11B)
DRUGS
(DOSAGE, ADMINISTRATION,
PRECAUTIONS AND MONITORING)

PREPEARED BY CLINICAL PHARMACIST:
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THE SUPERVISOR OF DRUG INFORMATION CENTER / JUST

1. Acetyl Salicylic Acid 100 mg EC TAB

Dosage:

- ✓ **Secondary prevention after acute coronary syndrome, secondary prevention after (CABG) surgery, primary prevention of cardiovascular diseases (CVD) , secondary prevention of CVD** : 1 tablet daily continued indefinitely.
- ✓ **Atrial fibrillation** (to prevent thromboembolism): 1-3 tablets once daily.
- ✓ **Percutaneous coronary intervention (PCI):** 1-3 tablets preprocedure and 1 tablet daily postprocedure continued indefinitely.
- ✓ **Peripheral arterial disease or coronary artery disease (CAD), established or chronic**: 1 tablet daily.
- ✓ **Prosthetic heart valve replacement** (thromboprophylaxis) : 1 tablet daily with anticoagulation (warfarin).
- ✓ **Pericarditis in association with myocardial infarction:** 6 tablets 4 times daily; may increase after 24 hours to 975 mg(9-10 tablets) 4 times daily if necessary .
- ✓ **Stroke/TIA**: initial dose of 3 tablets within 24 to 48 hours after stroke/TIA onset, followed 1 tablet once daily**.**

☒ Administration:

Do not crush enteric-coated tablet. Administer with food or a full glass of water to minimize GI distress. In situations for which a rapid onset of action is required (eg, acute treatment of MI), have patient chew immediate-release tablet.

☒ Precautions:

- Avoid use in patients with active peptic ulcer disease.

- Avoid for 24 hours following administration of alteplase.

- It should be avoided (if possible) in surgical patients for 1 to 2 weeks prior to elective surgery, to reduce the risk of excessive bleeding.

2 . Adenosine (6 mg/2 ml) Ampoule

☒ Dosage:

- ✓ **Paroxysmal supraventricular tachycardia:** rapid IV bolus (over 1 to 2 seconds, via peripheral line): Initial: 6 mg; if not effective within 1 to 2 minutes, 12 mg may be given; may repeat 12 mg bolus if needed (maximum single dose: 12 mg). Follow each dose with 20 mL normal saline flush.
- ✓ **Pharmacologic stress testing:** continuous IV infusion via peripheral line: 140 mcg/kg/minute for 6 minutes using syringe or volumetric infusion pump; total dose: 840 mcg/kg. Thallium-201 is injected at midpoint (3 minutes) of infusion.

☒ Administration:

For rapid bolus IV use only; administer IV push over 1 to 2 seconds at a peripheral IV site as proximal as possible to trunk (not in lower arm, hand, lower leg, or foot); follow each bolus with a rapid normal saline flush (infants and children ≥5 mL; adults 20 mL). Use of 2 syringes (one with adenosine dose and the other with NS flush) connected to a T-connector or stopcock is recommended. If administered via **central line** in adults, reduce initial dose to 3 mg.

☒ Preparation for Administration

Doses ≥0.6 mg: Give undiluted.

Doses <0.6 mg: Further dilution of dose may be necessary to ensure complete and accurate administration; dilution with **NS** to a final concentration of 0.3 to 1 mg/mL has been used; to prepare a 0.3 mg/mL solution, add 3 mg of adenosine (1 mL) to 9 mL of NS; to prepare a 1 mg/mL, add 3 mg of adenosine (1 mL) to 2 mL of NS.

☒ Precautions:

- Avoid use in irregular or polymorphic wide-complex tachycardia.

- Correct electrolyte disturbances, especially hypokalemia or hypomagnesemia, prior to use and throughout therapy.

- Use with extreme caution in heart transplant recipients.

- Avoid use in patients with bronchoconstriction or bronchospasm (eg, asthma); dyspnea, bronchoconstriction, and respiratory compromise have occurred during use.

- Avoid use in patients with WPW syndrome and preexcited atrial fibrillation/flutter since ventricular fibrillation may result.

☒ Monitoring Parameters:

ECG, HR, BP

3 .Adrenaline Injection (1 mg/ml) Ampoule

Epinephrine 1:1000 = 1 mg/mL and is most commonly used IM

Epinephrine 1:10,000 = 0.1 mg/mL and is used IV

☒ Dosage:

- ✓ **Asystole/pulseless arrest, pulseless VT/VF :***IV, Intraosseous:* 1 mg every 3 to 5 minutes until return of spontaneous circulation. *Endotracheal:* 2 to 2.5 mg every 3 to 5 minutes until IV/intraosseous access established or returns of spontaneous circulation; dilute in 5 to 10 mL NS or sterile water (preferable).
- ✓ **Bradycardia (symptomatic; unresponsive to atropine or pacing):** *IV infusion:* 2 to 10 mcg/minute **or** 0.1 to 0.5 mcg/kg/minute, titrate to desired effect.
- ✓ **Hypersensitivity reaction (eg, anaphylaxis): Note:** *IM (preferred), SubQ:* 0.2 to 0.5 mg using the **1 mg/mL** solution every 5 to 15 minutes in the absence of clinical improvement.
- ✓ **Hypotension/shock:** Severe and fluid resistant: IV infusion: Initial: 0.01 to 0.5 mcg/kg/minute; titrate to desired response. **Septic shock**: IV infusion: Initial: 0.05 to 2 mcg/kg/; titrate to desired mean arterial pressure (MAP). May adjust dose every 10 to 15 minutes by 0.05 to 0.2 mcg/kg/minute to achieve desired blood pressure goal. After hemodynamic stabilization, may wean incrementally every 30 minutes over 12 to 24 hours.

☒ Administration:

IV infusion: 1 mg in 250 mL (concentration: 4 mcg/mL) of D5W or NS.

IV: **central line** is preferred in continuous infusion. IV infusions require an infusion pump. If central line not available, as a temporary measure, may administer through a large vein. Avoid use of ankle veins, leg veins in elderly patients, or leg veins in those suffering from occlusive vascular diseases (eg, diabetic endarteritis, Buerger disease, arteriosclerosis, and atherosclerosis).

Vesicant; ensure proper needle or catheter placement prior to and during infusion; avoid extravasation.

Extravasation management: stop infusion immediately and disconnect (leave cannula/needle in place); gently aspirate extravasated solution (do NOT flush the line); remove needle/cannula; elevate extremity. Initiate phentolamine (or alternative antidote). Apply dry warm compresses.

Phentolamine: Dilute 5 to 10 mg in 10 to 20 mL NS and administer into extravasation site as soon as possible after extravasation; may readminister if patient remains symptomatic.

☒ Precautions:

- Rapid IV administration may cause death from cerebrovascular hemorrhage or cardiac arrhythmias. However, rapid IV administration during pulseless arrest is necessary.

- IM administration in the anterolateral aspect of the middle third of the thigh is preferred in the setting of anaphylaxis. Do not administer repeated injections at the same site (tissue necrosis may occur). Monitor for signs/symptoms of injection-site infection.

- Correct blood volume depletion before administering adrenaline

- Adrenaline is sensitive to light and air. Protection from light is recommended. Oxidation turns drug pink, then a brown color. Solutions should not be used if they are discolored or contain a precipitate.

☒ Monitoring Parameters

HR, BP (invasive blood pressure monitoring and central venous pressure monitoring recommended while receiving continuous infusion); monitor site of infusion for blanching/extravasation.

4 . Amiodarone Injection (150 mg/3ml) Ampoule

☒ Dosage:

- ✓ **Pharmacologic cardioversion for (Atrial fibrillation, Supraventricular tachycardia**), **electrical storm and incessant ventricular tachycardia hemodynamically stable, sudden cardiac arrest due to VF or pulseless VT, sustained monomorphic VT hemodynamically stable**: IV: Initial: 150 mg over 10 minutes, then 1 mg/minute for 6 hours, followed by 0.5 mg/minute for at least 18 hours ,then change to oral maintenance dosing.

- ✓ **Rate control for atrial fibrillation:** IV: 300 mg over 1 hour, then 10 to 50 mg/hour over 24 hours followed by an oral maintenance dose .Some experts recommend a more typical regimen of 150 mg over at least 10 minutes, followed by 0.5 to 1 mg/minute; may administer repeat boluses of 150 mg IV over at least 10 minutes as needed. Mean daily doses >2.1 g/day have been associated with hypotension.

☒ Administration:

- Injection must be diluted in D5W before continuous IV infusion use. Dilute to final concentration of 1 to 6 mg/mL. During pulseless VT/VF, administering undiluted is preferred.

- For infusions >1 hour, use concentrations ≤2 mg/mL unless a central venous catheter is used.

- Administer through an IV line located as centrally as possible. For peripheral infusions, an in-line filter has been recommended during administration to reduce the incidence of phlebitis.

- Adjust administration rate to urgency (give more slowly when perfusing arrhythmia present). Slow the infusion rate if hypotension or bradycardia develops. Infusions >2 hours must be administered in a non-PVC container (eg, glass or polyolefin). PVC tubing is recommended for administration regardless of infusion duration.

- **Incompatible** with heparin; flush with saline prior to and following infusion.

- May be a **vesicant**; ensure proper needle or catheter placement prior to and during IV infusion. Avoid extravasation.

Extravasation management: If extravasation occurs, stop infusion immediately and disconnect (leave needle/cannula in place); gently aspirate extravasated solution (do NOT flush the line); initiate hyaluronidase antidote for refractory cases; remove needle/cannula; apply dry warm compresses; elevate extremity.

Hyaluronidase: Intradermal: Inject a total of 1 mL (15 units/mL) as 5 separate 0.2 mL injections (using a 25-gauge needle) into area of extravasation.

☒ Precautions:

- May cause hypotension and bradycardia (infusion-rate related).

- May cause life-threatening or fatal cutaneous reactions, including Stevens-Johnson syndrome and toxic epidermal necrolysis (TEN). If symptoms or signs (eg, progressive skin rash often with blisters or mucosal lesions) occur, immediately discontinue.

- Obtain baseline and periodic liver transaminases and discontinue or reduce dose if the increase exceeds 3 times normal or doubles in a patient with an elevated baseline. Discontinue treatment if the patient experiences signs or symptoms of clinical liver injury.

- Regular ophthalmic examination is recommended.

-Avoid excessive exposure to sunlight; may cause photosensitivity.

-Amiodarone can exacerbate arrhythmias.

- Prior to initiation, obtain a baseline chest X-ray and pulmonary function tests, including diffusion capacity. Repeat history, physical exam, and chest X-ray every 3 to 6 months.

- May cause hyper- or hypothyroidism. Assess thyroid function tests before initiation of treatment and then periodically.

- Correct electrolyte disturbances, especially hypokalemia, hypomagnesemia, or hypocalcemia, prior to use and throughout therapy.

- Amiodarone should not be used in patients with WPW syndrome and preexcited atrial fibrillation/flutter since ventricular fibrillation may result.

- Potentially significant interactions may exist, requiring dose or frequency adjustment, additional monitoring, and/or selection of alternative therapy. Monitor INR closely after initiating amiodarone in patients take warfarin.

☒ Monitoring Parameters

BP, HR, ECG and rhythm, serum electrolytes, especially potassium and magnesium, infusion site.

