**APPENDIX F**

Pharmacology

**Drug Formulas**

\[
\text{Drug clearance} = V_d \times K_d \\
\text{Drug half-life (T_{1/2})} = \frac{0.693}{K_d} \\
\text{Drug elimination constant (K_e)} = \frac{\ln(\text{peak}/\text{trough})}{\text{peak} - \text{trough}} \\
\text{Drug loading dose} = V_d \times [\text{target peak}] \\
\text{Drug dosing interval} = (-1/K_d) \times \ln\left(\left[\frac{\text{desired trough}}{\text{desired peak}}\right]\right) + \text{infusion time (h)}
\]

**Dosage Adjustments in Renal Failure**

<table>
<thead>
<tr>
<th>TABLE F.1 Drug Dosage Adjustments in Renal Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td><strong>Adjustment</strong></td>
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<tr>
<td>Aminoglycosides</td>
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<tr>
<td>Gentamicin</td>
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<tr>
<td>Tobramycin</td>
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<tr>
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<tr>
<td>Tobramycin</td>
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<tr>
<td>Antifungals</td>
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<tr>
<td>Amphoterin B</td>
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<tr>
<td>Fluconazole</td>
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<td>Flucytosine</td>
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<td>Acyclovir</td>
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<td>Amantadine</td>
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<td>Sultam/trimethoprim</td>
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<td>Sulfamethoxazole</td>
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### TABLE F.1 Drug Dosage Adjustments in Renal Failure (Continued)

<table>
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<tr>
<th>Drug</th>
<th>GFR (mL/min)</th>
<th>Removed By</th>
<th>Dose Adjustment &gt;50</th>
<th>10–50</th>
<th>&lt;10</th>
<th>Hemodialysis</th>
<th>Peritoneal Dialysis</th>
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<td>Trimethoprim</td>
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<td>Tetracyclines</td>
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<td>12–18</td>
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<td>No</td>
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<tr>
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<td>Atenolol</td>
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<td>—</td>
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<td>None</td>
<td>50</td>
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<td>25</td>
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<tr>
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<td>150/d</td>
<td>150 qod</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Famotidine</td>
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<td>None</td>
<td>20/d or (40 qod)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

GFR, glomerular filtration rate; PCN G, penicillin G; D, dosage reduction method of dosage adjustment; I, interval extension method of dosage adjustment; qod, every other day; H2, histamine.


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### Drugs Commonly Used in the Intensive Care Unit (In Alphabetical Order), Excluding Antibiotics

**ADENOSINE**
- **Action:** Slows atrioventricular (AV) nodal conduction; produces short-term (seconds) high-degree AV blockade
- **Indications:** Antiarrhythmic; useful for diagnosing supraventricular tachycardias and effective for terminating reentrant AV tachyarrhythmias
- **Loading dose:** 6- or 12-mg intravenous (IV) bolus followed with a rapid saline flush
- **Dose interval/infusion:** Wait 1-2 min between doses; no continuous infusion
- **Comments:** Give through central venous catheter; contraindicated in heart block; sick sinus syndrome (except if pacemaker present), ventricular arrhythmias

**AMINOPHYLLINE**
- **Action:** Bronchodilator; improves diaphragm contractility; positive inotrope and chronotrope; natriuretic and diuretic
- **Indications:** Bronchoconstriction
- **Loading dose:** 5–6 mg/kg lean body weight over 20 min (if patient already taking aminophylline/theophylline then check level, begin infusion, and then adjust dose based on baseline value)
- **Dose interval/infusion:** 0.2–0.8 mg/kg/min (use increased dosage with smokers; decreased dosage with the elderly, patients with heart or liver disease)
- **Comments:** Produces increased irritability, agitation, tachycardia, arrhythmias, nausea, and vomiting

**AMRINONE/MILRINONE**
- **Action:** Inhibit cellular phosphodiesterase, producing extracellular to intracellular calcium shift; increased contractility but with arterial and venous dilatation
- **Indications:** Positive inotrope
c. Loading dose: Amrinone 0.75–3.0 mg/kg over 2–3 min; milrinone 50 μg/kg over 10 min
d. Dose interval/infusion: Amrinone 5–10 μg/kg/min continuous infusion; milrinone 0.375–0.75 μg/kg/min
e. Comments: Synergistic with dobutamine (because of receptor downregulation in congestive heart failure); hepatic metabolism; renal excretion; rapid onset of action; dose-related thrombocytopenia with prolonged use of amrinone

