Pulmonary Embolism RRG

RRG: M-290-RRG (ISC)
Link to Codes

MCG Health
Inpatient & Surgical Care
30th Edition

Clinical Indications for Admission

Observation Care	Inpatient Care
• Observation care is indicated for **1 or more** of the following[A][B][C][D]: ◦ Patient at high risk for bleeding complications upon initiation of anticoagulation ◦ Outpatient initiation of monitoring and therapy program not immediately feasible (eg, home healthcare support being arranged) ◦ Respiratory symptoms (eg, Tachypnea, dyspnea) ◦ Severe pain refractory to initial emergency department treatment (eg, pain from concomitant DVT) ◦ Inferior vena cava filter placement appropriate	• Admission is indicated for **1 or more** of the following: ◦ Hypoxemia ◦ Vital sign abnormality ◦ Chronic cardiopulmonary disease (eg, heart failure, coronary artery disease, COPD, asthma, cor pulmonale) that is clinically significant (eg, symptomatic, unstable) ◦ Hemoptysis ◦ Cardiac arrhythmias of immediate concern ◦ Syncope ◦ Right ventricular dysfunction or strain (eg, by echocardiogram, CT angiogram, or ECG) ◦ Acutely elevated cardiac biomarker (eg, troponin, BNP, or N-terminal pro-BNP) ◦ Inpatient monitoring of initiation or intensification of anticoagulation needed, as indicated by **ALL** of the following: ▪ Patient at high risk for bleeding complications upon initiation of anticoagulation

- Monitoring of response to anticoagulation needed beyond observation care
- Significant bleeding, or allergic, autoimmune (thrombocytopenia), or coagulopathic reaction in response to anticoagulation (current)
- Inpatient anticoagulation needed

− Thrombolysis (systemic or catheter-directed) needed, as indicated by **1 or more** of the following[E]:

- High-risk pulmonary embolism (eg, prolonged hypotension, bradycardia)
- Intermediate-high-risk pulmonary embolism (right ventricular strain and acutely elevated cardiac biomarker)
- Failure of therapeutic anticoagulation (eg, deterioration in oxygenation, worsening dyspnea, increased tachycardia, decline in blood pressure, progressive right heart dysfunction on echocardiogram)
- Visualized thrombus-in-transit (eg, on echocardiogram or CT angiogram)
- Right heart thrombus
- Cardiac arrest with suspected pulmonary embolism

− Thrombectomy or embolectomy (surgical or catheter-directed) needed, as indicated by **1 or more** of the following[F]:

- High-risk pulmonary embolism (eg, prolonged hypotension, bradycardia)
- Intermediate-high-risk pulmonary embolism (right ventricular strain and acutely elevated cardiac biomarker)
- Right heart thrombus
- Large thrombosis (eg, as source for pulmonary embolism)
- Contraindications to anticoagulation or thrombolysis

- Catastrophic thrombosis (hypercoagulable condition with multiple acute thromboembolic occlusions, also called "catastrophic thrombotic storm")[G]
- Pregnancy[H]
- Respiratory symptoms (eg, Tachypnea, dyspnea) that are severe (eg, ventilatory assistance needed or likely to be needed) or persistent despite observation care
- Severe pain requiring acute inpatient management (eg, from concomitant DVT)

See* Pulmonary Embolism *ISC Optimal Recovery Guideline for complete guideline and further supporting content such as Supplemental Medicare Criteria (ie, CMS' Two-Midnight Rule exceptions), Alternatives to Admission or Procedure, Optimal Recovery Course, and Evidence Summary.

Level of Care Criteria

For patient conditions requiring more than routine inpatient care, documentation of need may be done using the [**Level of Care**] chart.

Intensive Care	Intermediate Care	Telemetry Care
• ICU admission may be indicated when need is demonstrated by **1 or more** of the following: − Vital sign abnormalities, including **1 or more** of the following[I]: ▪ Systolic arterial blood pressure less than 90 mm Hg, or 20 mm Hg below patient's usual pressure in adult or child older than 10 years ▪ Systolic arterial blood pressure less than 60 mm Hg in neonate (younger than 1 month), 70 mm Hg in infant (1 month to 1 year of age), or less than the sum of 70 mm Hg plus twice the patient's age in child 2 to 10 years of age ▪ Mean arterial pressure less than 65 mm Hg in adult or child age 10 years or older[J] MAP Calculator ▪ Mean arterial pressure[J] drop of greater than 30 mm Hg from baseline attributable to cardiovascular dysfunction (eg, cardiogenic shock) MAP Calculator ▪ Pulse less than 45 or greater than 130 beats per minute in adult ▪ Pulse less than 40 or greater than 140 beats per minute in adolescent age 16 years or older ▪ Pulse less than 70 or greater than 150 beats per minute in child 2 to 15 years of age	• Intermediate care admission may be indicated after intensive care treatment (eg, as "step-down" care) or to provide higher level of care than general hospital ward (eg, as "step-up" care in absence of intensive care admission needs) (see Intensive Care Guidelines ISC), as indicated by **1 or more** of the following[W]: − Intermediate level monitoring or care needed, as indicated by **1 or more** of the following: ▪ Care requiring nurse to patient ratio of 1:2 or 1:3 (eg, complex wound management, postoperative high-risk patient, profound neuromuscular weakness) ▪ Frequent (but less frequent than hourly) monitoring, such as vital signs, vascular checks, or neurologic checks ▪ Stable chronic mechanical ventilator or long-term weaning needs ▪ Noninvasive ventilation[N][X] ▪ High-flow oxygen therapy[Y] ▪ Peritoneal dialysis ▪ Frequent pulmonary therapy with endotracheal suctioning	• Telemetry care admission[Z][AA][BB] may be indicated for **1 or more** of the following: − Suspected or proven acute ischemic cardiac event, including **1 or more** of the following: ▪ Acute coronary syndrome ▪ Post-acute MI ▪ Suspected vasospastic angina (to establish diagnosis with ST monitoring) ▪ Suspected MI (until it is ruled out) ▪ Newly diagnosed left main coronary artery lesion (until revascularization) − Cardiac rhythm disorder or conduction abnormality, including **1 or more** of the following: ▪ Dangerous arrhythmia diagnosed or suspected (until controlled or diagnosed as not requiring intervention) ▪ New-onset or recurrent atrial tachyarrhythmia ▪ Wolff-Parkinson-White syndrome with rapid conduction (until controlled by antiarrhythmic agent or ablation)

- Pulse less than 90 or greater than 160 beats per minute in infant younger than 2 years

− Laboratory findings (new), including **1 or more** of the following:

- Pulse oximetry or arterial oxygen saturation less than 90%, or partial pressure of oxygen less than 60 mm Hg (8.0 kPa) despite oxygen supplementation[K]
- Rising partial pressure of carbon dioxide with acute or uncompensated respiratory acidosis
- Arterial pH less than 7.2 or greater than 7.65
- Serum sodium less than 110 mEq/L (mmol/L) or greater than 160 mEq/L (mmol/L)
- Serum sodium less than 125 mEq/L (mmol/L) with Altered mental status, seizure, or respiratory arrest
- Serum sodium more than 145 mEq/L (mmol/L) with Altered mental status, seizure, diabetes insipidus requiring close monitoring of fluid balance and resuscitation, or severe dehydration requiring large-volume fluid resuscitation
- Serum potassium less than 2 mEq/L (mmol/L) or greater than 7 mEq/L (mmol/L)
- Serum potassium less than 2.5 mEq/L (mmol/L) with severe clinical or ECG manifestations (eg, paralysis, cardiac arrhythmia, delayed depolarization, flat T-waves, or U-waves)
- Serum potassium greater than 6.5 mEq/L (mmol/L) with ECG changes of hyperkalemia (eg, peaked T-waves, widened QRS, cardiac arrhythmia; for patient with permanent pacemaker: widened paced QRS, increased pacemaker stimulus to QRS interval, or failure to capture)

(nonintubated or chronic tracheostomy patient)

- Rapid diuresis for fluid overload
- Electrolyte, metabolic, or other problem requiring frequent laboratory testing or treatment adjustments
- Monitoring of continuous high-level epidural anesthesia
- Monitoring after toxic ingestion with risk for neurologic, cardiac, or respiratory compromise
- Titration of IV vasodilator or antiarrhythmic agents
- Low-dose inotropic or vasodilator therapy without need for frequent titration
- Continuous pulse oximetry monitoring
- Short-term electroencephalographic monitoring
- Patient who requires short-term inpatient monitoring (eg, cardiac, wound site, perfusion)

− **Thoracic Surgery and Pulmonary Disease** diagnoses or procedures, including **1 or more** of the following:

- Respiratory insufficiency with Hemodynamic stability and **1 or more** of the following:
  - Frequent monitoring for deterioration needed
  - Frequent pulmonary therapy (eg, suctioning, bronchodilator therapy)
  - Nasal continuous positive airway

- Symptomatic Bradycardia [CC]
- Chronic atrial fibrillation with medical condition that may affect ventricular rate (eg, autonomic dysfunction)[DD]
- High-risk ECG findings (eg, bifascicular block, abnormal QT interval, ventricular pre-excitation, other conduction abnormality)
- Firing of implantable cardioverter-defibrillator[EE]
- Suspected pacemaker or implantable cardioverter-defibrillator malfunction[FF]

− New administration or adjustment of treatment affecting cardiac rhythm or conduction, including **1 or more** of the following:

- New administration or adjustment of antiarrhythmic drug[GG]
- New administration or adjustment of rate control therapy for atrial tachyarrhythmia
- New administration or adjustment of negative chronotropic agent (eg, beta-blocker) in patient with baseline Bradycardia
- New administration or adjustment of QTc-prolonging medications[HH]
- New wearable (external) cardioverter-defibrillator for indication anticipated to be temporary (eg, myocarditis, untreated heart failure meeting implantable cardioverter-defibrillator criteria but expected to improve with

- Calcium[L] greater than 14 mg/dL (3.5 mmol/L) or ionized calcium greater than 10.0 mg/dL (2.50 mmol/L)
- Calcium[L] greater than 12 mg/dL (3.0 mmol/L) or ionized calcium greater than 8.0 mg/dL (2.0 mmol/L) with Altered mental status, severe volume depletion requiring large-volume IV fluid resuscitation, Hypotension, significant arrhythmia, heart block, or digitalis toxicity
- Serum phosphorus less than 1 mg/dL (0.32 mmol/L)
- Toxic drug level or poisoning causing or likely to cause neurologic abnormalities or Hemodynamic instability
- Less severe or other laboratory abnormalities (eg, hyperphosphatemia, hypomagnesemia, or hypermagnesemia) contributing to **1 or more** of the following:
  - Seizure
  - Altered mental status
  - Muscle weakness or severe spasms
  - Arrhythmias
  - Hemodynamic instability
  - Other significant clinical manifestations