5 . Atropine Sulfate Injection (1 mg/ml) Ampoule

☒ Dosage:

- ✓ **Antidote for anticholinesterase poisoning** (carbamate insecticides, nerve agents, organophosphate insecticides); antidote for muscarine-containing mushroom poisoning.: *IV, IM, endotracheal:* 1 to 6 mg; repeat every 3 to 5 minutes as needed, doubling the dose if previous dose did not induce a response. Administer repeat doses as needed for ≥2 to 12 hours based on recurrence of symptoms.

- ✓ **Treatment of symptomatic sinus bradycardia, atrioventricular (AV) nodal block**.: *IV, IM:* 0.5 mg every 3 to 5 minutes; maximum total dose: 3 mg

- ✓ **Inhibit salivation and secretions (preanesthesia):** *IM, IV, SubQ:* 0.4 to 1 mg 30 to 60 minutes preoperatively and repeats every 4 to 6 hours as needed; maximum total dose: 3 mg.

☒ Administration:

Administer undiluted by rapid IV injection; slow injection may result in paradoxical bradycardia. In bradycardia, atropine administration should not delay treatment with external pacing.

☒ Precautions:

- IV doses <0.5 mg have been associated with paradoxical bradycardia.

- Avoid use if possible in patients with obstructive uropathy or in other conditions resulting in urinary retention.

- Use may cause thickening of bronchial secretions and formation of viscid plugs in patients with chronic lung disease.

- Use may precipitate acute glaucoma.

☒ Monitoring Parameters:

HR, BP, pulse, mental status; intravenous administration requires a cardiac monitor. Signs and symptoms of atropine toxicity (eg, fever, muscle fasciculation, delirium); if toxicity occurs, discontinue atropine and monitor closely.

6 . Calcium Gluconate 10 % (10 ml)

☒ Dosage:

✓ **Hypocalcemia:** IV:

Mild (ionized calcium: [1 to 1.2 mmol/L]): 1 to 2 g over 2 hours; asymptomatic patients may be given oral calcium.

Moderate to severe (without seizure or tetany; ionized calcium: [<1 mmol/L]): 4 g over 4 hours.

Severe symptomatic (eg, seizure, tetany): 1 to 2 g over 10 minutes; repeat every 60 minutes until symptoms resolve. **Note:** Repeat ionized calcium measurement 6 to 10 hours after completion of administration. Check for hypomagnesemia and correct if present. Consider continuous infusion if hypocalcemia is likely to recur due to ongoing losses. ***Continuous infusion***: 5 to 20 mg/kg/hour; in patients with hypoparathyroidism, oral calcium and active vitamin D (ie, calcitriol) with or without ergocalciferol or cholecalciferol should be initiated as soon as is practical; IV calcium is generally tapered slowly while oral therapy is adjusted .

✓ **Hypocalcemia induced by citrate-based replacement fluid during continuous renal replacement therapy (CRRT)**: IV (administered via return line): **Note:** Prior to initiation of CRRT, check ionized calcium and administer calcium gluconate if (<1 mmol/L) until (>1 mmol/L). During CRRT, a continuous infusion sliding scale may be initiated (may use calcium gluconate 20 gram/1,000 mL NS or D5W solution). The following schema has been employed :
If ionized calcium is **(<0.9 mmol/L)**: Notify nephrology. If ionized calcium is **(0.9 to 1 mmol/L)**: 1.4 g/hour. If ionized calcium is **(1 to 1.1 mmol/L)**: 1.2 g/hour. If ionized calcium is **(1.1 to 1.3 mmol/L)**: 1 g/hour. If ionized calcium is **(>1.3 mmol/L)**: Notify nephrology.

✓ **Cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia:** IV: 1.5 to 3 g over 2 to 5 minutes.

✓ **Parenteral nutrition, maintenance requirement:** IV: **Note:** Expressed in terms of **elemental calcium:** 10 to 20 **mEq elemental calcium** daily. Adjust dose based on total or ionized calcium.

☒ Preparation for Administration:

- IV: Observe the vial for the presence of particulates. If particulates are observed, place vial in a 60°C to 80°C water bath with occasional agitation until solution is clear; shake vigorously; cool to room temperature before use. Do not use vial if particulates do not dissolve. Prior to administration, dilute in D5W or NS and use immediately:

- Bolus: dilute to a concentration of 10 to 50 mg/mL. Continuous infusion: dilute to a concentration of 5.8 to 10 mg/mL.

☒ Administration: IV

- Administer bolus slowly (not to exceed 200 mg/minute in adults or 100 mg/minute in pediatric patients).

- For continuous infusions, adjust rate as needed based on serum calcium levels.

- Due to the potential presence of particulates, use a 0.22 micron inline filter for IV administration (1.2 micron filter if admixture contains lipids).

- Not for IM administration. In acute situations of symptomatic hypocalcemia, infusions over 5 to 10 minutes have been described in pediatric patients .

- **Vesicant**; ensure proper needle or catheter placement prior to and during IV infusion. Avoid extravasation. **Extravasation management:** If extravasation occurs, stop infusion immediately and disconnect (leave needle/cannula in place); gently aspirate extravasated solution (do **NOT** flush the line).

  Early/acute calcium extravasation: Initiate hyaluronidase antidote; remove needle/cannula; apply dry cold compresses; elevate extremity. **Hyaluronidase**: Intradermal or SubQ: Inject a total of 1 to 1.7 mL (15 units/mL) as five separate 0.2 to 0.3 mL injections (using a 25-gauge needle) into area of extravasation at the leading edge in a clockwise manner. May also inject hyaluronidase through the catheter that caused the infiltration.

  Delayed calcium extravasation: Closely monitor site; most calcifications spontaneously resolve. However, if a severe manifestation of calcinosis cutis occurs, may initiate sodium thiosulfate antidote. **Sodium thiosulfate:** IV: 12.5 g over 30 minutes; may increase gradually to 25 g 3 times per week; monitor for non-anion gap acidosis, hypocalcemia, severe nausea.

☒ Precautions :

- Use with caution in patients with severe hyperphosphatemia as elevated levels of phosphorus and calcium may result in soft tissue and pulmonary arterial calcium-phosphate precipitation.

- Hypomagnesemia is a common cause of hypocalcemia; therefore, correction of hypocalcemia may be difficult in patients with concomitant hypomagnesemia. Evaluate serum magnesium and correct hypomagnesemia (if necessary), particularly if initial treatment of hypocalcemia is refractory.

☒ Monitoring Parameters:

Serum calcium every 4 hours (during intermittent infusion) or every 1 to 4 hours (during continuous infusion); albumin, phosphate, and magnesium; vitals and ECG when appropriate. Monitor infusion site.

7. Clopidogrel 75 mg tablet

☒ Dosage:

✓ **Acute coronary syndrome (ACS):** Initial: 300 mg or 600 mg loading dose, followed by 75 mg once daily for up to 12 months in combination with aspirin, followed by aspirin indefinitely

- If patient is to undergo primary PCI: 600 mg (loading dose) given as early as possible before or at the time of PCI, followed by 75 mg once daily (in combination with aspirin) for at least 12 months .
- PCI after fibrinolytic therapy:
  - Fibrinolytic administered with a loading dose of clopidogrel: Continue 75 mg once daily and do not administer an additional loading dose.
  - Fibrinolytic administered within previous 24 hours without a loading dose of clopidogrel: Administer 300 mg loading dose before or at the time of PCI.
  - Fibrinolytic administered more than 24 hours ago without a loading dose of clopidogrel: Administer 600 mg loading dose before or at the time of PCI.

☒ **Symptomatic carotid artery stenosis, secondary prevention after CABG surgery, established coronary artery disease (CAD), recent MI, recent stroke, or established peripheral arterial disease (PAD),secondary prevention of cardiovascular disease :** 75 mg(1 tablet) once daily **.**

☒ Administration:

Administer without regard to meals.

☒ Precautions:

- Use is contraindicated in patients with active pathological bleeding (eg, peptic ulcer, intracranial hemorrhage).
- Cases of TTP (usually occurring within the first 2 weeks of therapy), resulting in some fatalities.
- In patients undergoing elective surgery, consider discontinuing 5 days before surgery (except in some patients specific situations need to be discussed with cardiologist).
- Premature interruption of therapy may result in stent thrombosis with subsequent fatal and nonfatal MI. Duration of therapy, in general, is determined by the type of stent placed (bare metal or drug eluting) and whether an ACS event was ongoing at the time of placement.

☒ Monitoring Parameters

Signs of bleeding; hemoglobin and hematocrit periodically.

8. Diazepam(10 mg) Ampoule

☒ Dosage:

- ✓ **Acute ethanol withdrawal:** *IV, IM:* 10 mg initially; may administer 5 to 10 mg 3 to 4 hours later, if needed.
- ✓ **Anxiety (symptoms/disorders):** *IM, IV:* 2 to 10 mg; may repeat in 3 to 4 hours, if needed. **Preoperative: Anxiety:** *IM:* 10 mg prior to surgery
- ✓ **Sedation in the ICU patient:** *IV:* Loading dose: 5 to 10 mg; Maintenance dose: 0.03 to 0.1 mg/kg every 30 minutes to 6 hours.

☒ Administration:

- Administer undiluted by slow IV push; do not mix with other solutions or medications.
- Rapid injection may cause respiratory depression or hypotension, in adults, maximum infusion rate is 5 mg/minute.
- Do not administer through small veins (eg, dorsum of hand/wrist). Avoid intra-arterial administration.
- Continuous infusion is not recommended because of precipitation in IV fluids and absorption of drug into infusion bags and tubing.
- Vesicant; ensure proper needle or catheter placement prior to and during infusion; avoid extravasation.

Extravasation management: If extravasation occurs, stop IV administration immediately and disconnect (leave cannula/needle in place); gently aspirate extravasated solution (do **NOT** flush the line); remove needle/cannula; elevate extremity. Apply dry cold compresses.

☒ Precautions:

- It has been associated with anterograde amnesia.

- Patients must be cautioned about performing tasks that require mental alertness (eg, operating machinery, driving).

- Use with caution in patients with respiratory disease; a lower dose is recommended for chronic respiratory insufficiency.

- Concomitant use with opioids may result in profound sedation, respiratory depression, coma, and death; limit dosages and durations to the minimum required. Follow patients for signs and symptoms of respiratory depression and sedation.

- Chronic use of this agent may increase the perioperative benzodiazepine dose needed to achieve desired effect.

- Use caution when reducing dose or withdrawing therapy; decrease slowly and monitor for withdrawal symptoms.

☒ Monitoring Parameters:

HR, RR, BP, and mental status; liver enzymes and CBC with long-term therapy, depth of sedation in critically-ill patients.

9 . Digoxin (0.5 mg/ 2 ml) ampoule

☒ Dosage:

- ✓ **Rate control in atrial fibrillation or atrial flutter, supraventricular tachycardia :** *Total digitalizing dose (TDD):* Initial: IV: 0.25 to 0.5 mg over several minutes, with repeat doses of 0.25 mg every 6 hours to a maximum of 1.5 mg over 24 hours **or** a total of 8 to 12 **mcg**/kg (use lean body weight) (not to exceed 0.75 to 1.5 **mg**) administered by giving 50% of TDD over 5 minutes and the remaining 50% as 2 doses of 25% of TDD at 4- to 8-hour intervals after the initial dose; follow either of these TDD regimens with an oral maintenance regimen .