ATRACURIUM
a. Action: Nondepolarizing neuromuscular blocker; minimal dose-dependent histamine (H$_1$) release; no vagal activity
b. Indications: Intermediate-acting neuromuscular blockade
c. Loading dose: 0.4–0.5 mg/kg intubating dose
d. Dose interval/infusion: 4–12 μg/kg/min continuous infusion
e. Comments: Titrate to effect in intensive care unit (ICU) patients (monitor with train-of-four testing); onset within 3–5 min; 25–35 min duration; 40–60 min recovery; no dose adjustment in hepatorenal dysfunction

BUMETANIDE
a. Action: Acts at loop of Henle to prevent chloride and sodium uptake; diuretic
b. Indications: Decreased urine output, mobilize edema fluid, pulmonary edema, treat hypercalcemia
c. Loading dose: 0.5–1.0 mg over 1–2 min
d. Dose interval/infusion: Repeat dose every 2–3 h; up to 10 mg/d
e. Comments: Observe for secondary electrolyte disturbances (hyponatremia, hypokalemia)

CALCIUM CHLORIDE/GLUCONATE
a. Action: Required for wide variety of cellular functions
b. Indications: Ionized hypocalcemia; vasopressor; hypermagnesemia/hyperkalemia (stabilizes cell membrane); calcium channel blocker overdose
c. Loading dose: 90 mg Ca IV bolus (chloride: 1 g = 272 mg [13.6 mmol] Ca) (gluconate: 1 g = 90 mg [4.65 mmol] Ca)
d. Dose interval/infusion: 0.5–2.0 mg/h adjust to ionized calcium value
e. Comments: Monitor for hypercalcemia, hypophosphatemia, and decreased sensorium

CLONIDINE
a. Action: Central α$_2$-receptor agonist
b. Indications: Hypertension; withdrawal syndromes (opiates, nicotine); modulate sympathetic hyperactivity of closed head injury
c. Loading dose: 0.1 mg transdermal weekly (may require 2–3 d for response); for hypertensive urgencies use 0.2–0.3 mg orally every 20 min until target blood pressure is reached (maximum 0.9 mg)
d. Dose interval/infusion: Usually twice daily when taken orally, no intravenous formulation
e. Comments: Usual maximum dose 2.4 mg/d; rebound hypertension with acute withdrawal

DIAZEPAM
a. Action: Benzodiazepine
b. Indications: Sedation, anxiety, agitation; ethanol withdrawal; seizures
c. Loading dose: 5 mg
d. Dose interval/infusion: Begin at 5 mg/h and titrate to effect
e. Comments: Central nervous system (CNS) depression

DILTIAZEM
a. Action: Calcium channel blockade; negative inotrope and peripheral vasodilator; depresses sinoatrial (SA) and AV node
b. Indications: Hypertension, angina; rate control in atrial fibrillation/flutter
c. Loading dose: 0.25 mg/kg IV over 2 min
d. Dose interval/infusion: 5–15 mg/h
e. Comments: Maximum dose 360 mg/d

DEXMEDETOMIDINE
a. Action: Central α$_2$-receptor agonist
b. Indications: Short-acting sedative
c. Loading dose: 0.1 mg transdermal weekly (may require 2–3 d for response); for hypertensive urgencies use 0.2–0.3 mg orally every 20 min until target blood pressure is reached (maximum 0.9 mg)
d. Dose interval/infusion: Usually twice daily when taken orally, no intravenous formulation
e. Comments: Usual maximum dose 2.4 mg/d; rebound hypertension with acute withdrawal
dDAVP
a. Action: Synthetic vasopressin; decreased excretion of free water; increases factor VIII levels
b. Indications: Central (neurogenic) diabetes insipidus (DI); bleeding in patients with decreased factor VIII levels
c. Loading dose: 2–4 μg IV or subcutaneously (SQ) for DI; 0.3 μg/kg IV over 15–30 min for bleeding
d. Dose interval/infusion: Twice daily
e. Comments: Dose for central DI by following urine output/osmolarity and serum sodium/osmolarity