− ECG (or cardiac monitoring) findings, including **1 or more** of the following:

- Inherently unstable or life-threatening arrhythmia (eg, sustained ventricular tachycardia, ventricular fibrillation, asystole)
- Arrhythmia causing Hypotension (eg, Bradycardia, Tachycardia)
- Complete heart block causing Hypotension
- Other findings indicative of need for intensive care (eg, acute cardiac ischemia, myocardial infarction)

pressure
  - Intermittent or continuous noninvasive ventilation[R]
  - Heated humidified high-flow nasal cannula oxygen
- Stable long-term mechanical ventilation
- Need for noninvasive ventilation[R]
- Asthma with severe dyspnea or fatigue requiring frequent monitoring or therapy, CPAP, or noninvasive ventilation[R]
- COPD with severe dyspnea or fatigue requiring frequent monitoring or therapy
- Cor pulmonale with severe dyspnea or fatigue requiring frequent monitoring or therapy
- Obesity hypoventilation with **1 or more** of the following:
  - New need for noninvasive ventilation
  - Need for adjustment of pre-existing noninvasive ventilator with need for close monitoring of clinical status (eg, monitoring of mental status or hypercarbia)
  - New-onset Hypoxemia that persists despite observation care
  - Worsening of pre-existing hypercarbia (eg, documented

therapy, indication for implantable cardioverter-defibrillator with temporary contraindication to implantation, bridge to transplant or other advanced heart failure therapy)

− Following cardiac or major thoracic procedure, including **1 or more** of the following:

- Cardiac surgery (first 48 to 72 hours unless complications occur)
- Noncardiac thoracic surgery (eg, pulmonary lobectomy; first 48 to 72 hours unless complications occur)
- Nonurgent percutaneous coronary intervention with complications or suboptimal results (for at least 24 hours or until complication is resolved)
- Short-term monitoring after cardiac procedure, as indicated by **1 or more** of the following[II]:
  - Electrophysiologic studies
  - Implantable cardioverter-defibrillator placement
  - Nonurgent percutaneous coronary intervention without complications until sheath is pulled
  - Temporary pacemaker placement (until removed or permanent pacemaker placed)
  - Permanent pacemaker placement

− Physical findings, including **1 or more** of the following:
- Threatened airway
- Altered mental status that is severe or persistent
- Repeated or prolonged seizures
- New-onset anuria (urine output less than 0.1 mL/kg/hour over 4 hours)
- Cyanosis (new)
- Cardiac tamponade
- Status post respiratory or cardiac arrest
- Findings consistent with abdominal emergency (eg, peritoneal signs)

− Imaging findings, such as dissecting aneurysm or ruptured viscus

− Severe burns, as indicated by **1 or more** of the following[M]:
- Hemodynamic instability
- Hypotension or requirement for aggressive fluid resuscitation
- Inhalation injury
- Respiratory insufficiency with requirement for high-flow oxygen, mechanical ventilation, or extracorporeal membrane oxygenation
- Need for intubation or mechanical ventilation due to high risk of airway obstruction (eg, laryngeal injury seen on fiberoptic laryngoscopy, oropharyngeal burn, soot in nares or oropharynx, deep circular neck burn, stridor, change in voice, or facial burn with extensive burn involving total body surface area of 40% or greater in adult or 60% or greater in child)
- Need for intubation or mechanical ventilation due to reduced level of consciousness (eg, Glasgow coma scale less than 8) GCS Calculator
- Requirement for frequent or intensive debridement and dressing changes
- Serious chemical burn

partial pressure of carbon dioxide increase greater than 5 mm Hg (0.7 kPa) from disease baseline with respiratory acidosis (pH less than 7.35))
- Worsening of pre-existing Hypoxemia (eg, increased requirement for supplemental oxygen to maintain oxygenation at baseline level) with need for close monitoring of clinical status (eg, monitoring of mental status or for worsening of hypercarbia due to oxygen use)

- Low-intermediate risk (low-risk submassive) pulmonary embolism with Hemodynamic stability and **either** evidence of right ventricular strain (eg, by echocardiogram, CT angiogram, or ECG) **or** positive cardiac biomarkers
- Traumatic rib fracture with forced vital capacity between 26% and 45% of predicted
- Cardiopulmonary monitoring following an Apparent Life-Threatening Event (also known as Brief Resolved Unexplained Event) in infant younger than 1 year of age
- Monitoring of thoracotomy patient and chest tube output
- Arrhythmia ablation (up to 24 hours for complex ablations (eg, pulmonary vein isolation), atrioventricular nodal ablations, or serious comorbidities)
- Implantation of ventricular assist device
- Transcatheter procedures (eg, aortic valve replacement, valvuloplasty, atrial or ventricular septal defect closure)
- Percutaneous left atrial appendage closure (6 hours if performed under general anesthesia, shorter duration if performed under moderate sedation)

- Short-term monitoring of suspected cardiac contusion (eg, chest trauma with new abnormality (ST elevation, tachyarrhythmia, bundle branch block) on ECG)[JJ]

− Electrical injury and **1 or more** of the following:
- Loss of consciousness
- Dysrhythmia
- New ECG abnormality
- Troponin elevation
- Direct lightning injury

− Cardiac disease, including **1 or more** of the following:
- Acute myocarditis or pericarditis

- High-voltage (eg, 1000 volts or more) electrical burn
- Carbon monoxide poisoning
- Cyanide toxicity
- Infant younger than 1 year
- Multiple comorbidities
- Severe infection or sepsis (eg, skin and soft tissue, pneumonia, urinary infection)
- Life-threatening cardiac, renal, pulmonary, or neurologic dysfunction
- Concomitant trauma, organ failure, arrhythmia, or other medical condition requiring ICU care

− Specific intervention or monitoring needed, as indicated by **1 or more** of the following:

- New need for assisted ventilation, invasive or noninvasive[N]
- New need for intubation (eg, to protect airway)
- New tracheostomy (less than 48 hours old)
- Hourly vital signs or neurologic checks
- Pulmonary artery line monitoring needed (eg, for refractory heart failure, diagnostic uncertainty (eg, uncertain fluid status), guidance of device selection and utilization of mechanical circulatory support, assessment of pulmonary arterial pressure and vasodilator responses in pulmonary hypertension, and other select conditions)
- Continuous arterial line monitoring needed
- Continuous IV vasoactive medications
- Continuous IV antiarrhythmics
- Large volume IV fluid resuscitation (eg, greater than 6 L per day)
- Large or rapid transfusion needs (eg, more than 6 units within 24 hours)
- High-risk IV treatment, such as thrombolysis, hypertonic saline, or mannitol infusion

for first postoperative day

- Patient with impaired airway clearance requiring frequent suctioning and respiratory monitoring

- Acute decompensated heart failure[KK]
- Takotsubo cardiomyopathy (aka stress cardiomyopathy or apical ballooning syndrome)
- Infectious endocarditis
- Patient admitted with ventricular assist device (for cardiac or noncardiac problems)

− Drug overdose or poisoning with substance that causes Bradycardia, arrhythmia, QT prolongation, or QRS widening (eg, greater than 120 msec) (eg, beta-blockers, methadone, phenothiazines, sympathomimetic agents, cyclic antidepressants, digitalis, antiarrhythmic drugs)[HH]

- Short-term cardiac monitoring after therapeutic or diagnostic procedure requiring conscious sedation or anesthesia
- Acute cerebrovascular event[LL]
- Short-term cardiac monitoring during treatment with medications that increase risk of arrhythmia or Bradycardia (eg, lidocaine infusion for pain, neostigmine infusion for treatment of acute colonic pseudo-obstruction, phenytoin infusion for seizure without status epilepticus)

− Uncorrected electrolyte abnormalities associated with increased risk of dangerous arrhythmia (until corrected), as indicated by **1 or more** of the following:

- Hyperkalemia with attributable ECG changes
- Potassium less than 3.0 mEq/L (mmol/L)
- Potassium greater than or equal to 6.0 mEq/L (mmol/L)

- Rapid desensitization or graded drug provocation challenge for high-risk hypersensitivity reaction to required medication (eg, penicillin, aspirin, monoclonal antibody)
- Acute cardiac pacing
- Temporary mechanical circulatory support (eg, aortic balloon pump, ventricular assist device)
- Extracorporeal membrane oxygenation device
- Pericardiocentesis
- Hemodialysis in unstable patient
- Continuous renal replacement therapy (eg, continuous venovenous hemodialysis)
- Continuous fluid removal via hemofiltration (eg, continuous venovenous hemofiltration)
- Peritoneal dialysis initiation
- Emergency bronchoscopic therapy (eg, for hemoptysis)
- Emergency endoscopic therapy for bleeding
- Balloon tamponade for variceal bleeding
- Intracranial pressure monitoring or tissue oxygen monitoring
- Ventriculostomy monitoring
- Treatment of ongoing seizures
- Induced hypothermia or coma
- Ongoing frequent testing and treatment for acute conditions, including **1 or more** of the following:
    - Correction of severe metabolic acidosis or alkalosis
    - Frequent glucose checks (ie, more frequent than performable at lower level of care)
    - Severe fluid overload
    - Cerebral edema
    - Monitoring or suctioning for respiratory insufficiency or acidosis

but less than 6.5 mEq/L (mmol/L) in patient with acute kidney injury, acute illness, or anticipated rapid rise in potassium
- Potassium 6.5 mEq/L (mmol/L) or greater
- Magnesium less than 1.3 mEq/L (0.65 mmol/L)
- Magnesium greater than 6 mEq/L (3 mmol/L) or prolonged PR, QRS, or QT attributed to hypermagnesemia
- Calcium[MM] less than 8.6 mg/dL (2.15 mmol/L) or ionized calcium less than 4.65 mg/dL (1.16 mmol/L) with acute symptoms requiring IV repletion (eg, convulsions, severe muscle spasms, cardiac conduction disturbance)
- Prolonged QT attributed to hypokalemia, hypomagnesemia, or hypocalcemia
- Other clinically significant electrolyte abnormality associated with increased risk of arrhythmia

− Unexplained syncope or other neurologic event suspected of being due to arrhythmia or of cardiac origin, as indicated by **1 or more** of the following:
- Hemodynamic instability
- Outflow tract obstruction (eg, hypertrophic cardiomyopathy)
- Structural abnormality (eg, certain congenital heart defects, ventricular dysfunction, cardiomyopathy)
- Valvular disease (eg, aortic stenosis, prosthetic valve dysfunction)

- Monitoring for active bleeding
- Other need for treatment or monitoring not available outside the ICU

Systemic conditions, including **1 or more** of the following:

- Severe electrolyte or metabolic disturbance causing or likely to cause **1 or more** of the following:
  - Life-threatening cardiac dysrhythmia
  - Respiratory insufficiency
  - Altered mental status
  - Seizures
  - Hemodynamic instability
  - Muscular weakness
- Severe Hypothermia, as indicated by **1 or more** of the following:
  - Temperature 89.6 degrees F (32 degrees C) or lower
  - Temperature 95 degrees F (35 degrees C) or lower and severe organ dysfunction, as indicated by **1 or more** of the following:
    - Altered mental status
    - Hemodynamic instability
    - Respiratory depression
    - Pulmonary edema
    - Arrhythmia (eg, Bradycardia, atrial fibrillation, ventricular fibrillation)
    - Acute kidney injury (stage 2) or Acute renal failure (stage 3 acute kidney injury)
    - Other new end organ dysfunction attributable to hypothermia
- Heatstroke and **1 or more** of the following[O]:
  - Hemodynamic instability
  - Altered mental status
- Myocarditis
- Patient reported palpitations or tachycardia preceding syncope
- Syncope occurring during exercise
- Syncope sudden and without prodrome
- Syncope while supine
- Suspected dysfunction of implantable pacemaker or defibrillator
- History of Dangerous arrhythmia
- History of previous syncope due to arrhythmia
- Use of medication known to cause Dangerous arrhythmia
- Family history of sudden death
- Presentation consistent with acute coronary syndrome (eg, chest pain, cardiac ischemia)
- Multiple syncopal episodes within last 6 months
- Known channelopathy (eg, long QT syndrome, Brugada syndrome, or catecholaminergic paroxysmal ventricular tachycardia)
- High-risk ECG findings (eg, bifascicular block, Bradycardia, abnormal QT interval, ventricular pre-excitation, other conduction abnormality)

- Seizures
- Rhabdomyolysis
- Acute kidney injury (stage 2) or Acute renal failure (stage 3 acute kidney injury)
- Acute liver injury (eg, new INR elevation of 1.5 or greater; aspartate aminotransferase, alanine aminotransferase, or gamma-glutamyl transpeptidase greater than 100 units/L (1.67 mckat/L); new direct bilirubin greater than 2 mg/dL (34 micromoles/L); or new total bilirubin greater than 5 mg/dL (86 micromoles/L) attributable to hyperthermia)
- Disseminated intravascular coagulation
- Diffuse pulmonary infiltrates with Hypoxemia (eg, acute respiratory distress syndrome) attributable to hyperthermia

- Environmental injuries, such as electrical injuries, or near drowning
- Anaphylaxis with respiratory compromise, Hypotension, or other end organ dysfunction
- Confirmed or suspected malignant hyperthermia as evidenced by exposure to volatile anesthetic agent or succinylcholine and **1 or more** of the following[P]:
    - Hypermetabolism as evidenced by inappropriately increased CO_2 production, O_2 consumption, or acute mixed metabolic and respiratory acidosis
    - Unexplained Tachycardia
    - Cardiac tachyarrhythmias, ectopic ventricular beats, or ventricular bigeminy

- Masseter spasm
- Muscle rigidity
- Rapid increase in core body temperature
- Acute rise in serum potassium, creatine kinase, or myoglobin

- Neuroleptic malignant syndrome as evidenced by exposure to neuroleptic drug (eg, phenothiazine, butyrophenone) or dopamine-depleting drug (eg, alpha-methyltyrosine), or withdrawal of dopaminergic agent (eg, levodopa, amantadine) and **1 or more** of the following[P]:
  - Muscle rigidity
  - Akathisia (uncontrollable movement)
  - Hyperthermia
  - Altered mental status
  - Dysautonomia (eg, fluctuating blood pressure, tachycardia, hypersalivation, diaphoresis)
  - Hemodynamic instability
  - Acute rise in creatine kinase
  - Rhabdomyolysis
- Serotonin syndrome (serotonin toxicity) as evidenced by exposure to medication(s) that increases level of serotonin in CNS (eg, some antidepressants including serotonin reuptake inhibitors, monoamine oxidase inhibitors, opioids, stimulants, triptans, antiseizure medications, linezolid) and **1 or more** of the following:
  - Significant neurologic finding (eg, agitation, hypomania, hallucinations, Altered mental status, seizures)
  - Significant autonomic nervous system-related hyperactivity (eg, Hemodynamic instability, hypertension, blood pressure fluctuation, sweating,

hyperthermia, tachycardia, vomiting, diarrhea)
- Significant musculoskeletal findings (eg, rigidity, myoclonus, hyperreflexia, tremor, rhabdomyolysis, elevated creatinine kinase)

- Severe alcohol withdrawal with **1 or more** of the following:
  - Hemodynamic instability
  - Cardiac arrhythmias of immediate concern
  - Uncontrolled seizures
  - Respiratory depression with need for, or high likelihood of requiring, mechanical ventilation
  - Need for anesthetic agent to control agitation (eg, dexmedetomidine, propofol, ketamine, IV phenobarbital)
  - Delirium tremens as evidenced by **ALL** of the following:
    - Cessation of, or reduction in, heavy and prolonged alcohol use
    - Delirium (eg, fluctuating disturbance in attention, awareness, orientation, language)
    - Signs or symptoms of alcohol withdrawal, as indicated by **2 or more** of the following:
      - Autonomic hyperactivity (diaphoresis, tachycardia, hypertension)
      - Tremor
      - Nausea or vomiting
      - Hallucinations

- Increased anxiety
- Psychomotor agitation
- Generalized tonic-clonic seizures

Thoracic Surgery and Pulmonary Disease diagnoses or procedures, including **1 or more** of the following:

- Asthma with **1 or more** of the following:
  - Respiratory distress
  - Impending or actual respiratory failure
  - Need for mechanical ventilation
  - Peak expiratory flow rate less than 30% of predicted or personal best
  - Peak expiratory flow rate or forced expired volume in 1 second (FEV_1) less than 40% predicted after 1 hour of initial treatment
  - Acidosis
  - Persistent or worsening Hypoxemia after initial treatment
  - Hypercapnia (eg, arterial partial pressure of carbon dioxide greater than 43 mm Hg (5.7 kPa))
  - Altered mental status that is severe or persistent
  - Need for continuous inhaled bronchodilator
  - Cardiac arrhythmias of immediate concern
  - Hypotension
  - Need for advanced therapies (continuous intravenous bronchodilators, inhaled anesthetic agent, helium-oxygen therapy, or

extracorporeal membrane oxygenation)
- Barotrauma (pneumothorax, pneumoperitoneum, pneumopericardium)
- Child 5 years or younger and **1 or more** of the following:
  - Unable to speak or drink
  - Central cyanosis
  - Subcostal or subglottic contractions
  - Oxygen saturation less than 92%
  - Silent chest on auscultation
  - Respiratory rate greater than 40 breaths per minute
  - Age 0 to 3 years with pulse rate greater than 180 beats per minute
  - Age 4 to 5 years with pulse rate greater than 150 beats per minute

- Bronchiolitis in a child with **1 or more** of the following:
  - Impending respiratory failure[Q]
  - Need for invasive or noninvasive ventilation
  - Recurrent apnea
  - Hypoxemia unresponsive to oxygen supplementation
- Bronchopulmonary dysplasia rehospitalization with **1 or more** of the following:
  - Hemodynamic instability
  - Impending respiratory failure[Q]
  - Hypoxemia unresponsive to oxygen therapy
  - Need for invasive or noninvasive mechanical ventilation

- Pulmonary hypertension with acute pulmonary hypertensive crisis
- Need for invasive hemodynamic monitoring (eg, pulmonary artery or arterial catheter pressure monitoring)
- Need for close observation and aggressive therapy (eg, suctioning, chest physiotherapy, or inhalation treatments) at intervals less than 1 hour

- COPD with **1 or more** of the following:
  - Respiratory arrest
  - Need for mechanical ventilation[R]
  - Hemodynamic instability
  - Cardiac arrhythmias of immediate concern
  - Severe dyspnea unresponsive to initial treatment
  - Altered mental status
  - Massive aspiration or persistent vomiting
  - Persistent findings despite oxygen and outpatient management, including **1 or more** of the following:
    - Arterial partial pressure of oxygen less than 40 mm Hg (5.3 kPa)
    - Arterial partial pressure of carbon dioxide greater than 60 mm Hg (8.0 kPa) and uncompensated respiratory acidosis (pH less than 7.35)
    - Severe uncompensated acidosis (pH less than 7.25)

- Worsening Hypoxemia or acidosis

- Cor pulmonale with **1 or more** of the following:
  - Respiratory arrest
  - Hemodynamic instability
  - Need for IV inotropic or vasoactive agent
  - Need for inhaled nitric oxide or epoprostenol
  - Need for invasive hemodynamic monitoring (eg, central venous, pulmonary artery, or arterial catheter)
  - Arterial partial pressure of oxygen less than 40 mm Hg (5.3 kPa)
  - Worsening Hypoxemia or acidosis despite oxygen therapy
  - Unstable atrial tachyarrhythmia
  - Altered mental status
  - Need for mechanical ventilation[R]
  - Need for extracorporeal membrane oxygenator or right ventricular assist device
- Croup with **1 or more** of the following:
  - Hemodynamic instability
  - Hypoxemia
  - Impending respiratory failure[Q]
  - Cyanosis
  - Altered mental status
  - Need for mechanical ventilation
- Aspiration pneumonia with **1 or more** of the following:
  - Acute respiratory distress syndrome (eg, PaO_2 to FiO_2 ratio of 300 mm Hg or less)
  - Impending or actual respiratory failure
  - Need for invasive or noninvasive mechanical ventilation[R]

- *Pneumocystis jirovecii* pneumonia with **1 or more** of the following:
  - Hypoxia (eg, PaO_2 60 mm Hg (8.0 kPa) or less despite oxygen therapy)
  - Impending or actual respiratory failure
  - Need for invasive or noninvasive mechanical ventilation[R]
  - Patient with hematologic malignancy and signs of respiratory deterioration
- Pneumonia in adult with **1 or more** of the following:
  - Need for invasive or noninvasive assisted ventilation[R]
  - Hemodynamic instability
  - Severe disease, as indicated by **3 or more** of the following:
    - PaO_2 to FiO_2 ratio of 250 mm Hg or less
    - Multilobed infiltrates
    - Altered mental status
    - BUN 20 mg/dL (7.1 mmol/L) or greater
    - WBC count less than 4000/mm^3 (4 x10^9/L)
    - Platelet count less than 100,000/mm^3 (100 x10^9/L)
    - Serum sodium less than 130 mEq/L (mmol/L)
    - Temperature less than 96.8 degrees F (36 degrees C)
- Pneumonia in child with **1 or more** of the following:
  - Impending respiratory failure