☒ Preparation for Administration:

May be administered undiluted or diluted fourfold in D_5W, NS, or SWFI for direct injection. Less than fourfold dilution may lead to drug precipitation.

☒ Administration:

- May be administered undiluted or diluted. Inject slowly over ≥5 minutes

- Vesicant; ensure proper needle or catheter placement prior to and during administration; avoid extravasation.

Extravasation management: If extravasation occurs, stop IV administration immediately and disconnect (leave cannula/needle in place); gently aspirate extravasated solution (do **NOT** flush the line); remove needle/cannula; elevate extremity.

☒ Precautions:

- Digoxin toxicity: Signs and symptoms of digoxin toxicity include anorexia, nausea, vomiting, visual changes, and cardiac arrhythmias; toxicity is usually associated with digoxin levels >2 ng/mL, although symptoms may occur at lower levels. Patients at increased risk for digoxin toxicity include those with low body weight, advanced age, renal impairment, hypokalemia, hypercalcemia, or hypomagnesemia.

- Proarrhythmic effects: Monitor for proarrhythmic effects (especially with digoxin toxicity).
- Correct electrolyte disturbances, especially hypokalemia or hypomagnesemia, prior to use and throughout therapy; toxicity may occur despite therapeutic digoxin concentrations
- Use with caution in patients with renal impairment; dosage adjustment needed.

☒ Monitoring Parameters

HR, rhythm , periodic ECGs to assess desired effects and signs of toxicity; baseline and periodic serum creatinine, serum electrolytes, digoxin level.

10 . Dobutamine 250 mg injection

☒ Dosage:

- ✓ **Cardiac decompensation:** IV infusion:Initial dose: 0.5 to 1 mcg/kg/minute; may also initiate at higher doses (eg, 2.5 mcg/kg/minute) depending on severity of decompensation with titration to desired response.
  Maintenance dose: 2 to 20 mcg/kg/minute. Maximum dose: 40 mcg/kg/minute. Heart failure guidelines recommend a maximum dose of 20 mcg/kg/minute

- ✓ **Stress echocardiography (diagnostic agent):** IV infusion: Initial: 5 to 10 mcg/kg/minute; increase at 3-minute intervals to 20 mcg/kg/minute, then 30 mcg/kg/minute, and then 40 mcg/kg/minute.

☒ Administration:

- IV infusion: 250 mg in 500 mL (concentration: 500 **mcg**/mL), 500 mg in 250 mL (concentration: 2,000 **mcg**/mL), **or** 1,000 mg in 250 mL (concentration: 4000 **mcg**/mL) of D5W or NS.
- Always administer via infusion device; administer into large vein.

☒ Precautions:

- Ensure that ventricular rate is controlled in atrial fibrillation/flutter before initiating; may increase ventricular response rate.
- May cause dose-related increases in heart rate.
- Correct electrolyte disturbances, especially hypokalemia or hypomagnesemia, prior to use and throughout therapy to minimize the risk of arrhythmias.
- Correct hypovolemia first to optimize hemodynamics.

☒ Monitoring Parameters

BP, ECG, HR, CVP, RAP, MAP

11 . Dopamine (40 mg/ ml) ampoule(5 ml)

☒ Dosage:

✓ **Hemodynamic support:** IV infusion: 2 to 20 mcg/kg/minute; titrate to desired response (maximum: 50 mcg/kg/minute); infusion may be gradually increased by 5 to 10 mcg/kg/minute increments until optimal response is obtained.

☒ Administration:

- IV administer as a continuous infusion with the use of an infusion pump.
- Administer into large vein to prevent the possibility of extravasation (central line administration); monitor continuously for free flow; use infusion device to control rate of flow; administration into an umbilical arterial catheter is not recommended.
- When discontinuing the infusion, gradually decrease the dose of dopamine (sudden discontinuation may cause hypotension).

- **Vesicant**; ensure proper needle or catheter placement prior to and during infusion; avoid extravasation.

Extravasation management: If extravasation occurs, stop infusion immediately and disconnect (leave cannula/needle in place); gently aspirate extravasated solution (do **NOT** flush the line); remove needle/cannula; elevate extremity. Initiate phentolamine antidote. Apply dry warm compresses.

Phentolamine: Dilute 5 to 10 mg in 10 to 20 mL NS and administer into extravasation site as soon as possible after extravasation; may readminister if patient remains symptomatic .

☒ Precautions:

- May cause increases in heart rate, increasing the risk of tachycardia and other tachyarrhythmias including ventricular arrhythmias.
- Correct electrolyte disturbances, especially hypokalemia or hypomagnesemia, prior to use and throughout therapy to minimize the risk of arrhythmias.

- Protect from light.

☒ Monitoring Parameters:

✓

BP, ECG, HR, CVP, RAP, MAP

12. Flumazenil 0.5 mg amp

☒ Dosage:

- ✓ **Benzodiazepine reversal when used in conscious sedation or general anesthesia:** IV: Initial dose: 0.2 mg **over 15 seconds**. Repeat doses (maximum: 4 doses): If the desired level of consciousness is not obtained, 0.2 mg may be repeated at 1-minute intervals. Maximum total cumulative dose: 1 mg (usual total dose: 0.6 to 1 mg). In the event of resedation: Repeat doses may be given at 20-minute intervals as needed at 0.2 mg per minute to a maximum of 1 mg total dose and 3 mg in 1 hour.
- ✓ **Management of benzodiazepine overdose:** IV: Initial dose: 0.2 mg **over 30** seconds; if the desired level of consciousness is not obtained 30 seconds after the dose, 0.3 mg can be given over 30 seconds. Repeat doses: 0.5 mg over 30 seconds repeated at 1-minute intervals. Maximum total cumulative dose: 3 mg (usual total dose: 1 to 3 mg).

☒ Administration: Administer in freely-running IV into large vein.

☒ Precautions:

- Does not consistently reverse amnesia; patient may not recall verbal instructions after procedure.

-Patients must be cautioned about performing tasks which require mental alertness (eg, operating machinery or driving) for 24 hours after discharge.

- Flumazenil is not a substitute for evaluation of oxygenation. Establishing an airway and assisting ventilation, as necessary, is always the initial step in overdose management.

- Benzodiazepine reversal may result in seizures; seizures may occur more frequently in patients on benzodiazepines for long-term sedation or following tricyclic antidepressant overdose. Dose should be individualized and practitioners should be prepared to manage seizures.

☒ Monitoring Parameters

Monitor for return of sedation, respiratory depression, benzodiazepine withdrawal, and other residual effects of benzodiazepines for at least 2 hours and until the patient is stable and resedation is unlikely.

13 . Furosemide (20 mg/ 2ml) ampoule(2 ml)

☒ Dosage:

- ✓ **Acute pulmonary edema:** IV: Initial: 40 mg/dose. If response not adequate within 1 hour, may increase to 80 mg/dose. **Note:** Minimal additional response is gained by single doses over 160 to 200 mg; maximum: 200 mg/dose
- ✓ **Edema:**IM, IV: Initial: 20 to 40 mg/dose; if response is not adequate, may repeat the same dose or increase dose in increments of 20 mg/dose and administer 1 to 2 hours after previous dose (maximum: 200 mg/dose). **Note:** A higher initial dose may be considered for those receiving chronic oral diuretic therapy. Individually determined dose should then be given once or twice daily although some patients may initially require dosing as frequent as every 6 hours.

  - Continuous IV infusion: Initial: IV bolus dose 40 to 100 mg over 1 to 2 minutes, followed by continuous IV infusion rate of 10 to 40 mg/hour; repeat loading dose before increasing infusion rate.

  Note: In clinical trials evaluating dosing strategies in acute decompensated heart failure, median and maximum doses were ≤ 20 mg/hour. With lower baseline CrCl (eg, CrCl <25 mL/minute), the upper end of the initial infusion dosage range should be considered. If urine output is <1 mL/kg/hour, double as necessary to a maximum of 80 to 160 mg/hour. The risk associated with higher infusion rates (80 to 160 mg/hour) must be weighed against alternative strategies.

Note: in acute renal failure, doses up to **1 to 3 g** daily may be necessary to initiate desired response; avoid use in oliguric states.

☒ Preparation for Administration

IV infusion solution may be mixed in NS or D5W solution. May also be diluted for infusion to 1 to 2 mg/mL (maximum: 10 mg/mL).

☒ Administration:

- Undiluted direct IV injections may be administered at a rate of 20 to 40 mg per minute; maximum rate of administration for short-term intermittent infusion is 4 mg/minute; exceeding this rate increases the risk of ototoxicity.

- Protect from light. Exposure to light may cause discoloration; do not use furosemide solutions if they have a yellow color.

- Refrigeration may result in precipitation or crystallization; however, resolubilization at room temperature or warming may be performed without affecting the drug's stability.

- Infusion solution in D5W, NS, or LR is stable for 24 hours at room temperature.

☒ Precautions:

- Close medical supervision and dose evaluation are required. Watch for and correct electrolyte disturbances; adjust dose to avoid dehydration. When electrolyte depletion is present, therapy should not be initiated unless serum electrolytes, especially potassium, are normalized.

- Asymptomatic hyperuricemia has been reported with use.

- Monitor fluid status and renal function in an attempt to prevent oliguria, azotemia, and reversible increases in BUN and creatinine; close medical supervision of aggressive diuresis required.

- Rapid IV administration, severe renal impairment, excessive doses, hypoproteinemia, and concurrent use of other ototoxins are associated with ototoxicity.

- Photosensitization may occur.

- Avoid in patients with Sulfonamide ("sulfa") allergy.

- If given the morning of surgery, furosemide may render the patient volume depleted and blood pressure may be labile during general anesthesia.

- For some patients, despite higher doses of loop diuretic treatment, an adequate diuretic response cannot be attained. Diuretic resistance can usually be overcome by iv administration, the use of two diuretics together (eg, furosemide and chlorothiazide), or the use of a diuretic with a positive inotropic agent. When such combinations are used, serum electrolytes need to be monitored even more closely.

☒ Monitoring Parameters:

Monitor I & O and weight daily; BP, orthostasis; serum electrolytes, renal function; monitor hearing with high doses or rapid IV administration.

14. Haloperidol (10 mg) Ampoule

☒ Dosage:

- ✓ **Agitation and/or delirium:** IV: Initial: 0.5 to 10 mg depending on degree of agitation; if inadequate response, may repeat or increase bolus dose every 15 to 30 minutes until calm achieved, then administer 25% of the total bolus dose every 6 hours if needed. Monitor ECG and QTc interval. After symptoms resolve, haloperidol therapy should be tapered off over several days.

☒ Preparation for Administration:

- Haloperidol lactate may be administered IVPB or IV infusion in D_5W solutions. NS solutions should not be used due to reports of decreased stability and incompatibility. - Usual concentration range: 0.5 to 100 mg/50 to 100 mL D_5W.

☒ Administration:

Rate of IV administration not well defined; rates of a maximum of 5 mg/minute and 0.125 mg/kg (in 10 mL NS) over 1 to 2 minutes have been reported. .