DOBUTAMINE
a. Action: Positive inotrope, peripheral vasodilator, increases automaticity of SA node and enhances conduction through AV node and ventricles
b. Indications: Low cardiac output states, especially with increased systemic vascular resistance
c. Loading dose: 2.5–20.0 μg/kg/min
d. Dose interval/infusion: Titrate to effect
e. Comments: No dopaminergic effects on renal vessels; tachycardia may be a problem; contraindicated in idiopathic hypertrophic subaortic stenosis; tolerance may develop

DOPAMINE
a. Action: Dose-dependent vaso pressor acting at multiple receptor sites
b. Indications: Bradycardia and refractory hypotension after cardiac insult while patient is waiting to place a pacemaker; not demonstrate that increases renal blood flow and subsequently urine output
c. Loading dose: None
d. Dose interval/infusion: Dopaminergic 0.5–2.0 μg/kg/min; β plus dopaminergic 2–10 μg/kg/min; α, β, and dopaminergic at >10 μg/kg/min
e. Comments: Tachycardia may be significant; necrosis at injection site with extravasation (treat with phenolamine)

EPINEPHRINE
a. Action: α- and β-receptor agonist; vasopressor, positive inotrope and chronotrope; bronchodilatation; increased glycogenolysis
b. Indications: Bronchoconstriction; allergic reactions; advanced cardiac life support; refractory hypotension
c. Loading dose: 1-mg bolus IV
d. Dose interval/infusion: 0.01–0.3 μg/kg/min titrated to effect
e. Comments: Increased myocardial oxygen consumption with arrhythmias and ischemia; hypertension; hyperglycemia; poor renal perfusion

ESMOLOL
a. Action: Short-acting β-blockade (β1 > β2)
b. Indications: Supraventricular tachyarrhythmias; hypertension
c. Loading dose: 0.5–1.0 mg/kg over 1 min
d. Dose interval/infusion: 10–300 μg/kg/min
e. Comments: Hypotension; bradycardia; bronchospasm; may prolong neuromuscular blockade effects of succinylcholine; contraindicated in bradycardia, heart block, cardiogenic shock

FENTANYL
a. Action: Potent opiate receptor ligand; produces decreases in heart rate, blood pressure, and cardiac index; respiratory depressant; may produce skeletal muscle rigidity
b. Indications: Opioid analgesia
c. Loading dose: 1–3 μg/kg, depending on additional anesthetic agents used
d. Dose interval/infusion: 0.01–0.3 μg/kg/h
e. Comments: Approximately 100 times as potent as morphine; no histamine release

FLUMAZENIL
a. Action: Benzodiazepine antagonist; acts centrally at benzodiazepine receptors
b. Indications: Complete or partial reversal of sedative effects of benzodiazepines; reversal effects occur within 1 min of intravenous dose
c. Loading dose: 0.2 mg IV over 15–30 s
d. Dose interval/infusion: Can repeat 0.2 mg every 60 s up to total dose of 1 mg; may use up to 3 mg in suspected benzodiazepine overdose; no continuous infusion
e. Comments: Effective reversal of benzodiazepine effects lasts 20 min, so repeated dosing with flumazenil may be necessary; liver metabolism

FUROSEMIDE
a. Action: Inhibits chloride and sodium reabsorption in ascending loop of Henle, producing a diuretic effect
b. Indications: Decreased urine output, acute oliguric renal failure, mobilizes edema fluid, pulmonary edema, hypercalcemia
c. Loading dose: 10–200 mg, depending on the clinical situation
d. Dose interval/infusion: Begin at 5 mg/h and titrate to effect
e. Comments: Hepatic metabolism, renal excretion; up to 6 g/d has been given by continuous infusion; observe for electrolyte disturbances (hyponatremia, hypomagnesemia, hypokalemia)

GLUCAGON
a. Action: Increases glycogenolysis and gluconeogenesis producing hyperglycemia; increases lipolysis; positive inotrope; decreases gastrointestinal (GI) motility and secretions
b. Indications: Hypoglycemia; β-blocker and calcium channel blocker overdoses; hypotension
c. Loading dose: 0.5–1.0 mg SQ/IV/intramuscularly (IM)
d. Dose interval/infusion: Repeat loading dose every 15 min; 1–20 mg/h as continuous infusion
e. Comments: Hyperglycemia; tachycardia; hypokalemia