- Need for invasive or noninvasive ventilation[R]
- Hemodynamic instability
- Pulse oximetry less than 92% on greater than 50% inspired oxygen
- Recurrent apnea
- Altered mental status
- Hemolytic uremic syndrome[S]

- COVID-19 infection with **1 or more** of the following:
  - Need for invasive or noninvasive mechanical ventilation
  - Adult with pulse oximetry 90% or lower on 60% inspired oxygen or higher
  - Pregnant patient with pulse oximetry of 94% or lower despite supplemental oxygen
  - Child with pulse oximetry 92% or lower on 50% inspired oxygen or higher
  - Child with recurrent apnea
  - Respiratory acidosis with pH less than 7.20
  - Hemodynamic instability
  - Requirement for frequent hemodynamic measurements
  - Altered mental status
  - Need for intravenous vasopressor or inotrope infusion
  - New end organ dysfunction
- Acute viral illness (eg, influenza, respiratory syncytial virus) with **1 or more** of the following:
  - Impending respiratory failure[Q]
  - Need for invasive or noninvasive mechanical ventilation[R]
  - Hemodynamic instability

- Requirement for frequent hemodynamic measurements
- Need for intravenous vasopressor or inotrope infusion
- Altered mental status that is severe or persistent
- New end organ dysfunction (eg, Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury), acute liver failure)
- Respiratory acidosis with pH less than 7.20
- Adult with refractory hypoxemia (eg, pulse oximetry 90% or lower on 60% inspired oxygen or higher)
- Child with pulse oximetry less than 92% on 50% inspired oxygen or higher
- Child with recurrent apnea

- Pulmonary hypertension with **1 or more** of the following:
  - Hemodynamic instability
  - Hypoxemia unresponsive to oxygen supplementation
  - Need for pulmonary artery catheterization (eg, for titration of pulmonary vasodilator agents or monitoring of cardiac output)
  - Need for initiation of parenteral pulmonary vasodilator
  - Need for inhaled nitric oxide or epoprostenol
  - Need for vasopressor or inotropic agent
  - Need for mechanical circulatory support (eg, extracorporeal membrane oxygenator or right ventricular assist device, as bridge to recovery or transplant)
- Obesity hypoventilation with **1 or more** of the following:

- Respiratory distress
- Need for invasive mechanical ventilation
- Altered mental status thought to be caused by hypercarbia

- Impending respiratory failure, as indicated by **1 or more** of the following:
  - Child with clinical signs of impending respiratory failure[Q]
  - Clinical signs of respiratory fatigue (eg, use of respiratory accessory muscles, paradoxical motion of the diaphragm,[T] intercostal retractions)
  - Adult with respiratory rate greater than 30 breaths per minute[I][U]
  - Arterial partial pressure of oxygen less than 60 mm Hg (8.0 kPa) on 50% oxygen or more or PaO_2 to FiO_2 ratio less than 200 mm Hg
  - Arterial partial pressure of carbon dioxide greater than 45 mm Hg (6.0 kPa) with respiratory acidosis (pH less than 7.35)
  - Altered mental status due to respiratory disease
- Respiratory failure with **1 or more** of the following:
  - New need for acute invasive or noninvasive mechanical ventilation[R]
  - High likelihood of requiring mechanical ventilation within 24 hours
  - Observation in first several hours immediately after extubation from mechanical ventilation

- Need for close observation and aggressive therapy, such as suctioning, chest physiotherapy, or inhalation treatments at intervals less than 1 hour
- Pharmacologic ventilatory paralysis

- Venous thromboembolism or deep venous thrombosis with need for systemic or catheter-directed thrombolysis (eg, for limb-threatening or organ-threatening thrombosis, obstructive superior vena cava syndrome)
- Pulmonary embolus (PE) with **1 or more** of the following:
  - Hypotension
  - Arterial partial pressure of oxygen less than 60 mm Hg (8.0 kPa) on supplemental oxygen
  - Cardiac arrhythmias of immediate concern
  - Bleeding
  - Need for systemic or catheter-directed thrombolysis
  - High-risk submassive PE (high-intermediate risk), as evidenced by **ALL** of the following:
    - Evidence of right ventricular strain (eg, by echocardiogram or on CT angiogram)
    - Elevated cardiac biomarkers
- Lobectomy or other major thoracic surgery
- Lung transplant
- Need for extracorporeal membrane oxygenation
- Need for extracorporeal carbon dioxide removal

- Symptomatic upper airway obstruction (eg, laryngeal edema, mass, obstructing foreign body aspiration)
- Massive hemoptysis or pulmonary hemorrhage with **1 or more** of the following:
    - Respiratory distress or respiratory failure
    - Airway obstruction (eg, from active bleeding or clot)
    - Hypoxemia unresponsive to oxygen supplementation
    - Hypotension
    - Hemoptysis greater than 200 mL per day
    - Altered mental status or inability to clear secretions
    - Coagulopathy
    - Pulmonary vasculitis syndrome with concomitant organ failure requiring ICU care (eg, pulmonary-renal syndrome requiring continuous renal replacement therapy, systemic lupus erythematosus with acute encephalopathy)
- Pertussis and **1 or more** of the following:
    - Child younger than 3 months
    - Hemodynamic instability
    - Apnea
    - Respiratory fatigue (eg, loss of whooping inhalation due to fatigue, need for respiratory assistance)
    - Hypoxia (eg, PaO_2 60 mm Hg (8.0 kPa) or less despite oxygen therapy)
    - Impending or actual respiratory failure
- Near drowning (nonfatal submersion) with **1 or more** of the following[V]:
    - Need for acute invasive or noninvasive mechanical

ventilation
- Respiratory distress
- Neurologic impairment requiring monitoring
- Cardiac arrest or Dangerous arrhythmia
- Severe Hypothermia, as indicated by **1 or more** of the following:
    - Temperature 89.6 degrees F (32 degrees C) or lower
    - Temperature 95 degrees F (35 degrees C) or lower and severe organ dysfunction, as indicated by **1 or more** of the following:
        - Altered mental status
        - Hemodynamic instability
        - Respiratory depression
        - Pulmonary edema
        - Arrhythmia (eg, Bradycardia, atrial fibrillation, ventricular fibrillation)
        - Acute kidney injury (stage 2) or Acute renal failure (stage 3 acute kidney injury)
        - Other new end organ dysfunction

attributable to hypothermia

- Infection or thrombosis of intravenous device with **1 or more** of the following:
  - Unstable acute complication (eg, pericardial tamponade, tension pneumothorax, air embolism, active bleeding)
  - Hemodynamic instability
  - Requirement for frequent hemodynamic measurements
  - End organ dysfunction (eg, renal failure, Altered mental status that is severe or persistent)
  - Acute renal complications due to missed dialysis (eg, severe electrolyte abnormalities, uremia, or acidosis)
- Traumatic rib fracture or fractures with **1 or more** of the following:
  - Injury severity score of 19 or greater
  - Forced vital capacity of 25% predicted or less
  - Respiratory insufficiency
  - Flail chest
  - Sternum fracture
  - Vascular injury (eg, heart or great vessels)
- Pleural effusion with **1 or more** of the following:
  - Respiratory insufficiency
  - Hemothorax with active ongoing bleeding
  - Hemodynamic instability
  - Unstable comorbid condition (eg, heart failure)
- Tension pneumothorax
- Complications of any thoracic surgery requiring ICU intervention, as indicated by **1 or more** of the following:
  - Hemodynamic instability

	• MI with complications (eg, severe arrhythmia, Hypotension) • Excessive bleeding or severe coagulopathy • Respiratory failure or insufficiency • Renal failure • Airway instability or obstruction • Neurologic deterioration • Infection with Hypotension or significant fluid shifts		

Hospitalization

Goal Length of Stay: 4 days

Note: Goal Length of Stay assumes optimal recovery, decision making, and care. Patients may be discharged to a lower level of care (either later than or sooner than the goal) when it is appropriate for their clinical status and care needs.

Discharge Readiness

- Discharge readiness is indicated by patient meeting Recovery Milestones, including **ALL** of the following:
  - **Hemodynamic stability**
  - **No bleeding or evidence of new emboli**
  - **Oxygen absent[NN]**
  - **INR therapeutic if indicated[OO]**
  - **Ambulatory or acceptable for next level of care**
  - **Oral hydration[PP]**
  - **Oral medications or regimen acceptable for next level of care[QQ]**
  - **Oral diet or acceptable for next level of care**
  - **Discharge plans and education understood**

See Pulmonary Embolism Optimal Recovery Course ISC for full optimal recovery management information.

Extended Stay

Minimal (a few hours to 1 day), Brief (1 to 3 days), Moderate (4 to 7 days), and Prolonged (more than 7 days).

- Extended stay beyond goal length of stay may be needed for:
  - Failure to meet discharge criteria (recovery milestones within final day in Optimal Recovery Course)
    - Expect brief stay extension.

- Acute bleeding secondary to anticoagulation
  - Anticipate evaluation to locate source of bleeding (if unknown); re-evaluation of anticoagulation plan; possible red cell, plasma, platelet, or cryoprecipitate transfusion; possible desmopressin, antifibrinolytic agent (tranexamic acid or aminocaproic acid), or reversal agent (eg, idarucizumab or dialysis for dabigatran, protamine for heparin, andexanet alfa for rivaroxaban or apixaban, 4-factor prothrombin complex concentrate).
  - Anticipate administration of vitamin K, fresh-frozen plasma, platelets, or reversal agents (eg, protamine, desmopressin, activated factor VII, prothrombin complex concentrate; dabigatran may be reversed by dialysis or idarucizumab; rivaroxaban and apixaban may be reversed by andexanet alfa), as appropriate.[RR]
  - Patient may be rechallenged with reversible anticoagulant (eg, heparin) if bleeding is controlled, or inferior vena cava filter may be placed if bleeding is ongoing or rebleeding risk is high.
  - Expect brief stay extension.
- Persistent subtherapeutic anticoagulation with warfarin[D]
  - Anticipate low-molecular-weight heparin use and continued transition to warfarin on outpatient basis, or consider change to oral factor Xa inhibitor (eg, rivaroxaban, apixaban, edoxaban) or oral direct thrombin inhibitor (dabigatran).
  - Transition patient to home care or recovery facility for complex warfarin adjustment.
  - Expect minimal to brief stay extension. See Anticoagulation Requirement: Common Complications and Conditions ISC for further information.
- Recurrent thromboembolism
  - Recurrent pulmonary embolism may require extended observation during anticoagulation or inferior vena cava procedure.
  - Expect brief to moderate stay extension.
- Persistent respiratory symptoms (eg, Hypoxemia, dyspnea, Tachypnea)
  - Anticipate respiratory monitoring and treatment.
  - Expect brief stay extension.
- Massive embolism
  - Massive embolism may cause Hemodynamic instability or cor pulmonale.
  - Anticipate IV fluid support, possible systemic or catheter-directed thrombolysis or thrombectomy, vasopressor or inotrope, extracorporeal membrane oxygenation, right ventricular assist device, or embolectomy.
  - Expect brief to moderate stay extension.
- Active comorbidities (eg, heart failure, atrial fibrillation, pneumonia, renal failure)
  - Anticipate therapy directed at comorbidity.
  - Expect brief stay extension.
- Hyponatremia
  - Anticipate electrolyte management.
  - Expect brief stay extension.
- Heparin-induced thrombocytopenia
  - Anticipate discontinuation of heparin and substitution of non-heparin anticoagulant (eg, direct thrombin inhibitor, fondaparinux, direct oral anticoagulant).
  - Expect brief to moderate stay extension.
- Malnutrition
  - Malnutrition is associated with worse outcomes, including respiratory failure, acute kidney injury, sepsis, shock, non-home discharge, and in-hospital mortality.
  - Expect brief stay extension.