☒ Precautions:

- Prior to initiation of intravenous therapy, obtain a baseline ECG. Consider continuous ECG monitoring, especially if the patient has risk factors for QTc prolongation, the baseline ECG reveals a prolonged QTc, or cumulative doses of ≥2 mg are needed.

- Monitor electrolyte concentrations throughout therapy. If the baseline QTc interval increases by 20% to 25%, increases >500 msec, or if T-waves flatten or U-waves develop on the ECG, reduce the dosage or consider alternatives.

- Discontinue therapy at first signs of blood dyscrasias or if absolute neutrophil count <1,000/mm^3.

- Patients must be cautioned about performing tasks that require mental alertness (eg, operating machinery, driving).

- May cause extrapyramidal symptoms (EPS), including pseudoparkinsonism, acute dystonic reactions, akathisia, and tardive dyskinesia. Consider therapy discontinuation with signs/symptoms of tardive dyskinesia.

- Avoid in thyrotoxicosis; severe neurotoxicity (rigidity, inability to walk or talk) may occur with use.

- Use with caution in patients with severe cardiovascular disease because of the possibility of transient hypotension and/or precipitation of angina pain.

☒ Monitoring Parameters:

Mental status, vital signs, ECG, CBC, electrolytes, liver function, abnormal involuntary movements or parkinsonian signs.

15. Heparin sodium (5000 IU/ ml) vial

☒ Dosage:

- ✓ **Acute coronary syndromes:** IV infusion (weight-based dosing per institutional nomogram recommended):

  STEMI, NSTE-ACS: Adjunct to fibrinolysis, Initial bolus of 60 units/kg (maximum: 4,000 units), then 12 units/kg/hour (maximum: 1,000 units/hour) as continuous infusion. Adjust to target aPTT of 1.5 to 2 times control (approximately 50 to 70 seconds). Continue for a minimum of 48 hours, and preferably for the duration of hospitalization (up to 8 days) or until revascularization (if performed)

- ✓ **Anticoagulation (Intermittent administration):** IV: Initial: 10,000 units, then 50 to 70 units/kg (5,000 to 10,000 units) every 4 to 6 hours.
- ✓ **Maintenance of catheter patency (continuous infusion):** Using heparin 2 unit/mL large volume IV solutions, may administer at an infusion rate of 3 mL/hour (equivalent to 6 units/hour); however, rate of infusion dependent upon age, weight, clinical condition of patient, and procedure being employed. Do not use as a "catheter lock flush".
- ✓ **Maintenance of line patency (line flushing):** When using daily flushes of heparin to maintain patency of single and double lumen central catheters, 10 units/mL is commonly used for younger infants (eg, <10 kg) while 100 units/mL is used for older infants, children, and adults.
- ✓ **Atrial fibrillation (to prevent stroke and systemic embolism):** General guidelines pertaining to peri-cardioversion use: IV: If patient is not on another anticoagulant prior to presentation, begin heparin and titrate based on institutional protocol to maintain an aPTT equivalent to anti-Xa activity in the range of 0.3 to 0.7 units/mL .

- ***Cardioversion:***
  - *Patients with atrial fibrillation >48 hours or unknown duration*: **Note:** Patient should receive therapeutic anticoagulation (usually an oral anticoagulant) for ≥3 weeks prior to cardioversion. Alternatively, a transesophageal echocardiogram (TEE) may be performed and if no thrombus is visualized, cardioversion may be performed within 24 hours .
  - *Patients with atrial fibrillation <48 hours:* **Note:** Begin heparin at the time of presentation. Cardioversion may be performed without 3 weeks of anticoagulation prior to procedure .
  - *Emergency cardioversion in hemodynamically unstable patient:* **Note:** Begin heparin at the time of presentation, but initiation of anticoagulation should not delay emergency cardioversion. Cardioversion may be performed without 3 weeks of anticoagulation prior to procedure .

  Note: In all scenarios, patients should be transitioned to an oral anticoagulant and receive therapeutic anticoagulation for at least 4 weeks after cardioversion .

- ✓ **Dialysis, anticoagulation of circuit:**

***Intermittent hemodialysis*:**
- Standard dose: IV: Initial: Bolus 2,000 units; repeat bolus halfway through hemodialysis treatment **or** may start a continuous infusion of 500 units/hour after the initial bolus; titrate to maintain an ACT of 200 to 250 seconds throughout procedure. If an infusion is used, turn off the infusion 30 minutes before the end of the procedure.
- Minimum dose (for patients at high risk for bleeding): IV: Initial: Bolus 500 units; repeat boluses every 30 minutes **or** may start a continuous infusion of 250 to 500 units/hour after the initial bolus; monitor frequently and titrate to maintain an ACT of 150 to <200 seconds throughout procedure.

***Continuous renal replacement therapy (alternative agent)*:** IV: Initial: Bolus 500 to 1,000 units; followed by a continuous infusion of 500 units/hour; titrate to maintain an aPTT of ~45 seconds. **Note**: Standard dosing has not been established. Protocols should be individualized based on coagulation abnormalities and risk for bleeding.

- ✓ **Thromboprophylaxis (low-dose heparin):** SubQ: 5,000 units every 8 to 12 hours. Duration of therapy and specific dosing for certain populations*:*

  - *Acute illness in hospitalized cancer patients:* SubQ: 5,000 units every 8 hours; recommended duration of therapy is length of hospital stay or until fully ambulatory.

  - *Major surgery in cancer patients:* SubQ: 5,000 units 2 to 4 hours preoperative and 5,000 units every 8 hours thereafter; continue therapy for at least 7 to 10 days. Prolonged treatment up to 4 weeks should be considered in patients undergoing major abdominal or pelvic surgery for cancer with high-risk features (eg, limited mobility, obesity, VTE history, comorbid conditions) .

  - *Orthopedic surgery:* Minimum duration of therapy of 10 to 14 days for patients undergoing total hip arthroplasty, total knee arthroplasty, or hip fracture surgery .

- ✓ **Venous thromboembolism (DVT/PE), treatment :***Initial anticoagulation:*

  IV: Inpatient setting: 80 units/kg (or alternatively 5,000 units) IV bolus followed by an initial continuous infusion of 18 units/kg/hour (or alternatively 1,000 units/hour).

☒ Administration:

- Continuous IV infusion: Infuse via infusion pump.

- Heparin lock: Inject via injection cap using positive pressure flushing technique. Heparin lock flush solution is intended only to maintain patency of IV devices and is **not** to be used for anticoagulant therapy.

- Central venous catheters: Must be flushed with heparin solution when newly inserted, daily (at the time of tubing change), after blood withdrawal or

transfusion, and after an intermittent infusion through an injectable cap. A volume of at least 10 mL of blood should be removed and discarded from a heparinized line before blood samples are sent for coagulation testing.

- Do **not** administer IM due to pain, irritation, and hematoma formation.

☒ Precautions :

- Use with caution in patients with an increased risk of bleeding

- Monitor for hyperkalemia.

- Heparin-induced thrombocytopenia (HIT) may occur.. Monitor platelets closely; discontinue therapy and consider alternatives if platelets are <100,000/mm^3 and/or thrombosis develops. HIT may be delayed and can occur up to several weeks after discontinuation of heparin.

☒ Monitoring Parameters:

- Hemoglobin, hematocrit, signs of bleeding; fecal occult blood test; **aPTT**(prior to heparin therapy, 6 hours after initiation, and 6 hours after any dosage change, and should be used to adjust the heparin infusion until the aPTT exhibits a therapeutic level. When two consecutive aPTT values are therapeutic, subsequent measurements may be made every 24 hours, and if necessary, dose adjustment carried out.

- Platelet counts should be routinely monitored (eg, every 2 to 3 days on days 4 to 14 of heparin therapy) when the risk of HIT is >1% (eg, receiving therapeutic dose heparin, postoperative antithrombotic prophylaxis), if the patient has received heparin or low molecular weight heparin (eg, enoxaparin) within the past 100 days, if pre-exposure history is uncertain, or if anaphylactoid reaction to heparin occurs. When the risk of HIT is <1% (eg, medical/obstetrical patients receiving heparin flushes), routine platelet count monitoring is not recommended.

- Institution-specific and indication-specific nomograms should be consulted for dose adjustment.

16. Hydralazine 20mg amp

☒ Dosage:

- ✓ **Hypertensive emergency:** IM, IV: 10 to 20 mg every 4 to 6 hours as needed; may increase dose to a maximum of 40 mg/**dose** if necessary.
- ✓ **Hypertensive emergency in pregnancy or postpartum (including acute-onset hypertension in preeclampsia/eclampsia) :** IM, IV: Initial: 5 or 10 mg; repeat with 5 to 10 mg doses every 20 minutes if blood pressure continues to exceed thresholds .If SBP or DBP remains above threshold after a total cumulative dose of 20 to 30 mg, another agent should be used.

- ✓ **Perioperative hypertension** :IV: 5 to 20 mg every 4 to 6 hours as needed .

☒ **Administration**: undiluted as IM injection. **Also** undiluted as slow IV push.

☒ Precautions:

- May cause a drug-induced lupus-like syndrome including: glomerulonephritis, especially in patients receiving higher doses.

  - Postural hypotension may occur.

- Use is contraindicated in patients with coronary artery disease (CAD)
- Use with caution in patients with mitral valvular disease; may increase pulmonary artery pressure in these patients. Use is contraindicated in patients with mitral valve rheumatic heart disease.
- Use with caution in patients with advanced renal impairment; dosage adjustment recommended

☒ Monitoring Parameters:

- BP , HR,CBC

17. Hydrocortisone 100 mg vial

☒ Dosage:

- ✓ **Anti-inflammatory or immunosuppressive:** IM, IV: Initial: 100 to 500 mg/dose at intervals of 2, 4, or 6 hours.
- ✓ **Multiple sclerosis, acute exacerbations:** IM, IV: 800 mg/day for 1 week, followed by 320 mg every other day for 1 month
- ✓ **Adrenal insufficiency:**
  Acute adrenal insufficiency (adrenal crisis) : 100 mg IV bolus, immediately followed by 200 mg over 24 hours as a continuous IV infusion or in divided doses (IM or IV) every 6 hours, then 100 mg over 24 hours the following day. Alternatively, may administer 100 mg IV bolus, then 50 to 75 mg IV every 6 hours for 24 hours, followed by a slow taper over the next 72 hours (administering doses every 4 to 6 hours during taper).
- ✓ **Stress dosing in patients known to be adrenally-suppressed (ie, prevention of adrenal crisis in glucocorticoid-treated patients) :**

Gastroenteritis with vomiting and/or diarrhea: IM, SubQ: 100 mg dose given early in course of illness; repeat after 6 to 12 hours.

Severe infection (eg, pneumonia/with altered cognition): IM, SubQ: 100 mg dose given early in course of illness; repeat after 6 to 12 hours until recovery.