HALOPERIDOL
a. Action: Dopaminergic blockade acting as an antipsychotic
b. Indications: Agitation; acute psychosis, Delirium (hyperactive)
c. Loading dose: 0.5–5.0 mg IV/IM
d. Dose interval/infusion: Can be given hourly; 1–20 mg/h as continuous infusion
e. Comments: Decrease dose in hepatic dysfunction; observe closely for dystonic reactions and sedative effects; α-blockade

HEPARIN
a. Action: Anticoagulant acting through antithrombin III complexes
b. Indications: Deep venous thrombosis (acute and prophylaxis); pulmonary embolism; acute myocardial infarction; hemodialysis; catheter patency
c. Loading dose: Wide variety, depending on clinical situation
d. Dose interval/infusion: Adjusted to desired anticoagulant effect, usually based on following serial activated partial thromboplastin time (aPTT)
e. Comments: Side effects include hemorrhage, thrombocytopenia, fever

H₂ BLOCKERS (CIMETIDINE, FAMOTIDINE, RANITIDINE)
a. Action: H₂ receptor competitive antagonist decreasing gastric acid secretion
b. Indications: Prophylaxis for stress ulcer GI bleeding, acute/chronic peptic ulcer disease, acid hypersecretory diseases, reflux disease
c. Loading dose for stress ulcer prophylaxis: Cimetidine 300 mg IV every 6 h; famotidine 20 mg IV every 12 h; ranitidine 50 mg IV every 8 h
**ISOPROTERENOL**
- **Action:** Nonspecific \( \beta \)-agonist; positive inotrope and chronotrope; bronchodilator
- **Indications:** Bronchoconstriction; symptomatic bradycardia; \( \beta \)-blocker overdose
- **Loading dose:** 0.02–0.06 mg IV
- **Dose interval/infusion:** 2–20 \( \mu \)g/min
- **Comments:** Tachycardia; arrhythmias (torsade de pointes); myocardial ischemia; anxiety

**LABETALOL**
- **Action:** \( \alpha_1 \)- and nonspecific \( \beta \)-blocker
- **Indications:** Hypertension
- **Loading dose:** 0.1, 0.2, 0.4, 0.8, 1.6 mg/kg IV. Start at lowest dose and advance to the next highest dose every 10 min until BP control is achieved. May repeat hourly; when repeating start with the dose one step below that which allowed control of BP.
- **Dose interval/infusion:** Boluses can be repeated every 10 min; continuous infusion of 1–10 mg/min titrated to effect
- **Comments:** Observe for bronchospasm, bradycardia

**LEVOSIMENDAN**
- **Action:** Calcium sensitization for positive inotrope effect and activation of adenosine triphosphate (ATP)-dependent potassium channels for vasodilation and cardioprotective effect
- **Indication:** Decompensated low-output heart failure (cardiac index < 2.5 L/min/m\(^2\) or pulmonary capillary wedge pressure [PCWP] > 16 mmHg or left ventricular ejection fraction [LVEF] < 0.4)
- **Dose infusion/interval:** Infusion 0.05–0.2 \( \mu \)g/kg/min for 24 h
- **Comments:** Most common adverse reaction is headache and hypotension (both 5%); caution in renal, hepatic impairment, severe hypotension, severe tachycardia, history of torsades de pointes; correct hypovolemia

**LIDOCAINE**
- **Action:** Antidysrhythmic and local anesthetic
- **Indications:** Local anesthesia; ventricular arrhythmias; prophylaxis in acute myocardial infarction
- **Loading dose:** 1.0–1.5 mg/kg bolus IV (maximum load, 3 mg/kg)
- **Dose interval/infusion:** Bolus repeated in 20 min; 1–4 mg/min continuous infusion
- **Comments:** Observe for metabolic acidosis, altered mental status (including seizures), and myocardial depression; hepatic metabolism; methemoglobinemia

**LORAZEPAM**
- **Action:** Benzodiazepine
- **Indications:** Agitation; seizures; supplemental sedation with neuromuscular blockade