- Other complication or condition, including:
  - Anemia
    - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
      - Hemodynamic stability
      - Active blood loss absent
      - Signs and symptoms of anemia absent or acceptable for next level of care
      - Mental status normal or at baseline
      - Hgb/Hct level stable and acceptable for next level of care
      - Etiology of anemia requiring inpatient care absent
  - Arrhythmia
    - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
      - Hemodynamic stability
      - Arrhythmia evaluation completed
      - Reversible causes of arrhythmia eliminated or mitigated
      - Specific antiarrhythmia treatment initiated as appropriate
      - Anticoagulation requirements addressed (or anticoagulation not required). See Anticoagulation Requirement: Common Complications and Conditions ISC for further information.
  - Electrolyte disorder
    - Extended stay beyond goal length of stay for primary condition may be needed until **1 or more** of the following is present:
      - Electrolyte abnormality manageable at next level of care[SS]
      - No electrolyte abnormality, as indicated by **ALL** of the following:
        - Potassium greater than 3.5 mEq/L (mmol/L) and less than 5.0 mEq/L (mmol/L)
        - Sodium greater than 135 mEq/L (mmol/L) and less than 145 mEq/L (mmol/L)
        - Calcium greater than 8.5 mg/dL (2.13 mmol/L) and less than 10.5 mg/dL (2.63 mmol/L)
        - Phosphorus greater than 2.5 mg/dL (0.81 mmol/L) and less than 5.0 mg/dL (1.62 mmol/L)
        - Magnesium greater than 1.5 mEq/L (0.75 mmol/L) and less than 3.0 mEq/L (1.5 mmol/L)
  - Fever
    - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
      - Hemodynamic stability
      - Hypoxemia absent
      - Tachypnea absent
      - Temperature status acceptable, as indicated by **1 or more** of the following:
        - Temperature less than 100.5 degrees F (38.1 degrees C) (oral)
        - Temperature as expected for disease process and acceptable for next level of care
      - Cultures negative or infection identified and under adequate treatment
      - No condition, organ dysfunction (eg, renal failure), or laboratory finding (eg, acidosis) identified that requires inpatient care
      - Behavior or mental status abnormalities absent or manageable at next level of care. See Mental Status Change: Common Complications and Conditions ISC for further information.
      - Adequate diet tolerated
      - Medical comorbidities absent or manageable at next level of care

- Gastrointestinal bleeding
  - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
    - Hemodynamic stability
    - Bleeding absent
    - Stable Hgb/Hct
    - Platelet count, prothrombin time, and partial thromboplastin time acceptable for next level of care
    - Surgical or other acute intervention not needed
    - Mental status at baseline
    - Oral hydration and diet tolerated
- Hyperglycemia and diabetes control
  - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
    - Hemodynamic stability
    - Mental status at baseline
    - No precipitating cause identified, or cause manageable at next level of care
    - Acidosis absent
    - Blood glucose under acceptable control
    - Dehydration absent
    - Electrolyte abnormalities absent or acceptable for next level of care
    - Renal function at baseline or acceptable for next level of care
    - Outpatient diabetic medication regimen established
    - Oral hydration
    - Oral medications or regimen acceptable for next level of care
    - Oral diet or acceptable for next level of care
- Mental status change
  - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
    - Underlying medical etiology of mental status change absent, or manageable at next level of care
    - Danger to self or others absent or manageable at next level of care
    - Behavioral crisis management, including physical restraint or emergent pharmacologic treatment of agitation, not required or available at next level of care
    - Substance or alcohol withdrawal absent or manageable at next level of care
    - Behavioral symptoms (eg, agitation, somnolence, inappropriate behavior) absent or manageable at next level of care
- Psychiatric disorders
  - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
    - Danger to self or others absent or manageable at next level of care
    - Behavior crisis management, including physical or chemical restraints, not required or available at next level of care
    - Behavioral symptoms (eg, agitation, somnolence, inappropriate behavior) absent or manageable at next level of care
    - Functional status is sufficient to participate at available next level of care.
    - Patient and supports understand follow-up treatment and crisis plan.
    - Provider and supports are sufficiently available at next level of care.
    - Patient can participate (eg, verify absence of plan for harm) in needed monitoring.
- Respiratory insufficiency
  - Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:

- Suctioning, pulmonary toilet, or other therapy not needed or available at next level of care
- Respiratory insufficiency resolved or manageable at next level of care
- Anticoagulation treatment not needed or available at next level of care

− Urinary complications

- Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
  - Hemodynamic stability
  - Mental status at baseline
  - Antibiotic regimen for next level of care established
  - Voiding adequately or with urinary catheter, percutaneous suprapubic tube, or plan for intermittent self-catheterization, and management regimen performable at next level of care
  - Urine output adequate
  - Renal function at baseline or acceptable for next level of care
  - Pain absent or managed
  - Oral intake adequate
  - Afebrile or temperature acceptable for next level of care

− Venous thrombosis and pulmonary embolism

- Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
  - Hemodynamic stability
  - Dyspnea absent
  - New oxygen requirement absent or supplementation can be performed at next level of care
  - Tachypnea absent
  - Dangerous arrhythmia absent
  - No bleeding or evidence of new emboli
  - Pain absent or managed
  - No evidence of cardiac dysfunction (eg, right ventricular heart failure)
  - Lower extremity examination at baseline, stable, or improved
  - Anticoagulation tolerated (eg, no allergic reaction)
  - Outpatient anticoagulation plan established

− Wound and skin care

- Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present:
  - Hemodynamic stability
  - Volume status acceptable (eg, not dehydrated)
  - Mental status at baseline
  - Hypoxemia absent
  - Tachypnea absent
  - Fistulas, tunneling, or infection absent or manageable at next level of care
  - Surgical management requiring inpatient care absent
  - Afebrile or temperature appropriate for next level of care
  - Pain absent or managed
  - Wound care needs manageable at next level of care
  - Drain absent or drain care manageable at next level of care
  - Wound hematoma or seroma absent or manageable at next level of care

See Common Complications and Conditions ISC for further information.

See* Pulmonary Embolism *ISC Optimal Recovery Guideline for complete guideline and further supporting content such as Supplemental Medicare Criteria (ie, CMS' Two-Midnight Rule exceptions), Alternatives to Admission or Procedure, Optimal Recovery Course, and Evidence Summary.

Discharge Destination

- Post-hospital levels of admission may include:
  - Home.
  - Home healthcare. See Home Care Indications for Admission Section HC in Venous Thromboembolism guideline in Home Care.
  - Recovery facility care. See Recovery Facility Care Indications for Admission Section RFC in Pulmonary Embolism guideline in Recovery Facility Care.

Footnotes

[A] The use of an oral direct thrombin inhibitor (eg, dabigatran) or an oral coagulation factor Xa inhibitor (eg, rivaroxaban, apixaban, edoxaban) has been found in randomized trials to be noninferior to vitamin K antagonists (eg, warfarin) in terms of recurrent venous thromboembolism. Further, it has been found that these alternatives to warfarin have a lower risk of clinically relevant bleeding, such that the use of a direct thrombin inhibitor or a factor Xa inhibitor is recommended as first-line treatment for most patients with venous thromboembolism. [A in Context Link 1]

[B] Specialty society guidelines recommend low-molecular-weight heparin (preferred) or a direct oral anticoagulant over unfractionated heparin plus warfarin for patients with cancer and venous thromboembolism.Low-molecular-weight heparin is also recommended for pregnancy-associated DVT, with a possible switch to unfractionated heparin close to delivery (due to its shorter half-life and reversibility with protamine). Patients with suspected or proven heparin-induced thrombocytopenia should be anticoagulated with a non-heparin anticoagulant (eg, direct thrombin inhibitor, fondaparinux, direct oral anticoagulant). [B in Context Link 1]

[C] Patients using low-molecular-weight heparin, fondaparinux, an oral direct thrombin inhibitor, or an oral coagulation factor Xa inhibitor achieve full anticoagulation rapidly (eg, a few hours after first dose). [C in Context Link 1]

[D] A systematic review of relevant randomized controlled trials concludes that direct oral anticoagulants (ie, oral factor Xa inhibitors and oral thrombin inhibitors) should not be standard treatment for patients with mechanical heart valves, atrial fibrillation with rheumatic mitral stenosis, or thrombotic antiphospholipid syndrome. For these indications, the use of a vitamin K antagonist (eg, warfarin) is preferred. The review further concludes that the efficacy and safety of direct oral anticoagulants (DOACs) is uncertain in patients with left ventricular thrombus, catheter-associated deep venous thrombosis, or cerebral venous sinus thrombosis. Concerning patients with end-stage renal disease, the review states that the choice of an anticoagulant should be individualized due to the lack of definitive data, balancing the pros and cons of DOAC and vitamin K antagonist-based anticoagulation. Patients who are pregnant or breast-feeding should avoid DOACs pending further study concerning safety. [D in Context Link 1, 2]

[E] Routine use of thrombolysis is not recommended. Cardiac biomarkers (eg, BNP, N-terminal pro-BNP level, troponin), severity scores (eg, Pulmonary Embolism Severity Index (PESI) or simplified sPESI), lactate levels, and right ventricular imaging (echocardiogram or CT angiogram) are useful in assessing mortality risk for thrombolysis evaluation. [E in Context Link 1]

[F] Embolectomy may be performed surgically or using an aspiration catheter. Routine use of thrombectomy or embolectomy is not recommended. [F in Context Link 1]

[G] Conditions associated with catastrophic thrombosis include, but are not limited to, malignancy, catastrophic antiphospholipid antibody syndrome, autoimmune disorders, antiplatelet factor 4 antibody (eg, heparin-induced thrombocytopenia, vaccine-induced thrombotic thrombocytopenia), pregnancy, and autoimmune disorders. This life-threatening condition requires aggressive anticoagulation and may require rapid treatment of the underlying etiology (eg, IVIG, plasmapheresis, immunotherapy). [G in Context Link 1]