Surgery:Minor stress (ie, inguinal herniorrhaphy): IV :25 mg/day for 1 day *Moderate stress (ie, joint replacement, cholecystectomy):* IV: 50 to 75 mg/day (25 mg every 8 to 12 hours) for 1 to 2 days .*Major stress (pancreatoduodenectomy, esophagogastrectomy, cardiac surgery):* IV: 100 to 150 mg/day (50 mg every 8 to 12 hours) for 2 to 3 days

- ✓ **Septic shock:** IV: 50 mg bolus every 6 hours, either as monotherapy or in combination with fludrocortisone **or** 200 mg/day as a continuous infusion . Guidelines suggest therapy duration of ≥3 days; most studies treated for up to 7 days; not all studies tapered therapy. May consider a slow taper over several days when vasopressors are no longer required to avoid possible hemodynamic deterioration which may occur with abrupt .
- ✓ **Thyroid storm:** IV: 300 mg loading dose, followed by 100 mg every 8 hours .

☒ Preparation for Administration:

- IV bolus or IM administration: Reconstitute 100 mg vials with bacteriostatic water or bacteriostatic sodium chloride (not >2 mL).

- IV infusion administration: Add reconstituted solutions to an appropriate volume of D5W, NS, or D5NS (100 to 1,000 mL for a 100 mg solution.In cases where administration of a small volume of fluid is desirable, 100 to 3,000 mg of hydrocortisone may be added to 50 mL of D5W or NS.

☒ Administration:

IM: Avoid injection into deltoid muscle (high incidence of subcutaneous atrophy). Dermal and/or subdermal skin depression may occur at injection site.

IV: Dermal and/or subdermal skin depression may occur at injection site.

IV bolus: Administer undiluted over at least 30 seconds; for large doses (≥500 mg), administer over 10 minutes.

IV intermittent infusion: Further dilute in a compatible fluid and administer over 20 to 30 minutes.

☒ Precautions :

- Prolonged use of corticosteroids may increase the incidence of secondary infection, mask acute infection (including fungal infections), prolong or exacerbate viral infections.
- May cause hypercortisolism or suppression of hypothalamic-pituitary-adrenal (HPA) axis, particularly in younger children or in patients receiving high doses for prolonged periods.
- Acute myopathy has been reported with high dose corticosteroids, usually in patients with neuromuscular transmission disorders; may involve ocular and/or respiratory muscles; monitor creatine kinase; recovery may be delayed.
- Corticosteroid use may cause psychiatric disturbance.
-Use with caution in patients with HF and/or hypertension; use has been associated with fluid retention, electrolyte disturbances, and hypertension.
- May alter glucose production/regulation leading to hyperglycemia.
- Use with caution in patients with GI diseases (diverticulitis, fresh intestinal anastomoses, active or latent peptic ulcer, ulcerative colitis, abscess or other pyogenic infection) due to perforation risk.
- High-dose corticosteroids should not be used for the management of head injury.
- Use with caution in patients with cataracts and/or glaucoma; increased intraocular pressure, open-angle glaucoma, and cataracts have occurred with prolonged use.
- May affect growth velocity; growth should be routinely monitored in pediatric patients.
- Withdraw therapy with gradual tapering of dose.

☒ Monitoring Parameters:

Serum glucose, electrolytes; BP, weight, presence of infection; monitor IOP with therapy >6 weeks; bone mineral density; assess HPA axis suppression (eg, ACTH stimulation test, morning plasma cortisol test, urinary free cortisol test); growth in pediatric patients.

18. Isosorbid Dinitrate 5 mg SL tab

☒ Dosage:

- ✓ Acute angina attack: **sublingual**: 5 mg , in the case of no response within 5 minutes, an additional tab must be administered. In the case of no response within the next 5 minutes, an additional tab must be administered with going to the emergency.

☒ Administration:

Place one tablet under the tongue and allow it to dissolve. Do not chew or swallow the tablet.

☒ Precautions :

- Take the dose while you are sit-down to prevent orthostatic hypotension.

19. Lidocaine 2% plain (50 mg) Vial

☒ Dosage:

- ✓ **Antiarrhythmic for VF or pulseless VT (after defibrillation attempts, CPR, and vasopressor administration), alternative to amiodarone and for hemodynamically stable monomorphic VT:** IV, intraosseous (IO): Initial: 1 to 1.5 mg/kg bolus. If refractory VF or pulseless VT, repeat 0.5 to 0.75 mg/kg bolus every 5 to 10 minutes (maximum cumulative dose: 3 mg/kg). Follow with continuous infusion (1 to 4 mg/minute) after return of perfusion . Reappearance of arrhythmia during constant infusion: 0.5 mg/kg bolus and reassessment of infusion .

  Note: Reduce maintenance infusion in patients with CHF, shock, or hepatic disease; initiate infusion at 10 mcg/kg/minute (maximum dose: 1.5 mg/minute or 20 mcg/kg/minute).

- ✓ **Anesthesia, local injectable:** Varies with procedure, degree of anesthesia needed, vascularity of tissue, duration of anesthesia required, and physical condition of patient.

  - *Cutaneous infiltration*: Maximum: 4.5 mg/kg/dose not to exceed 300 mg; do not repeat within 2 hours.

  - *Intraosseous line or infusion pain:* Lidocaine 2% preservative-free solution: Intraosseous: Initial dose: 40 mg over 1 to 2 minutes; usual adult dose range and maximum: 20 to 50 mg/dose; after allowing lidocaine to dwell for up to 1 minute, follow with NS flush; immediately following the NS flush, some centers administer a second lower (50% dose reduction) lidocaine dose over 30 to 60 seconds (usual adult maximum repeat dose: 20 mg/dose); if discomfort reoccurs, may repeat doses at a maximum frequency of every 45 minutes during intraosseous access; maximum total dose not established .

☒ Preparation for Administration:

Local infiltration: Buffered lidocaine for injectable local anesthetic may be prepared: Add 2 mL of sodium bicarbonate 8.4% to 18 mL of lidocaine 1%.

☒ Administration:

IV Bolus: may administer at 25 to 50 mg/minute. In the setting of cardiac arrest (eg, ventricular fibrillation or pulseless ventricular tachycardia), may be infused rapidly into a peripheral vein .

IV Continuous infusion: After initial bolus dosing, may administer as a continuous infusion; refer to indication-specific infusion rates in dosing for detailed recommendations. In the setting of cardiac arrest, infusion may be initiated once patient has return of spontaneous circulation resulting from lidocaine administration; however, there is no evidence to support subsequent continuous infusion to prevent recurrence. Local thrombophlebitis may occur in patients receiving prolonged IV infusions.

☒ Precautions:

- Use with extreme caution in patients with severe hepatic dysfunction; may have increased risk of lidocaine toxicity.

- Constant ECG monitoring is necessary during IV administration.

- Use cautiously in hepatic impairment, HF, marked hypoxia, severe respiratory depression, hypovolemia, history of malignant hyperthermia, or shock. Increased ventricular rate may be seen when administered to a patient with atrial fibrillation.

- Use is contraindicated in patients with Wolff-Parkinson-White syndrome and severe degrees of SA, AV, or intraventricular heart block (except in patients with a functioning artificial pacemaker).

- Correct electrolyte disturbances, especially hypokalemia or hypomagnesemia, prior to use and throughout therapy.

- Correct any underlying causes of ventricular arrhythmias. Monitor closely for signs and symptoms of CNS toxicity.

☒ Monitoring Parameters:

Liver function tests, ECG; in patients requiring drug >24 hrs, blood level monitoring recommended.

20 . Magnesium Sulphate 10% (10ml) ampoule

☒ Dosage:

Note: 1 g of magnesium sulfate = 98.6 mg elemental magnesium = 8.12 mEq elemental magnesium = magnesium 4.06 mmol

✓ **Eclampsia/preeclampsia (severe):** IV, IM: An initial total dose of 10 to 14 g administered as follows: 4 g IV infusion with simultaneous IM injections of 4 to 5 g in each buttock. After the initial IV/IM doses, may administer a 1 to 2 g/hour continuous infusion or may follow with IM doses of 4 to 5 g into alternate buttocks every 4 hours as necessary. Maximum: 40 g/24 hours. Alternatively, may administer an IV only regimen using an initial 4 to 6 g loading dose followed by 1 to 2 g/hour continuous infusion for at least 24 hours.

✓ **Hypomagnesemia, treatment:**

- Mild deficiency: IM: 1 g every 6 hours for 4 doses, or as indicated by serum magnesium concentrations

- Mild to moderate (serum concentration 1 to 1.5 mg/dL): IV: 1 to 4 g (up to 0.125 g/kg), administer at ≤1 g/hour if asymptomatic; do not exceed 12 g over 12 hours. **Note:** Additional supplementation may be required after the initial dose with replenishment occurring over several days.

- Severe deficiency:*IM*: Up to 250 mg/kg within a 4-hour period. *IV*: Severe (<1 mg/dL): 4 to 8 g (up to 0.1875 g/kg), administer at ≤1 g/hour if asymptomatic; in symptomatic patients, may administer ≤4 g over 4-5 minutes .

☒ **Torsades de pointes: Polymorphic VT (with pulse) associated with QT prolongation (torsades de pointes):** IV: 1 to 2 g (diluted in 50 to 100 mL D5W) over 15 minutes (range: 5 to 60 minutes); may follow with a continuous IV infusion of 0.5 to 1 g/hour. **VF/pulseless VT associated with torsades de pointes:** IV/IO: 1 to 2 g (diluted in 10 mL D5W) administered as a bolus .

☒ Preparation for Administration:

IV: Dilute to ≤20% in a compatible solution (eg, D5W, NS) for IV infusion.

☒ Administration:

- Must be diluted to a ≤20% solution for IV infusion and may be administered IV push, IVPB, or as a continuous IV infusion, or intraosseous (IO).

- When giving IV push, must dilute first and should generally not be given any faster than 150 mg/minute.

- Maximal rate of infusion (routine administration for hypomagnesemia prevention/treatment): Up to 50% of an IV dose may be eliminated in the urine, therefore, slower administration may improve retention (maximum rate: 1 g/hour in asymptomatic hypomagnesemia). For doses <6 g, infuse over 8 to 12 hours and for larger doses infuse over 24 hours if patient is asymptomatic. If patient is severely symptomatic (or has conditions such as preeclampsia or eclampsia) more aggressive therapy (≤4 g over 4 to 5 minutes) may be required; patients should be closely monitored (Kraft 2005).

☒ Precautions:

- Use with extreme caution in patients with myasthenia gravis or other neuromuscular disease.

- Use with caution in patients with renal impairment; accumulation of magnesium may lead to magnesium intoxication.

- Concurrent hypokalemia or hypocalcemia can accompany a magnesium deficit. Hypomagnesemia is frequently associated with hypokalemia and requires correction in order to normalize potassium.

- Magnesium toxicity can lead to fatal cardiovascular arrest and/or respiratory paralysis.

☒ Monitoring Parameters:

ECG, vital signs, deep tendon reflexes; magnesium concentrations if frequent or prolonged dosing required particularly in patients with renal dysfunction, calcium, and potassium concentrations; renal function.

21 . Metoprolol (1 mg/ ml) ampoule

☒ Dosage:

- ✓ **Acute ventricular rate control for atrial fibrillation/flutter, acute treatment for supraventricular tachycardia:** IV: 2.5 to 5 mg over 2 minutes; repeat dose every 5 minutes as needed; maximum total dose: 15 mg).
- ✓ **Early treatment for myocardial infarction, acute ventricular tachycardia*(eg, sustained VT)***: Initial: IV : 5 mg; repeat dose every 5 minutes for up to 3 doses as needed based on heart rate and blood pressure; maximum total dose: 15 mg; then begin oral therapy.