**MAGNESIUM**
- **Action:** Coenzyme; muscular contractility; nerve conduction; membrane stabilization; antiseizure; inhibits uterine contractility
- **Indications:** Hypomagnesemia; arrhythmias; preeclampsia and eclampsia
- **Loading dose:** 0.5–2 mg bolus IV (In an older person start with lower dose)
- **Dose interval/infusion:** Begin at 1 mg/h and titrate to effect
- **Comments:** CNS depression

**MINOXIDIL**
- **Action:** Nondepolarizing neuromuscular blocker; minimal to moderate H\(_2\) release; minimal tachycardia
- **Indications:** Short-acting neuromuscular blockade
- **Loading dose:** 0.1–0.25 mg/kg intubating dose
- **Dose interval/infusion:** 5–15 \( \mu \)g/kg/min continuous infusion; onset in 2–4 min; 13–40 min duration of action; 6–14 min recovery
- **Comments:** CNS depression; active metabolites; respiratory depression when used in combination with narcotics; three to four times the potency of diazepam

**MORPHINE**
- **Action:** Opioid analgesia; venodilation
- **Indications:** Analgesia, sedation; pulmonary edema
- **Loading dose:** 1–5 mg IV
- **Dose interval/infusion:** Rebolus every 2–3 h; 1–10 mg/h continuous infusion titrated to effect
- **Comments:** CNS disturbances; hypotension (especially if intravascular volume depletion is present); respiratory depression; histamine release

**NICARDIPINE**
- **Action:** Noncardiosuppressive calcium channel antagonist
- **Indications:** Postoperative hypertension, prevention of vasospasm from subarachnoid hemorrhage; angina
- **Loading dose:** 5 mg/h and increase by 2.5 mg/h every 15 min
- **Dose interval/infusion:** 1–15 mg/h; 20–40 mg orally three times daily
- **Comments:** Hypotension; reflex tachycardia
NIFEDIPINE
a. Action: Calcium channel blocker; minimal myocardial depression with slowing of conduction; smooth muscle relaxation
b. Indications: Angina, hypertension
c. Loading dose: 10–20 mg orally or sublingually
d. Dose interval/infusion: Hourly as needed, no intravenous preparation; maximum dose 180 mg/d
e. Comments: Hypotension and reflex tachycardia

NIMODIPINE
a. Action: Calcium channel antagonist; minimal cardiovascular effect
b. Indications: Prevention of vasospasm due to subarachnoid hemorrhage
c. Loading dose: None, no IV formulation available
d. Dose interval/infusion: 60 mg orally or sublingually every 4 h for 21 d
e. Comments: Hypotension may occur

NITROGLYcerin
a. Action: Smooth muscle relaxation through nitric oxide pathway; pulmonary vasculature and venous vasodilator; decreased preload; improved coronary blood flow
b. Indications: Myocardial ischemia; hypertension; congestive heart failure; esophageal spasm
c. Loading dose: None necessary in intravenous dosing
d. Dose interval/infusion: 10–400 μg/min titrated to effect
e. Comments: Liver metabolism; renal excretion; tolerance; rare methemoglobinemia; increased cerebral blood flow (CBF); hypotension

NITROPRussIDE
a. Action: Arterial and venous vasodilatation through nitric oxide pathway; coronary vasodilatation; increased CBF and volume with subsequent increased intracranial pressure
b. Indications: Hypertension; acute left ventricular failure
c. Loading dose: Not indicated
d. Dose interval/infusion: 0.5–10 μg/kg/min and titrate to effect
e. Comments: Coronary steal (angina) possible with coronary vasodilatation; metabolic acidosis; follow thiocyanate levels if toxicity suspected (toxicity: Amyl nitrate and sodium nitrite converts hemoglobin to methemoglobin; methemoglobin binds cyanide; sodium thiosulfate converts cyanide to thiocyanate)

NOREpINEphrine
a. Action: α- and β,-agonists; arterial and venous vasoconstriction; minimal chronotropic effect
b. Indications: Hypotension
c. Loading dose: Not indicated
d. Dose interval/infusion: 0.01–0.1 μg/kg/min titrated to effect
e. Comments: Decreased renal perfusion; peripheral vasoconstriction; arrhythmias; tissue necrosis with extravasation