[H] An evidence-based specialty society guideline recommends hospitalization for the initiation of anticoagulation therapy in pregnant women in cases of hemodynamic instability, large clots, maternal comorbidities, or when intravenous unfractionated heparin is appropriate for the initial treatment of pulmonary embolism, such as situations in which delivery, surgery, or thrombolysis may be necessary. On the other hand, the validated Hestia clinical decision tool (designed to assist with inpatient vs outpatient treatment of pulmonary embolism determination) includes pregnancy (without qualification) as an indication for inpatient treatment. [H in Context Link 1]

[I] Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture. [I in Context Link 1, 2]

[J] The mean arterial pressure (MAP) takes into account both systolic and diastolic blood pressure readings. [J in Context Link 1, 2]

[K] Pulse oximetry (SpO_2) may underestimate arterial saturation (SaO_2), especially in people with dark skin pigmentation, thick skin, cold body temperature, or who are wearing colored nail polish, and thus may not accurately detect hypoxemia. Where appropriate, pulse oximetry should be measured after warming fingers or removing nail polish. Pulse oximetry results should be assessed within the context of the patient's clinical presentation, and performance of an arterial blood gas considered for a more accurate assessment of oxygenation if indicated. Specific target values may require adjustment when care is delivered at high altitude. [K in Context Link 1]

[L] An ionized calcium level may be more accurate than a total serum calcium level, especially in the setting of acidosis, renal failure, multiple transfusions, hypoalbuminemia, or the presence of a paraprotein. [L in Context Link 1, 2]

[M] A dedicated burn unit is recommended. [M in Context Link 1]

[N] Ventilatory assistance includes noninvasive methods (eg, high-flow nasal cannula (HFNC), CPAP, BPAP) and invasive methods (intubation with mechanical ventilation). [N in Context Link 1, 2]

[O] The definition of heatstroke commonly includes a core body temperature of 104 degrees F (40 degrees C); however, hyperthermia-related organ failure may occur at lower temperatures. [O in Context Link 1]

[P] Expert advice in management of malignant hyperthermia or neuroleptic malignant syndrome is available from the Malignant Hyperthermia Association of the United States through their website at www.mhaus.org/healthcare-professionals/managing-a-crisis/ or at their 24-hour hotline 1-800-644-9737. [P in Context Link 1, 2]

[Q] Factors included in the subjective assessment of impending respiratory failure in children include the severity of tachypnea and tachycardia; presence of chest retractions, central cyanosis, Altered mental status, and difficulty feeding due to respiratory distress. [Q in Context Link 1, 2, 3, 4, 5]

[R] Continuous noninvasive ventilation may be administered in some intermediate care units depending on unit capabilities, staffing, and policies. [R in Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]

[S] Hemolytic uremic syndrome (HUS) is a thrombotic microangiopathy characterized by hemolytic anemia, thrombocytopenia, and acute kidney injury. While usually associated with gastroenteritis from Shiga toxin and Shiga-toxin-producing bacteria (eg, *Escherichia coli*, *Shigella*, and *Citrobacter* species), invasive *Streptococcus pneumoniae* infection is the most common nondiarrheal etiology and is responsible for about 5% of cases of HUS. Severe cases may involve other organs, including the central nervous system (eg, encephalopathy, seizures), pancreas (pancreatitis, diabetes), liver (hepatitis, jaundice), and heart (eg, hypertension, heart failure). [S in Context Link 1]

[T] Paradoxical diaphragm motion or abdominal paradox occurs when the diaphragm is severely fatigued or paralyzed and is pulled up into the chest cavity during inspiration, opposite its normal physiologic direction. [T in Context Link 1]

[U] Interpretation of respiratory rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline respiratory rate and whether the respiratory rate is indicative of significant underlying respiratory or other pathology. In addition, the measurement of the respiratory rate is subject to error. A medical textbook states that because there can be significant breath-to-breath variation in respiratory rate, the rate should be assessed for at least 30 seconds, preferably for a full minute. This same textbook also states that new technologies designed to measure the respiratory rate have not proved to be clinically useful. [U in Context Link 1]

[V] Patients arriving to the emergency department following a near drowning incident who do not have respiratory complaints, severe cough, abnormal vital signs, or abnormal physical examination may be sent home from the emergency department after a 4-hour to 6-hour period of observation. [V in Context Link 1]

[W] The Intermediate Care guideline should not be used independently but in conjunction with the appropriate Inpatient & Surgical Care or General Recovery Care guideline. [W in Context Link 1]

[X] Noninvasive ventilation may be administered in some intermediate care units depending on unit capabilities, staffing, and policies. [X in Context Link 1]

[Y] A specialty society guideline recommends the use of high-flow nasal oxygen over conventional oxygen therapy for patients with acute hypoxic respiratory failure because it decreases the risk of subsequent intubation and mechanical ventilation. High-flow oxygen is also recommended over conventional oxygen therapy for postextubation hypoxic respiratory failure due to a slightly lower likelihood for reintubation and improved patient comfort. [Y in Context Link 1]

[Z] For the purposes of the Inpatient & Surgical Care guidelines, telemetry care is defined as inpatient ECG monitoring not performed in an intensive or intermediate care unit. It is presumed that the patient meets clinical indications for admission or continued hospital stay, as the presence of a diagnosis or clinical situation listed in the Telemetry Care Guidelines does not necessarily indicate a need for inpatient care and monitoring. Telemetry care includes arrhythmia monitoring and may include continuous ST-segment ischemia monitoring and monitoring for QTc prolongation. [Z in Context Link 1]

[AA] The continued need for telemetry care monitoring, including ST-segment monitoring and QTc prolongation monitoring, should be reassessed at least daily. Indications for telemetry care are often time-limited. Inappropriate use of telemetry care can be reduced by incorporating indication-based ordering into electronic ordering systems, excluding telemetry care from order sets when monitoring is not usually indicated, daily reviewing telemetry care orders and need for ongoing monitoring, using automated advisories suggesting discontinuation based on diagnosis and duration of telemetry, and educating the healthcare team on appropriate telemetry care indications. [AA in Context Link 1]

[BB] The Telemetry Care guideline should not be used independently but in conjunction with the appropriate Inpatient & Surgical Care or General Recovery Care guideline. [BB in Context Link 1]

[CC] Telemetry care monitoring is not indicated for patients with Bradycardia who are hemodynamically stable and admitted for another reason. [CC in Context Link 1]

[DD] Telemetry care monitoring is not indicated for patients with chronic atrial fibrillation admitted for a reason other than arrhythmia or rate and who are hemodynamically stable. [DD in Context Link 1]

[EE] Appropriate defibrillator detection and firing require monitoring until treatment of the inciting event. Inappropriate firing requires monitoring until the device is interrogated. [EE in Context Link 1]

[FF] Telemetry care monitoring is not indicated for patients with a presumably functional defibrillator or pacemaker who are admitted for another reason. [FF in Context Link 1]

[GG] The initiation of certain antiarrhythmic medications may require continuous ECG monitoring because of proarrhythmic effects. [GG in Context Link 1]

[HH] Lists of agents associated with QT prolongation may be found at www.crediblemeds.org. [HH in Context Link 1, 2]

[II] Routine uncomplicated cardiac procedures, such as coronary angiography, do not require cardiac monitoring once the femoral sheath is pulled post procedure. [II in Context Link 1]

[JJ] The majority of life-threatening arrhythmias or heart failure episodes caused by cardiac contusion occur within 48 hours of chest trauma. [JJ in Context Link 1]

[KK] Patients admitted with acute heart failure have multiple risk factors for arrhythmia, including diuretic-induced electrolyte abnormalities, myocardial injury, hypoxemia, and structural heart disease. [KK in Context Link 1]

[LL] Dedicated intermediate-level stroke care units that incorporate rehabilitation are recommended over a telemetry care unit for acute ischemic stroke, if available. Specialty society guidelines recommend long-term telemetry (eg, 2 to 4 weeks) for patients with acute transient ischemic attack or stroke in whom a cardioembolic source is suspected and who are candidates for anticoagulation. Absent other indications (eg, unstable arrhythmia), this does not require extended inpatient care, as monitoring is usually performed in the outpatient setting using wearable or implantable monitors. [LL in Context Link 1]

[MM] An ionized calcium level may be more accurate than a total serum calcium level, especially in the setting of acidosis, renal failure, multiple transfusions, or hypoalbuminemia or in the presence of a paraprotein. [MM in Context Link 1]

[NN] The patient may continue to require supplemental oxygen if they did so at baseline. [NN in Context Link 1]

[OO] Follow-up PT/INR measurements are appropriate if a vitamin K antagonist is used. [OO in Context Link 1]

[PP] Some patients may have their hydration needs met via alternative means (eg, percutaneous endoscopic gastrostomy tube). [PP in Context Link 1]

[QQ] Some subcutaneous medications (eg, low-molecular-weight heparin) may be needed. [QQ in Context Link 1]

[RR] Depending on the timing of the last dose given, the severity of bleeding, and the presence or absence of renal or liver impairment, a reversal agent may not be required for direct-acting oral anticoagulants as their effects wane by 12 to 24 hours. [RR in Context Link 1]

[SS] Patients with chronic disease (eg, renal failure with potassium greater than 5 mEq/L (mmol/L) or liver disease with sodium less than 135 mEq/L (mmol/L)) with chronically abnormal electrolytes are often manageable on an outpatient basis. [SS in Context Link 1]

Definitions

Acute kidney injury (stage 2)

- Acute kidney injury (stage 2) with significant clinical findings, as indicated by **ALL** of the following(1)(2)(3):
  - Acute[A] kidney injury (stage 2), as indicated by **1 or more** of the following[B]:
    - Acute[A] rise in serum creatinine between 2 and 2.9 times its baseline value[C] (increase of 3 times baseline would qualify as stage 3 acute kidney injury)
    - Decreased urine output,[D] as indicated by **ALL** of the following:
      - Assessment of urine output appropriate (eg, adequate volume status, no urinary obstruction)
      - Urine output less than 0.5 mL/kg/hr for 12 hours
  - Significant clinical findings, as indicated by **1 or more** of the following[B]:
    - Hemodynamic instability
    - Worsening clinical status despite observation care (eg, rising creatinine or urine output remains less than 0.5 mL/kg/hr)
    - Altered mental status
    - Cardiac arrhythmias of immediate concern
    - Severe hypertension (SBP greater than 180 mm Hg or DBP greater than 120 mm Hg in adults or greater than the 95th percentile for age, gender, and height plus 30 mm Hg in pediatric patients)(4)(5)
    - Significant respiratory findings (eg, pulmonary edema) that are severe (eg, Hypoxemia) or persist despite observation care
    - Clinically significant electrolyte abnormality that is severe (eg, hyperkalemia with severe ECG findings)[E] or persists despite observation care
    - Clinically significant metabolic abnormality (eg, metabolic acidosis) that is severe or persists despite observation care