☒ Administration:

By IV bolus. Some centers may administer by slow infusion (ie, 5 to 10 mg of metoprolol in 50 mL of D5W, NS) over ~30 to 60 minutes during less urgent situations (eg, substitution for oral metoprolol).

☒ Precautions :

- Metoprolol should not be withdrawn abruptly (particularly in patients with CAD), but gradually tapered over 1 to 2 weeks to avoid acute tachycardia, hypertension, and/or ischemia.

- Switching between oral and intravenous dosage forms: the range of Oral:IV conversion ratios was approximately 2:1 to 5:1

☒ Monitoring Parameters:

ECG, HR, and BP.

23. Naloxone (0.4 mg/ml) amp

☒ Dosage:

- ✓ **Opioid overdose:** IV, IM, SubQ: Initial: 0.4 to 2 mg; may need to repeat doses every 2 to 3 minutes. A lower initial dose (0.1 to 0.2 mg) should be considered for patients with opioid dependence to avoid acute withdrawal or if there are concerns regarding concurrent stimulant overdose. After reversal, may need to readminister dose(s) at a later interval (ie, 20 to 60 minutes) depending on type/duration of opioid. If no response is observed after 10 mg total, consider other causes of respiratory depression. *Continuous infusion:* IV: **Note:** For use with exposures to long-acting opioids (eg, methadone), sustained release product, and symptomatic body packers after initial naloxone response. Calculate dosage/hour based on effective intermittent dose used and duration of adequate response seen **or** use two-thirds ($^2/_3$) of the initial effective naloxone bolus on an hourly basis (typically 0.25 to 6.25 mg/hour); one-half ($^1/_2$) of the initial bolus dose should be readministered 15 minutes after initiation of the continuous infusion to prevent a drop in naloxone levels; adjust infusion rate as needed to assure adequate ventilation and prevent withdrawal symptoms.

- ✓ **Reversal of respiratory depression with therapeutic opioid doses:** IV: Initial: 0.02 to 0.2 mg; titrate to avoid profound withdrawal, seizures, arrhythmias, or severe pain. *Continuous infusion:* IV: **Note:** same regimen as in opioid overdose but the rate is (typically 0.2 to 0.6 mg/hour).

  - *Opioid-dependent patients being treated for cancer pain:* IV: **Note:** May dilute 0.4 mg/mL (1 mL) ampule into 9 mL of normal saline for a total volume of 10 mL to achieve a 0.04 mg/mL (40 **mcg**/mL) concentration. 0.02 mg (20 **mcg**) IV push; administer every 2 minutes until improvement in symptoms **or** 0.04 to 0.08 mg (40 to 80 **mcg**) slow IV push; administer every 30 to 60 seconds until improvement in symptoms; if no response is observed after total naloxone dose 1 mg, consider other causes of respiratory depression. If respiratory depression is due to long-acting opioids, may consider administering naloxone as a continuous infusion starting at 66% of the total bolus dose (or 0.2 mg per hour) to reverse the opioid toxicity .

  - *Postoperative reversal:* IV: 0.1 to 0.2 mg every 2 to 3 minutes until desired response (adequate ventilation and alertness without significant pain). **Note:** Repeat doses may be needed within 1 to 2 hour intervals depending on type, dose, and timing of the last dose of opioid administered.

- ✓ **Opioid-induced pruritus:** IV infusion: 0.25 **mcg/kg/hour** . Doses up to ~3 **mcg/kg/hour** have been employed. However, doses >2 **mcg/kg/hour** are more likely to lead to reversal of analgesia and are not recommended.

☒ **Preparation for administration:** IV push: Dilute naloxone 0.4 mg (1 mL ampul) with 9 mL of NS for a total volume of 10 mL to achieve a concentration of 0.04 mg/mL.

- IV infusion: Dilute naloxone 2 mg in 500 mL of NS or D5W to make a final concentration of 4 **mcg**/mL.

☒ Administration:

- IV push: Administer over 30 seconds as undiluted preparation **or** administer as diluted preparation slow IV push by diluting 0.4 mg (1 mL) ampoule with 9 mL of normal saline for a total volume of 10 mL to achieve a concentration of 0.04 mg/mL.

- May administer IM or SubQ if unable to obtain IV access.

☒ Precaution:

- Administration of naloxone causes the release of catecholamines, which may precipitate acute withdrawal or unmask pain in those who regularly take opioids. Symptoms of acute withdrawal in opioid-dependent patients may include pain, tachycardia, hypertension, fever, sweating, abdominal cramps, diarrhea, nausea, vomiting, agitation, and irritability**.**

- Continuously observe patients until there is no further risk of recurrent respiratory or CNS depression.

- Use with caution in patients with history of seizures; avoid use in the treatment of meperidine-induced seizures.

- Excessive dosages should be avoided after use of opioids in surgery.

☒ Monitoring Parameters

Respiratory rate, HR, BP, temperature, level of consciousness, ABGs or pulse oximetry.

24. Nitroglycerin (1 mg/ ml) ampoule

☒ Dosage :

- ✓ **Acute decompensated heart failure:** IV: Initial: 10 to 20 mcg/minute, with subsequent titration (eg, 10 to 20 mcg/minute every 5 to 15 minutes) up to 200 mcg/minute **or** 0.3 to 0.5 mcg/**kg**/minute with titration (if SBP ≥90 mm Hg) in increments of 20 mcg/minute every 1 to 3 minutes up to 400 mcg/minute.

- ✓ **Gastroesophageal variceal hemorrhage:** IV infusion: Initial: 40 mcg/minute, increase by 40 mcg/minute every 15 minutes if systolic blood pressure is >90 to 100 mm Hg, up to a maximum of 400 mcg/minute.

☒ Preparation for Administration:

- Each 50 mg diluted in 250 ml D5W (Maximum concentration: 0.4 mg/ml).

☒ Administration:

- Use glass bottles. Alternatively use Excel® or PAB® flexible containers: Avoid in-line IV filters that adsorb nitroglycerin. Administer via infusion pump.

- Calculation of drip rate (50 mg/250 ml) ml/hr = (DOSE) mcg/min x 0.3
(eg .20mcg/min = 6 ml/hr)

☒ Precautions:

- Avoid nitrates in the following conditions: Hypotension (SBP <90 mm Hg or ≥30 mm Hg below baseline), marked bradycardia or tachycardia, and right ventricular infarction.
- Dose-related headaches may occur, especially during initial dosing.
- Severe hypotension and shock may occur (even with small doses); paradoxical bradycardia and increased angina pectoris may accompany hypotension and extreme caution with inferior wall MI and suspected right ventricular involvement.

- Avoid concurrent use with phosphodiesterase-5 (PDE-5) inhibitors (sildenafil, tadalafil) because they enhance the vasodilatory effect.

☒ Monitoring Parameters:

HR, and BP.

25. Noradrenaline 4 mg injection

☒ Dosage:

✓ **Hypotension/shock:** Continuous IV infusion:Initial: 8 to 12 mcg/minute; titrate to desired response. Usual maintenance range: 2 to 4 mcg/minute; dosage range varies greatly depending on clinical situation.

☒ Preparation for Administration:

Continuous IV infusion: Dilute with D5W, D5NS.
Concentrations ranging from 4 to 16 mcg/mL are typically used in clinical

☒ Administration:

- Administer as a continuous infusion via an infusion pump**.** Dilute prior to use. **Central line** administration is preferred.

- Ensure proper needle or catheter placement prior to and during infusion; avoid extravasation.

- Do not administer sodium bicarbonate (or any alkaline solution) through an IV line containing norepinephrine; inactivation of norepinephrine may occur.

Extravasation management: stop infusion immediately and disconnect (leave cannula/needle in place); gently aspirate extravasated solution (do **NOT** flush the line); remove needle/cannula; elevate extremity. Initiate **phentolamine** (or alternative) antidote. Apply dry warm compresses .Phentolamine: dilute 5 to 10 mg in 10 mL NS and administer into extravasation area (within 12 hours of extravasation).

☒ Monitoring Parameters

HR, BP or MAP, cardiac output (as appropriate), intravascular volume status, pulmonary capillary wedge pressure (as appropriate); urine output, peripheral perfusion; monitor infusion site closely.

26. Potassium Chloride 15% (10 ml) ampoule

☒ Dosage:

✓ **Treatment of hypokalemia:** *IV intermittent infusion:* Peripheral or central line: ≤10 mEq/hour; repeat as needed based on frequently obtained lab values; central line infusion and continuous ECG monitoring highly recommended for infusions >10 mEq/hour.

Potassium dosage/rate of infusion general guidelines (per product labeling): **Note:** High variability exists in dosing/infusion rate recommendations; therapy guided by patient condition and specific institutional guidelines. As an estimate, 10 mEq of potassium chloride will roughly increase serum levels by 0.1 mEq/L. Patients with more severe forms of hypokalemia (eg, serum potassium levels <3.5 mEq/L) may require increased amounts due to total body potassium deficit .

Serum potassium >2.5 to 3.5 mEq/L: Maximum infusion rate: 10 mEq/hour; maximum concentration: 40 mEq/L; maximum 24-hour dose: 200 mEq

Serum potassium <2.5 mEq/L or symptomatic hypokalemia (excluding emergency treatment of cardiac arrest): Maximum infusion rate (central line only): 40 mEq/hour in presence of continuous ECG monitoring and frequent lab monitoring; in selected situations, patients may require up to 400 mEq/24 hours.

☒ Preparation for Administration:

It must be diluted prior to parenteral administration. The concentration of infusion may be dependent on patient condition and specific institution policy. Some clinicians recommend that and 20-40 mEq/100 mL for central infusions.

☒ Administration:

- Potassium chloride **must be diluted** prior to parenteral administration. For IV infusion; **do not administer IV push.**

- The maximum concentration for peripheral infusion is 10 mEq/100 mL and the maximum rate of administration for peripheral infusion is 10 mEq/hour. With central line administration, higher concentrations and more rapid rates of infusion may be used; concentrations of 20 to 40 mEq/100 mL at a maximum rate of 40 mEq/hour via central line have been safely administered.

- **Vesicant/irritant** (at concentrations >0.1 mEq/mL); ensure proper needle or catheter placement prior to and during IV infusion. Avoid extravasation. **Extravasation management:** If extravasation occurs, stop infusion immediately and disconnect (leave needle/cannula in place); gently aspirate extravasated solution (do **NOT** flush the line); initiate hyaluronidase antidote; remove needle/cannula; apply dry cold compresses; elevate extremity.

Hyaluronidase: Intradermal or SubQ: Inject a total of 1 to 1.7 mL (15 units/mL) as five separate 0.2 to 0.3 mL injections (using a 25-gauge needle) into area of extravasation at the leading edge in a clockwise manner .

☒ Precautions:

- Use with caution in patients with cardiovascular disease (eg, heart failure, cardiac arrhythmias, atrioventricular [AV] block); patients may be more susceptible to life-threatening cardiac effects associated with hyper/hypokalemia.

- Evaluate renal function, cardiac and fluid status, and any factors contributing to altered potassium concentrations (eg, acidosis, alkalosis) prior to therapy.

- Do NOT administer undiluted or IV push.

- Pain and phlebitis may occur during parenteral infusion requiring a decrease in infusion rate or potassium concentration.