OCTROtIDE
a. Action: Mimics effects of somatostatin; increases GI motility while decreasing GI and pancreatic secretions; decreases splanchnic blood flow
b. Indications: Gut neuroendocrine tumors, diarrhea, excess GI/pancreatic secretions; variceal hemorrhage
c. Loading dose: 250–μg bolus
d. Dose interval/infusion: 25–100 μg three times daily or 50–250 μg/h infusion
e. Comments: Total dose, 50–1,500 μg/d; both hypoglycemia and hyperglycemia

PANCURONIUM
a. Action: Nondepolarizing neuromuscular blocker; no histamine release, modest to marked vagal block with tachycardia
b. Indications: Long-acting neuromuscular blockade
c. Loading dose: 0.1-mg/kg intubating dose
d. Dose interval/infusion: 1–2 μg/kg/min continuous infusion
e. Comments: Titrate to effect in ICU patient (monitor with train-of-four testing); onset within 2–4 min and duration of action of 60–100 min; recovery within 120–180 min; primarily renal excretion

PHENTOLamine
a. Action: α-blocker; vasodilatation
b. Indications: Hypertension; pheochromocytoma
c. Loading dose: 5 mg IV/IM to effect
d. Dose interval/infusion: No continuous infusion
e. Comments: Monitor for hypotension

PHENYLEphrine
a. Action: α-agonist; arterial and venous vasoconstriction; vasopressor with reflex decrease in heart rate
b. Indications: Hypotension
c. Loading dose: Not indicated
d. Dose interval/infusion: 0.1–1 μg/kg/min titrated to effect
e. Comments: Hypertension, bradycardia, myocardial ischemia, decreased renal perfusion

PROCAINAmIDE
a. Action: Antiarrhythmic; vasodilatation
b. Indications: Supraventricular and ventricular arrhythmias; recurrent atrial fibrillation/flutter
c. Loading dose: 50 mg/min to effect or total dose of 17 mg/kg
d. Dose interval/infusion: 2–6 mg/min continuous infusion
e. Comments: Observe for conduction disturbances (including torsade) and myocardial depression

PROPOFOL
a. Action: Alkylphenol
b. Indications: Short-acting sedative
c. Loading dose: 1.5–3 mg/kg
d. Dose interval/infusion: Titrated to effect; usual dose is 10–50 μg/kg/min
e. Comments: No analgesic properties; very short duration of action (2–3 min); reduce dosage in the elderly; monitor triglyceride values
**PROPRANOLOL**

a. Action: Nonspecific β-blockade; decreased heart rate and contractility; antiarrhythmic
b. Indications: Supraventricular tachyarrhythmias, angina, hypertension, acute myocardial infarct
c. Loading dose: 0.5–1.0 mg bolus IV
d. Dose interval/infusion: Repeat bolus every 5 min to effect
e. Comments: Bradycardia, hypotension, bronchospasm

**PROTAMINE**

a. Action: Heparin antagonist (complexes with heparin)
b. Indications: Reverse the effects of heparin
c. Loading dose: 1 mg/90 IU bovine heparin; 1 mg/115 IU porcine heparin over 1–3 min
d. Dose interval/infusion: Titrate to aPTT
e. Comments: Maximum dose of 50 mg in any 10-min period; observe for bleeding after large dosages; hypotension

**REMIFENTANIL**

a. Action: Potent opiate receptor ligand; produces decreases in heart rate and blood pressure; respiratory depressant; may produce skeletal muscle rigidity and vocal cord closure
b. Indications: Opioid analgesia
c. Loading dose: If needed, bolus 0.1–0.2 μg/kg
d. Dose interval/infusion: Usually ranges between 0.05 and 0.25 μg/kg/min, higher doses have been used
e. Comments: About twice as potent as fentanyl; rapid onset of action with short duration—about 6.5 min to wake up after turning off infusion

**ROCURONIUM**

a. Action: Nondepolarizing neuromuscular blocker; minimal H₂ release; minimal to moderate vagal blockade
b. Indications: Intermediate-acting neuromuscular blockade
c. Loading dose: 0.4–1.2 mg/kg intubating dose
d. Dose interval/infusion: 10–12 μg/kg/min continuous infusion
e. Comments: Titrate to effect in ICU patients (monitor with train-of-four testing); 1–3 min onset of action; 22–67 min duration of action; recovery in 10–20 min

**SUCCINYLCHOLINE**

a. Action: Depolarizing neuromuscular blocker; no H₂ release, some vagal stimulation
b. Indications: Rapid onset of paralysis; short-acting neuromuscular blockade
c. Loading dose: 0.25–1.5 mg/kg (ED₉₅ is 0.25 mg/kg)
d. Dose interval/infusion: Continuous infusion of 7.1–142 μg/kg/min
e. Comments: Onset in 0.5–5 min with duration of action of 2–3 min and recovery within 10 min; hyperkalemia; prolonged blockade in patients with atypical pseudocholinesterase; increased intracranial pressure (ICP)

**SUFTENTANIL**

a. Action: Potent opiate receptor ligand; produces decreases in heart rate, blood pressure, and cardiac index; respiratory depressant; may increase ICP in patients with compromised intracranial compliance; may produce skeletal muscle rigidity
b. Indications: Opioid analgesia
c. Loading dose: 1–30 μg/kg, depending on other anesthetic agents used
d. Dose interval/infusion: As needed, no infusion
e. Comments: Five to ten times as potent as fentanyl with a shorter duration of action; muscle rigidity

**THIOPENTAL**

a. Action: Barbiturate with hypnotic and anesthetic properties
b. Indications: General anesthesia, seizures, increased ICP
c. Loading dose: 3–5 mg/kg for induction of anesthesia; 75–125 mg for treatment of seizures
d. Dose interval/infusion: Additional doses as clinically indicated; no continuous infusion
e. Comments: Observe clinically and use blood levels as necessary; respiratory depression

**THROMBOLYTICS (STREPTOKINASE, UROKINASE, TISSUE PLASMINOGEN ACTIVATOR)**

a. Action: Plasminogen activators; plasmin produced; plasmin degrades fibrinogen and fibrin, dissolving pre-existing thrombi
b. Indications: Pulmonary embolism, acute myocardial infarction, venous thrombosis, graft thrombosis, catheter occlusion
c. Loading dose: Varies, depending on agent used and clinical condition
d. Dose interval/infusion: Variable
e. Comments: Bleeding (about 5% of patients); absolute contraindications include active hemorrhage, recent (2 mo) neurologic injury/surgery/tumor

**VASOPRESSIN**

a. Action: Decreases hepatic blood flow and portal pressure; increased clotting; decreased free water excretion; increases gut motility
b. Indications: Central (neurogenic) DI; bleeding esophageal varices, septic shock, and cardiopulmonary resuscitation
c. Loading dose: Central DI—aqueous vasopressin 5–10 IU IM/SQ
d. Dose interval/infusion: Sepsis—0.02–0.04 Units/min IV; Central DI—two to four times daily dosing (follow polyuria and serum sodium); GI bleeding—aqueous vasopressin 0.2–1.0 U/min IV
e. Comments: CNS disturbances, hypertension, angina, hyponatremia; metabolic acidosis

**VECURONIUM**

a. Action: Nondepolarizing neuromuscular blocker; no H₂ release; no vagal activity or tachycardia
b. Indications: Intermediate-acting neuromuscular blockade
Appendix F
Pharmacology

**Pharmacology**

1. Loading dose: 0.08 mg/kg intubating dose
2. Dose interval/infusion: 1–2 μg/kg/min continuous infusion
3. Comments: Titrate to effect in ICU patients (monitor with train-of-four testing); onset within 2.5–4.5 min; 35–45 min duration; recovery within 45–60 min; renal and hepatic excretion

**VERAPAMIL**

a. Action: Antiarrhythmic; calcium channel blockade
b. Indications: Treatment of angina, hypertension, hypertrophic cardiomyopathy, and supraventricular tachyarrhythmias (SVTs) (slows ventricular response in atrial fibrillation or flutter and may convert SVT to sinus rhythm)
c. Loading dose: 0.075–0.15 mg/kg (5–10 mg) IV over 2–3 min; may repeat bolus in 10 min
d. Dose interval/infusion: Continuous infusion of 5 mg/h titrated to effect
e. Comments: May produce hypotension; Bradycardia and AV block in patients treated with concomitant β-blockers