☒ Monitoring Parameters:

Electrolytes (including serum potassium, calcium, chloride, magnesium, phosphate, sodium), acid/base balance; renal function; cardiac monitor (if intermittent infusion or potassium infusion rates >10 mEq/hour in adults); to assess adequate replacement, repeat serum potassium level 2 to 4 hours after dose; IV infusion site.

27. Propofol 1% (10 mg /ml) 20ml ampoule

☒ **Dosage:** Dosage must be individualized based on total body weight and titrated to the desired clinical effect. Wait at least 3 to 5 minutes between dosage adjustments to clinically assess drug effects.

- ✓ **General anesthesia:** ***Induction****:* Healthy adults, ASA-PS 1 or 2, <55 years: IV: 2 to 2.5 mg/kg (~40 mg every 10 seconds until onset of induction). ***Maintenance of general anesthesia****:* Healthy adults, <55 years: IV infusion: Initial: 100 to 200 mcg/kg/minute (or 6 to 12 mg/kg/**hour**) for 10 to 15 minutes; usual maintenance infusion rate: 50 to 100 mcg/kg/minute (or 3 to 6 mg/kg/**hour**) to optimize recovery time. Or IV intermittent bolus: 25 to 50 mg increments as needed

- ✓ **Monitored anesthesia care sedation:** Healthy adults, ASA-PS 1 or 2, <55 years: Slow IV infusion: 100 to 150 mcg/kg/minute (or 6 to 9 mg/kg/**hour**) for 3 to 5 minutes **or** slow injection: 0.5 mg/kg over 3 to 5 minutes followed by IV infusion of 25 to 75 mcg/kg/minute (or 1.5 to 4.5 mg/kg/**hour**) **or** incremental bolus doses: 10 mg or 20 mg

- ✓ **ICU sedation in intubated mechanically-ventilated patients:** Avoid rapid bolus injection; individualize dose and titrate to response. ***Continuous infusion****:* Initial: 5 mcg/kg/minute (or 0.3 mg/kg/**hour**); increase by 5 to 10 mcg/kg/minute (or 0.3 to 0.6 mg/kg/**hour**) every 5 to 10 minutes until desired sedation level is achieved; usual maintenance: 5 to 50 mcg/kg/minute (or 0.3 to 3 mg/kg/**hour**); reduce dose after adequate sedation established and adjust to response. Daily interruption with retitration or a light target level of sedation is recommended to minimize prolonged sedative effects.

☒ Preparation for Administration:

Does not need to be diluted; however, propofol may be further diluted in D5W to a concentration of ≥2 mg/mL. The mixture should be prepared aseptically immediately prior to administration and must be administered within 6 hrs of preparation.

☒ Administration:

- IVbolus or by continuous IV infusion.

-Do not administer through the same IV catheter with blood or plasma. Tubing and any unused portions of propofol ampoule should be discarded after 12 hours.

- To reduce pain associated with injection, use larger veins of forearm or antecubital fossa; lidocaine IV (1 mL of a 1% solution) may also be used prior to administration or it may be added to propofol immediately before administration in a quantity not to exceed 20 mg lidocaine per 200 mg propofol. Do not use filter <5 micron for administration.

☒ Precautions:

- Use a lower induction dose, a slower maintenance rate of administration, and avoid rapidly delivered boluses in **elderly** patients to reduce the incidence of unwanted cardiorespiratory depressive events.

- Serum triglyceride levels should be obtained prior to initiation of therapy and every 3 to 7 days thereafter. Monitoring of serum **triglycerides** should especially be considered with therapy >48 hours with doses exceeding 50 mcg/kg/minute .
- The major cardiovascular effect of propofol is **hypotension** especially if patient is hypovolemic or if bolus dosing is used.

- Propofol-related infusion syndrome (PRIS) is a serious side effect with a high mortality rate ,characterized by dysrhythmia (eg, bradycardia or tachycardia), heart failure, hyperkalemia, lipemia, metabolic acidosis, and/or rhabdomyolysis or myoglobinuria with subsequent renal failure. The onset of the syndrome is rapid, occurring within 4 days of initiation. Alternate sedative therapy should be considered .
- Avoid abrupt discontinuation prior to weaning or daily wake up assessments. Discontinue opioids and paralytic agents prior to weaning. Long-term infusions can result in some tolerance; taper propofol infusions to prevent withdrawal.

☒ Monitoring Parameters

Cardiac monitor, BP, O_2 saturation (during monitored anesthesia care sedation), arterial blood gas (with prolonged infusions). With prolonged infusions (eg, ICU sedation), monitor for signs and symptoms of propofol-related infusion syndrome (PRIS): Metabolic acidosis, hyperkalemia, rhabdomyolysis or elevated CPK, hepatomegaly, and progression of cardiac and renal failure.

Note: use intravenous port opposite propofol infusion or temporarily suspend infusion and flush port prior to blood draw.

28 . Regular Insulin (100IU/ ml)(10 ml vial)

☒ Dosage:

✓ **Diabetes mellitus, type 1:** SubQ:. **The total daily doses (TDD) presented below are expressed as the total units/kg/day of all insulin formulations combined.**

General insulin dosing: ***Initial TDD:*** ~0.4 to 0.5 units/kg/day ; conservative initial doses of 0.2 to 0.4 units/kg/day may be considered to avoid the potential for hypoglycemia; higher initial doses may be required in patients who are obese, sedentary, or presenting with ketoacidosis .

Usual TDD maintenance range: 0.4 to 1 units/kg/day in divided dose

Division of TDD (multiple daily injections): Basal insulin: Generally, 40% to 50% of the TDD is given as basal insulin (intermediate [NPH]- or long-acting [eg, glargine, degludec, detemir]) in 1 to 2 daily injections . Prandial insulin: The remaining portion (ie, 50% to 60%) of the TDD is then divided and administered before or at mealtimes.

Dose adjustment: Dosage must be titrated to achieve glucose control and avoid hypoglycemia. Adjust dose to maintain premeal and bedtime glucose in target range.

✓ **Diabetes mellitus, type 2:** SubQ: *Initial:* 4 to 6 units **or** 0.1 unit/kg **or** 10% of the **basal** insulin dose administered before the largest meal of the day and usually given in addition to a regimen that includes basal insulin (ie, a long-acting insulin such as glargine, degludec, or detemir; or an intermediate-acting insulin such as NPH) and metformin +/- other noninsulin agents. Consider reducing the basal insulin dose if HbA_{1c} is <8% when initiating prandial insulin.

*Dosage adjustment:*To reach self-monitoring glucose target: Adjust prandial insulin dose by 10% to 15% **or** 1 to 2 units; may adjust at weekly **or** twice weekly intervals .For hypoglycemia: If no clear reason for hypoglycemia, decrease prandial insulin dose by 2 to 4 units **or** by 10% to 20% .
HbA_{1c}still not controlled despite titrations to reach glycemic targets: One option is to advance to 'basal-bolus' (ie, prandial insulin coverage before ≥2 meals per day) in addition to **basal** insulin and usually given in addition to metformin +/- other noninsulin agents .

✓ **Patients with diabetes receiving enteral feedings:** SubQ: **Note**: TDD of insulin is divided into a basal component (intermediate- or long-acting insulin) and nutritional and correctional components (regular insulin or rapid-acting insulins).

Nutritional/Correctional: SubQ: 1 unit of regular insulin per 10 to 15 g of carbohydrate plus correctional regular insulin (as needed for hyperglycemia) administered every 6 hours or prior to each bolus feeding.

✓ **Patients with diabetes receiving parenteral feedings (ADA 2018)**:

IV (added to TPN solution): 1 unit of regular insulin per 10 g of carbohydrate added to TPN IV solution; adjust dose daily. One option is to increase the amount of regular insulin added to the TPN by two-thirds of the amount of the correctional insulin used on the previous day . *SubQ*: Administer correctional regular insulin every 6 hours as needed for hyperglycemia.

- ✓ **Diabetic ketoacidosis:** IV:*Bolus:* 0.1 units/kg (optional), *Infusion:* If a bolus was administered, follow with 0.1 units/kg/hour. If no bolus was administered, initiate with 0.14 units/kg/hour (lower doses may not achieve adequate insulin concentrations to suppress hepatic ketone body production).

Adjustment: If serum glucose does not fall by at least 10% in the first hour, give an IV bolus of 0.14 units/kg and continue previous regimen. In addition, if serum glucose does not fall by 50 to 75 mg/dL in the first hour, the insulin infusion dose should be increased hourly until a steady glucose decline is achieved Once serum glucose reaches **200** mg/dL, decrease infusion dose to 0.02 to 0.05 units/kg/hour or switch to SubQ rapid-acting insulin (eg, aspart, lispro) at 0.1 units/kg every 2 hours; administer dextrose-containing IV fluids to maintain serum glucose between 150 to 200 mg/dL until the resolution of ketoacidosis.

Transition from IV to SubQ insulin: After resolution of diabetic ketoacidosis, supplement IV insulin with SubQ insulin as needed until the patient is able to eat and transition fully to a SubQ insulin regimen. An overlap of ~1 to 2 hours between discontinuation of IV insulin and administration of SubQ insulin is recommended to ensure adequate plasma insulin levels; for basal insulin analogues (eg, degludec, detemir, glargine), may consider an overlap of 3 to 4 hours due to their delayed onset of action .

- ✓ **Hyperkalemia, moderate to severe:** IV: 10 units regular insulin mixed with 25 g dextrose (50 mL $D_{50}W$) given over 15 to 30 minutes or alternatively, 10 units regular insulin as IV bolus followed by 50 mL $D_{50}W$ administered over 5 minutes; a weight-based insulin dose of 0.1 units/kg (maximum: 10 units) may also be considered to reduce the risk of hypoglycemia. Effects on potassium are temporary; repeat dosing as needed.
- ✓ **Hyperosmolar hyperglycemic state: IV** *Bolus:* 0.1 units/kg bolus (optional)

Infusion: If a bolus was administered, follow with 0.1 units/kg/hour. If no bolus was administered, initiate with 0.14 units/kg/hour.

Adjustment: If serum glucose does not fall by at least 10% in the first hour, give an IV bolus of 0.14 units/kg and continue previous regimen. In addition, if serum glucose does not fall by 50 to 75 mg/dL in the first hour, the insulin infusion dose should be increased hourly until a steady glucose decline is achieved. Once serum glucose reaches **300** mg/dL, decrease dose to 0.02 to 0.05 units/kg/hour; administer dextrose-containing IV fluids to maintain serum glucose between **200 to 300** mg/dL until the patient is mentally alert.

Transition from IV to SubQ insulin: same as **Diabetic ketoacidosis**.

☒ **Preparation for Administration: For IV infusion:**100 IU may be diluted in 100 ml NS to concentrations of 1 unit/mL.

☒ Administration:

✓ IV:

- Do not use if solution is viscous or cloudy; use only if clear and colorless.
- IV infusions: To minimize insulin adsorption to plastic IV tubing: Insulin loss will occur by adsorption to plastic (ie, PVC, polyethylene, polyolefin, polypropylene) IV containers and tubing .Therefore, flush the IV tubing with a priming infusion of 20 mL from the insulin infusion, whenever a new IV tubing set is added to the insulin infusion container .
- If insulin is required prior to the availability of the insulin drip, regular insulin should be administered by IV push injection.
- Because of insulin adsorption to plastic IV tubing or infusion bags, the actual amount of insulin being administered via IV infusion could be substantially less than the apparent amount. Therefore, adjustment of the IV infusion rate should be based on effect and not solely on the apparent insulin dose. The apparent dose may be used as a starting point for determining the subsequent SubQ dosing regimen ; however, the transition to SubQ administration requires continuous medical supervision, frequent monitoring of blood glucose, and careful adjustment of therapy.

✓ Subcutaneous:

- Do not use if solution is viscous or cloudy; use only if clear and colorless.
- Regular insulin cold injections should be avoided.
- Should be administered approximately 30 minutes before a meal.
- SubQ administration is usually made into the thighs, arms, buttocks, or abdomen; rotate injection sites within the same region to avoid lipodystrophy.
- When mixing 100 IU regular insulin with NPH insulin, 100 IU regular insulin should be drawn into syringe first.

☒ Precautions:

- Close monitoring of blood glucose and serum potassium.

- Exclusive use of **a sliding scale** insulin regimen in the inpatient hospital setting is strongly discouraged. In the critical care setting, continuous IV insulin infusion has been shown to best achieve glycemic targets.

- In noncritically ill patients with either poor oral intake or taking nothing by mouth, **basal** insulin or **basal** plus bolus is preferred.
- In noncritically ill patients with adequate nutritional intake, a combination of **basal** insulin, nutritional, and correction components is preferred.
- A blood glucose value <70 mg/dL should prompt a treatment regimen review and change, if necessary, to prevent further hypoglycemia.
- Diabetes self-management education (DSME) is essential to maximize the effectiveness of therapy.

☒ Monitoring Parameters

Serum potassium and glucose.

29. Rocuronium (10 mg /ml) 5 ml ampoule

☒ Dosage:

✓ **Intensive care unit paralysis (eg, use for up to 48 hours in patients with early ARDS with PaO_2/FiO_2 <150, to facilitate mechanical ventilation, or for shivering from therapeutic hypothermia) :**Initial bolus of 0.6 to 1 mg/kg, followed by continuous IV infusion of 8 to 12 **mcg**/kg/**minute** (0.48 to 0.72 **mg**/kg/**hour**); monitor depth of blockade every 2 to 3 hours initially until stable dose, then every 8 to 12 hours; adjust rate of administration by 10% increments according to desired clinical response and possibly with peripheral nerve stimulation .

✓ **Neuromuscular blockade for endotracheal intubation, surgery, or mechanical ventilation (as adjunct to general anesthesia):**
- Rapid sequence intubation: IV: 0.6 to 1.2 mg/kg

- Tracheal intubation: IV:*Initial:* 0.45 to 0.6 mg/kg; administration of 0.3 mg/kg may also provide optimal conditions for tracheal intubation .
-*Maintenance for continued surgical relaxation:* 0.1 to 0.2 mg/kg; repeat as needed **or** a continuous infusion of 10 to 12 **mcg**/kg/**minute** (0.6 to 0.72 **mg**/kg/**hour**) only after recovery of neuromuscular function is evident; infusion rates have ranged from 4 to 16 **mcg**/kg/**minute** (0.24 to 0.96 **mg**/kg/**hour**)

☒ Preparation for Administration:

May be diluted in D5NS, D5W, LR or NS at concentrations up to 5 mg/mL; use within 24 hours of preparation.

☒ Administration:

May be given as a bolus injection (undiluted) or via a continuous infusion.

☒ Precautions:

- Ensure adequate pain control and sedation prior to and during administration of neuromuscular blockade to achieve deep sedation.
- Ideal body weight or adjusted body weight is generally recommended when calculating dose for obese patients.
- Resistance may occur in burn patients (≥20% of total body surface area), usually several days after the injury, and may persist for several months after wound healing.
-Maintenance of an adequate airway and respiratory support is critical. Tolerance to rocuronium may develop.
- All patients should receive eye care including liberal use of lubricating drops, gel, or ointment and eyelids should remain closed during continuous neuromuscular blockade to protect against damage to the cornea (ulceration and drying).
- Should be administered by adequately trained individuals familiar with its use.
- If extravasation occurs, local irritation may ensue; discontinue administration immediately and restart in another vein.

☒ Monitoring Parameters:

Vital signs (heart rate, blood pressure, respiratory rate); degree of muscle paralysis (eg, presence of spontaneous movement, ventilator asynchrony, shivering, and consider use of a peripheral nerve stimulator with train of four monitoring along with clinical assessments).

30. Sodium Bicarbonate 8.4% (50 ml) vial

☒ **Dosage: Note:** 1 mEq $NaHCO_3$ is equivalent to 84 mg; each g of $NaHCO_3$ provides ~12 mEq each of sodium and bicarbonate ions**.**

✓ **Metabolic acidosis:** IV: Dosage should be based on the following formula if blood gases and pH measurements are available:

HCO_3^-(mEq) = 0.5 x weight (kg) x [24 - serum HCO_3^-(mEq/L)] **or** HCO_3^-(mEq) = 0.5 x weight (kg) x [desired increase in serum HCO_3^-(mEq/L)]

Administer $^1/_2$ dose initially, then remaining $^1/_2$ dose over the next 24 hours; monitor pH, serum HCO_3^-, and clinical status. **Note:** These equations provide an estimated replacement dose. *If acid-base status is not available*: 2 to 5 mEq/kg IV infusion over 4 to 8 hours; subsequent doses should be based on patient's acid-base status.

✓ **Hyperkalemia:** IV: 50 mEq over 5 minutes (as appropriate, consider methods of enhancing potassium removal/excretion).

☒ Administration:

- For IV administration to **infants**, use the 0.5 mEq/mL solution or dilute the 1 mEq/mL solution 1:1 with **sterile water**; for direct IV infusion in emergencies, administer slowly (maximum rate in infants: 10 mEq/minute); for infusion, dilute to a maximum concentration of 0.5 mEq/mL in dextrose solution and infuse over 2 hours (maximum rate of administration: 1 mEq/kg/hour).

- Vesicant (at concentrations ≥8.4%); ensure proper needle or catheter placement prior to and during IV infusion. Avoid extravasation.
Extravasation management: If extravasation occurs, stop infusion immediately and disconnect (leave needle/cannula in place); gently aspirate extravasated solution (do **NOT** flush the line); initiate hyaluronidase antidote; remove needle/cannula; apply dry cold compresses ,elevate extremity. ***Hyaluronidase****:* Intradermal or SubQ: Inject a total of 1 to 1.7 mL (15 units/mL) as five separate 0.2 to 0.3 mL injections (using a 25-gauge needle) into area of extravasation at the leading edge in a clockwise manner .

☒ Precautions:

- Rapid administration in **neonates, infants, and children <2 years** of age has led to hypernatremia, decreased CSF pressure, and intracranial hemorrhage.

☒ Monitoring Parameters:

Monitor infusion site, monitor for signs of fluid retention, monitor cardiac status, arterial blood gases, and electrolytes.

31. Tenecteplase(10,000 IU/50 mg) vial

☒ Dosage:

- ✓ **Acute hemodynamically unstable/massive pulmonary embolism, acute hemodynamically stable/submassive pulmonary embolism, Pulmonary embolism associated with cardiac arrest, STEMI:** Administer dose as a single IV bolus over 5 to 10 seconds
  <60 kg: 30 mg
  ≥60 to <70 kg: 35 mg
  ≥70 to <80 kg: 40 mg
  ≥80 to <90 kg: 45 mg
  ≥90 kg: 50 mg

- ✓ **Treatment of Acute Limb Ischemia (Intra-Arterial):** Bolus infusion of 1–5 mg , followed by infusions ranging from 0.125–0.5 mg/h .

☒ Preparation for Administration:

- Tenecteplase should be reconstituted using the supplied 10 mL syringe sterile water for injection.
- Do not shake when reconstituting. Slight foaming is normal and will dissipate if left standing for several minutes.
- The reconstituted solution is 5 mg/mL.
- Any unused solution should be discarded. If reconstituted and not used immediately, store in refrigerator and use within 8 hours.

☒ Administration:

- Tenecteplase is **incompatible** with dextrose solutions. Dextrose-containing lines must be flushed with a saline solution before and after administration.
- Administer as a single IV bolus over 5 seconds. - For acute PE, administer as an IV bolus over 5 to 10 seconds using a peripheral vein
- For acute limb ischemia, Tenecteplase solution is infused via the intra-arterial catheter (concurrently with heparin).

☒ Precautions:

- Tenecteplase should be administered within 30 minutes of hospital arrival.

- It may result in reperfusion arrhythmias .Antiarrhythmic therapy should be available during therapy.

- Monitor all potential bleeding sites; if serious bleeding occurs, the infusion of tenecteplase and any other concurrent anticoagulants (eg, heparin) and antiplatelets should be stopped and the patient should be treated appropriately.

- Avoid IM injections and nonessential handling of patient.

☒ Monitoring Parameters

CBC, aPTT, signs and symptoms of bleeding, ECG, Fibrinogen level.

32. Tirofiban (0.25 mg /ml) 50 ml vial

☒ Dosage:

- ✓ **Unstable angina/non-ST-elevation myocardial infarction (UA/NSTEMI):** IV: Loading dose: 25 mcg/kg administered over 5 minutes or less; Maintenance infusion: 0.15 mcg/kg/minute continued for up to 18 hours.
- ✓ **Percutaneous coronary intervention (PCI) for(UA/NSTEMI) or for ST-elevation myocardial infarction (STEMI)**: IV: Loading dose: 25 mcg/kg administered over 5 minutes or less **at the time of PCI**; Maintenance infusion: 0.15 mcg/kg/minute continued for up to 18 hours.

☒ Preparation for Administration:

Draw 50 ml from 250 ml container of NS or D5W and replace with 50 ml tirofiban to make up a concentration of 50 mcg/ml. mix well before use.

☒ Administration:

Administer IV loading dose over 5 minutes or less, followed by a continuous infusion.

☒ Precautions:

- It can be given with heparin through the same infusion tube.
- Profound **thrombocytopenia** has been reported with use of tirofiban. If during therapy platelet count decreases to <90,000/mm^3, monitor platelet counts to exclude pseudothrombocytopenia. If thrombocytopenia is confirmed, discontinue tirofiban and heparin if administered concurrently. Platelet counts should recover rapidly (within 1 to 5 days) after discontinuation.
- Use is contraindicated in patients with a history of thrombocytopenia following exposure to tirofiban.
- Dosage reduction of the maintenance infusion rate is necessary in patients with CrCl ≤60 mL/minute.
- In percutaneous coronary intervention, prior to pulling the sheath, ACT should be <180 seconds or aPTT <50 seconds .Use standard compression techniques after sheath removal. Watch the site closely afterwards for further bleeding.
- Discontinue at least 2 to 4 hours prior to coronary artery bypass graft surgery.
- The most common complication is bleeding, including retroperitoneal, pulmonary, and spontaneous GI and/or GU bleeding; watch closely for bleeding.

☒ Monitoring Parameters

Platelet count (baseline; 6 hours after initiation and daily thereafter during therapy), hemoglobin and hematocrit; signs of bleeding.