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Footnotes

A. A specialty society practice guideline defines acute kidney injury as a change in renal function that is known or presumed to have occurred over the previous 7 days.(1)

B. In determining the stage of acute kidney injury (eg, stage 2 vs stage 3), patients should be staged according to the criteria that give them the highest stage.(1)
C. If the baseline serum creatinine is not known, absent known or suspected chronic kidney disease, a baseline serum creatinine can be approximated by assuming an estimated GFR of 75 mL/min/1.73m^2 (1.25 mL/sec/1.73m^2).(1) eGFR - Adult Calculator eGFR - Pediatric Calculator
D. The use of urine output as an indicator of acute kidney injury is important, as change in urine output can occur before a noticeable rise in creatinine.(1)(3) It is also suggested that urine output can identify patients with acute kidney injury that may otherwise be missed.(1)(3) However, urine output as a metric is only valid under the appropriate conditions. For example, the patient must not be hypovolemic, there must not be urinary obstruction, and the collection and measurement of urinary output must be complete and accurate.(1)(3) Use of urinary output to define acute kidney injury can be inaccurate in obese patients due to the nonlinear relationship between body weight and urine output. For example, in a 100-kg (220-lb) patient, urine output of 45 mL/hr over 12 hours (adequate output) would qualify as stage 2 acute kidney injury.(1)(3)
E. ECG findings include peaked T-waves, PR interval greater than 0.20 seconds, QRS interval greater than 0.12 seconds, and arrhythmia.(6)(7)

Acute renal failure (stage 3 acute kidney injury)

- Acute[A] kidney injury (stage 3),[B] as indicated by **1 or more** of the following[C](1)(2)(3):
  - Acute[A] rise in serum creatinine to 3 times its baseline value[D] or higher
  - Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%) and serum creatinine is greater than 4 mg/dL (354 micromoles/L)
  - In child younger than 18 years, estimated GFR less than 35 mL/min/1.73m^2 (0.58 mL/sec/1.73m^2) eGFR - Pediatric Calculator and **1 or more** of the following:
    - Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%)
    - Within past 48 hours, rise in serum creatinine greater than 0.3 mg/dL (26.5 micromoles/L)
  - Decreased urine output,[E] as indicated by **ALL** of the following:
    - Assessment of urine output appropriate (eg, adequate volume status, no urinary obstruction)
    - Oligoanuria, as indicated by **1 or more** of the following:
      - Urine output less than 0.3 mL/kg/hr for 24 hours
      - Anuria (urine output less than 0.1 mL/kg/hr) for 12 hours
  - Initiation of renal replacement therapy required(4)

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Footnotes

A. A specialty society practice guideline defines acute kidney injury as a change in renal function that is known or presumed to have occurred over the previous 7 days.(1)
B. For purposes of these criteria, the term acute renal failure can be viewed as stage 3 acute kidney injury in the KDIGO classification system.(1) Of note, in the ICD-10 diagnostic coding system (main coding scheme used in labeling diagnoses), the relevant codes covering the clinical entity of significant acute kidney injury use the term acute kidney failure (eg, code N17.9).
C. In determining the stage of acute kidney injury (eg, stage 2 vs stage 3), patients should be staged according to the criteria that give them the highest stage.(1)
D. If the baseline serum creatinine is not known, absent known or suspected chronic kidney disease, a baseline serum creatinine can be approximated by assuming an estimated GFR of 75 mL/min/1.73m^2 (1.25 mL/sec/1.73m^2).(1) eGFR - Adult Calculator eGFR - Pediatric Calculator
E. The use of urine output as an indicator of acute kidney injury is important, as change in urine output can occur before a noticeable rise in creatinine.(1)(3) It is also suggested that urine output can identify patients with acute kidney injury that may otherwise be missed.(1)(3) However, urine output as a metric is only valid under the appropriate conditions. For example, the patient must not be hypovolemic, there must not be urinary obstruction, and the collection and measurement of urinary output must be complete and accurate.(1)(3) Use of urinary output to define acute kidney injury can be inaccurate in obese patients due to the nonlinear relationship between body weight and urine output. For example, in a 100-kg (220-lb) patient, urine output of 45 mL/hr over 12 hours (adequate output) would qualify as stage 2 acute kidney injury.(1)(3)

Altered mental status

- Altered mental status (ie, different from baseline), as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Confusional state (eg, disorientation, difficulty following commands, deficit in attention)
  - Lethargy (eg, awake or arousable, but with drowsiness; reduced awareness of self and environment)
  - Obtundation (ie, arousable only with strong stimuli, lessened interest in environment, slowed responses to stimulation)
  - Stupor (ie, may be arousable but patient does not return to normal baseline level of awareness)
  - Coma (ie, not arousable)

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Altered mental status that is severe or persistent

- Altered mental status (ie, different from baseline) that is severe or persistent, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Confusional state (eg, disorientation, difficulty following commands, deficit in attention) that persists despite appropriate treatment (eg, of underlying cause, despite observation care)
  - Lethargy (eg, awake or arousable, but with drowsiness; reduced awareness of self and environment) that persists despite appropriate treatment (eg, of underlying cause, despite observation care)
  - Obtundation (ie, arousable only with strong stimuli, lessened interest in environment, slowed responses to stimulation)
  - Stupor (ie, may be arousable but patient does not return to normal baseline level of awareness)
  - Coma (ie, not arousable)

References

1. Maher PJ. Confusion. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:126-131.e1.
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Bradycardia

- Bradycardia[A], as indicated by **1 or more** of the following(1)(2)(3):
  - Heart rate less than 50 beats per minute in adult (age 18 years or older)[B]
  - Heart rate less than 55 beats per minute in adolescent 13 to 17 years of age
  - Heart rate less than 60 beats per minute in child or adolescent 6 to 12 years of age
  - Heart rate less than 65 beats per minute in child 3 to 5 years of age
  - Heart rate less than 70 beats per minute in child 1 to 2 years of age
  - Heart rate less than 80 beats per minute in infant 6 to 11 months of age
  - Heart rate less than 90 beats per minute in infant 3 to 5 months of age

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Footnotes

A. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

B. An evidence-based specialty society guideline has defined bradycardia in adults as less than 50 beats per minute.(1)

Cardiac arrhythmias of immediate concern

- Cardiac arrhythmias or findings of immediate concern, as indicated by **1 or more** of the following(1)(2)(3):
  - Heart rhythms that are inherently dangerous or unstable, as indicated by **1 or more** of the following(4)(5)(6):
    - Resuscitated ventricular fibrillation or cardiac arrest
    - Ventricular escape rhythm

- Sustained ventricular tachycardia (30 seconds or more of ventricular rhythm at greater than 100 beats per minute)
- Nonsustained ventricular tachycardia and **1 or more** of the following:
  - Suspected cardiac ischemia as cause or consequence of ventricular tachycardia
  - Acute myocarditis

- Unstable cardiac conduction defects, as indicated by **1 or more** of the following(7)(8):
  - Type II second-degree atrioventricular block
  - Third-degree atrioventricular block
  - New-onset left bundle branch block with suspected myocardial ischemia(9)
- Any heart rhythm and **1 or more** of the following(5)(8)(10)(11)(12)(13):
  - Continuous long-term ECG monitoring needed (eg, initiation of drug requiring monitoring beyond observation care)
  - Patient has automatic implantable cardioverter-defibrillator that is repeatedly firing, malfunctioning, or in need of immediate adjustment of settings beyond scope of observation care.
- Heart rhythms of concern due to **1 or more** of the following(8):
  - Hypotension
  - Respiratory distress
  - Association with other significant symptoms (eg, syncope)(10)(11)

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Dangerous arrhythmia

- Dangerous arrhythmia, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Heart rhythms that are inherently dangerous or unstable, as indicated by **1 or more** of the following(5)(6):
    - Resuscitated ventricular fibrillation or cardiac arrest
    - Ventricular escape rhythm
    - Sustained ventricular tachycardia (30 seconds or more of ventricular rhythm at greater than 100 beats per minute)
    - Nonsustained ventricular tachycardia and **1 or more** of the following:
      - Acute myocarditis
      - Myocardial ischemia
  - Unstable cardiac conduction defects, as indicated by **1 or more** of the following(7):
    - Type II second-degree atrioventricular block
    - Third-degree atrioventricular block
    - New-onset left bundle branch block with suspected myocardial ischemia
  - Heart rhythms of concern due to **1 or more** of the following(8):
    - Hypotension
    - Respiratory distress
    - Association with other significant symptoms (eg, syncope)(7)(9)(10)(11)

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1. Curtis AB, Tomaselli GF. Approach to the patient with cardiac arrhythmias. In: Libby P, Bonow RO, Mann DL, Tomaselli GF, Bhatt DL, Solomon SD, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 12th ed. Elsevier; 2022:1145-1162.e7.
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Dangerous arrhythmia absent

- Dangerous arrhythmia absent, as indicated by absence of **ALL** of the following(1)(2)(3)(4)(5)(6)(7)(8)(9)(10):
  - Resuscitated ventricular fibrillation or cardiac arrest
  - Ventricular escape rhythm
  - Sustained ventricular tachycardia (30 seconds or more of ventricular rhythm at greater than 100 beats per minute)
  - Nonsustained ventricular tachycardia with myocarditis or ischemia
  - Type II second-degree atrioventricular block
  - Third-degree atrioventricular block
  - New-onset left bundle branch block with suspected myocardial ischemia
  - Heart rhythms of concern due to association with Hypotension, Respiratory distress, or other significant symptoms (eg, syncope)

References

1. Curtis AB, Tomaselli GF. Approach to the patient with cardiac arrhythmias. In: Libby P, Bonow RO, Mann DL, Tomaselli GF, Bhatt DL, Solomon SD, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 12th ed. Elsevier; 2022:1145-1162.e7.
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Hemodynamic instability

- Hemodynamic instability, as indicated by **1 or more** of the following:

- Vital sign abnormality not corrected by appropriate treatment, as indicated by **1 or more** of the following[A]:
  - Tachycardia that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
  - Hypotension that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
  - Orthostatic hypotension that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
- Severe hypotension in adult patient, as indicated by **1 or more** of the following:
  - Systolic blood pressure less than 80 mm Hg(1)[A]
  - Shock index greater than 1.0 (shock index is the heart rate divided by systolic blood pressure)[A](2)(3)(4)
  - Mean arterial pressure[B] less than 65 mm Hg MAP Calculator[A](1)(6)
  - IV inotropic or vasopressor medication required to maintain adequate blood pressure or perfusion(3)(6)
  - Hypoperfusion due to hypotension, as indicated by **ALL** of the following:
    - Hypotension
    - Evidence of hypoperfusion, as indicated by **1 or more** of the following:
      - Lactate of 2.0 mmol/L (18 mg/dL) or more secondary to hypotension (ie, hypoperfusion)[C](3)(6)(8)
      - Metabolic acidosis (arterial or venous[D] pH less than 7.35) not otherwise explained(3)(6)(8)
      - Significant end organ dysfunction due to hypotension (eg, Altered mental status, myocardial ischemia, 2-fold or higher acute increase in serum creatinine)(3)(6)
- Severe hypotension in pediatric patient, as indicated by **1 or more** of the following:
  - Systolic blood pressure less than 80 mm Hg in child 6 to 17 years of age[A](14)
  - Systolic blood pressure less than 75 mm Hg in child 6 months to 5 years of age[A](14)
  - Shock index greater than 0.9 in child 13 to 17 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
  - Shock index greater than 1.0 in child 7 to 12 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
  - Shock index greater than 1.2 in child 4 to 6 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
  - IV inotropic or vasopressor medication required to maintain adequate blood pressure or perfusion(5)(6)
  - Hypoperfusion due to hypotension, as indicated by **ALL** of the following:
    - Hypotension
    - Evidence of hypoperfusion, as indicated by **1 or more** of the following:
      - Lactate of 2.0 mmol/L (18 mg/dL) or more secondary to hypotension (ie, hypoperfusion)[C](6)(8)
      - Metabolic acidosis (arterial or venous pH less than 7.35) not otherwise explained[D](5)(6)(14)
      - Significant end organ dysfunction due to hypotension (eg, Altered mental status, myocardial ischemia, 2-fold or higher acute increase in serum creatinine)(5)(6)(14)

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Footnotes

A. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.
B. The mean arterial pressure (MAP) takes into account both SBP and DBP readings.(3)(5)
C. There are numerous causes of an elevated lactate level. The most common are cardiogenic or hypovolemic shock, severe heart failure, severe trauma, or sepsis. However, there are also other etiologies to consider such as vigorous exercise, seizures, liver disease, or medication use (eg, metformin, beta2-agonists); therefore, interpretation of elevated lactate levels requires consideration of the clinical context (eg, well-appearing post exercise vs hypotensive). The severity and persistence of the elevation can sometimes be helpful in this differentiation. In most instances of lactic acidosis, blood pH is less than 7.35, with a serum bicarbonate level of 20 mEq/L (mmol/L) or lower. However, a coexisting respiratory or metabolic alkalosis can mask these findings.(7)(8)
D. Analyses have concluded that venous and arterial pH measurements are highly correlated, with small differences between them that are usually not clinically significant.(9)(10)(11)(12)(13) If a mixed acid-base disorder is suspected, an arterial blood gas is indicated.(10)

Hemodynamic stability

- Hemodynamic stability, as indicated by **1 or more** of the following:
  - Hemodynamic abnormalities at baseline or acceptable for next level of care
  - Patient hemodynamically stable, as indicated by **ALL** of the following(1)(2):
    - Tachycardia absent
    - Hypotension absent
    - No evidence of inadequate perfusion (eg, no myocardial ischemia)
    - No other hemodynamic abnormalities (eg, no Orthostatic hypotension)

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Hypotension

- Hypotension, as indicated by **1 or more** of the following:
  - Hypotension in adult patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure less than 90 mm Hg[A][B](1)
    - Mean arterial pressure[C] less than 70 mm Hg[A][B] MAP Calculator(1)(2)
    - Decrease in baseline systolic blood pressure of 30 mm Hg or more, with significant signs or symptoms due to lower blood pressure (eg, near syncope, syncope, chest pain)[A][B](1)
  - Hypotension in pediatric patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure less than 110 mm Hg in child 13 to 17 years of age[A][D](3)
    - Systolic blood pressure less than 100 mm Hg in child 6 to 12 years of age[A][D](3)
    - Systolic blood pressure less than 95 mm Hg in child 3 to 5 years of age[A][D](3)
    - Systolic blood pressure less than 90 mm Hg in child 1 or 2 years of age[A][D](3)
    - Systolic blood pressure less than 80 mm Hg in infant 6 to 11 months of age[A][D](3)
    - Systolic blood pressure less than 70 mm Hg in infant 3 to 5 months of age[A][D](3)
    - Systolic blood pressure less than 65 mm Hg in infant 1 or 2 months of age[A][D](3)

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2. Puskarich MA, Jones AE. Shock. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:34-41.e1.
3. Anderson CC, Kapoor S, Mark TE. Pediatric parameters and equipment. In: Anderson CC, Kapoor S, Mark TE, editors. The Harriet Lane Handbook: A Manual for Pediatric House Officers. 23rd ed. Elsevier; 2024:i-iii.

Footnotes

A. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

B. Interpretation of blood pressure requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline blood pressure, medications, and clinical impact. For example, an elderly patient with heart failure may be prescribed medication with the intentional goal of a reduced pressure. If the patient's baseline SBP is 92 mm Hg to 96 mm Hg, absent signs or symptoms of hypotension, an emergency department SBP of 86 mm Hg should not automatically be categorized as hypotensive. This would hold for mean arterial pressure (MAP) as well. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term hypotension. Whether a blood pressure below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

C. The mean arterial pressure (MAP) takes into account both SBP and DBP readings.

D. Interpretation of blood pressure requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline blood pressure, medications, and clinical impact. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term hypotension. Whether a blood pressure below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Hypotension absent

- Hypotension absent,[A] as indicated by **1 or more** of the following:
  - Hypotension absent in adult patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure greater than or equal to 90 mm Hg[A](1)
    - Mean arterial pressure[B] greater than or equal to 70 mm Hg MAP Calculator[A](1)(2)
    - Blood pressure at patient's baseline (eg, healthy adult with low systolic blood pressure), at intentional therapeutic goal (eg, patient with heart failure), or acceptable for next level of care (eg, blood pressure stable and no significant signs or symptoms due to low blood pressure)
  - Hypotension absent in pediatric patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure greater than or equal to 110 mm Hg in child 13 to 17 years of age[A](3)
    - Systolic blood pressure greater than or equal to 100 mm Hg in child 6 to 12 years of age[A](3)
    - Systolic blood pressure greater than or equal to 95 mm Hg in child 3 to 5 years of age[A](3)
    - Systolic blood pressure greater than or equal to 90 mm Hg in child 1 or 2 years of age[A](3)
    - Systolic blood pressure greater than or equal to 80 mm Hg in infant 6 to 11 months of age[A](3)
    - Systolic blood pressure greater than or equal to 70 mm Hg in infant 3 to 5 months of age[A](3)
    - Systolic blood pressure greater than or equal to 65 mm Hg in infant 1 or 2 months of age[A](3)
    - Blood pressure at patient's baseline (eg, healthy child with low systolic blood pressure), at intentional therapeutic goal, or acceptable for next level of care (eg, blood pressure stable and no significant signs or symptoms due to low blood pressure)

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Puskarich MA, Jones AE. Shock. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:34-41.e1.
3. Anderson CC, Kapoor S, Mark TE. Pediatric parameters and equipment. In: Anderson CC, Kapoor S, Mark TE, editors. The Harriet Lane Handbook: A Manual for Pediatric House Officers. 23rd ed. Elsevier; 2024:i-iii.

Footnotes

A. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.
B. The mean arterial pressure (MAP) takes into account both SBP and DBP readings.

Hypothermia

- Hypothermia indicated by core (eg, rectal) body temperature less than or equal to 95 degrees F (35 degrees C)(1)

References

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Hypoxemia

- Hypoxemia, as indicated by **1 or more** of the following(1):
  - Patient without baseline need for supplemental oxygen with oxygen saturation (SpO_2) of less than 90% or arterial blood gas partial pressure of oxygen (PaO_2) of less than 60 mm Hg (8.0 kPa) on room air[A][B]
  - Patient without baseline need for supplemental oxygen who now requires supplemental oxygen to keep SpO_2 greater than 89% or PaO_2 greater than 59 mm Hg (7.9 kPa)[A]
  - Patient with baseline need for supplemental oxygen who now requires increased supplemental oxygen to maintain oxygenation at baseline or acceptable level

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Footnotes

A. Pulse oximetry (SpO_2) may underestimate arterial saturation (SaO_2), especially in people with dark skin pigmentation, thick skin, cold body temperature, or who are wearing colored nail polish, and thus may not accurately detect hypoxemia.(2) Where appropriate, pulse oximetry should be measured after warming fingers or removing nail polish. Pulse oximetry results should be assessed within the context of the patient's clinical presentation, and performance of an arterial blood gas considered for a more accurate assessment of oxygenation if indicated.(2) Specific target values may require adjustment when care is delivered at high altitude.(3)

B. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

Hypoxemia absent

- Hypoxemia absent, as indicated by **1 or more** of the following(1):
  - Arterial oxygen saturation (SpO_2) of 90% or greater or arterial partial pressure of oxygen (PaO_2) of 60 mm Hg (8.0 kPa) or greater on room air[A][B]
  - Oxygen requirements are stable and arranged for at next level of care.

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Rojas-Camayo J, et al. Reference values for oxygen saturation from sea level to the highest human habitation in the Andes in acclimatised persons. Thorax 2018;73(8):776-778. DOI: 10.1136/thoraxjnl-2017-210598.

Footnotes

A. Specific target values (ie, 90% or 60 mm Hg (8.0 kPa)) may require adjustment when care is delivered at high altitude.(2)

B. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

Inferior vena cava filter placement appropriate

- Vena cava filter placement appropriate, as indicated by **1 or more** of the following[A][B](1)(3)(4)(5)(6)(7)(12):
  - Recurrence or progression of venous thromboembolism[C] while anticoagulated, as indicated by **ALL** of the following:
    - Confirmation of recurrence or progression while fully anticoagulated (eg, patient adherent, correct dosage)
    - Recurrence or progression occurred while being treated with low-molecular-weight heparin, or low-molecular-weight heparin is contraindicated (eg, heparin-induced thrombocytopenia, allergy to heparin).
    - Recurrence or progression occurred after treatment with increased dose of low-molecular-weight heparin (25% to 33% above usual dose), low-molecular-weight heparin is contraindicated (eg, heparin-induced thrombocytopenia, allergy to heparin), or risk of bleeding is too high to increase dose.
  - Venous thromboembolism and contraindication to anticoagulation, as indicated by **1 or more** of the following(2)(16)(17):
    - Active uncontrolled bleeding(16)(17)
    - Major bleeding diathesis (eg, coagulopathy, severe thrombocytopenia)(16)(17)
    - History of active bleeding while anticoagulated necessitating discontinuation of anticoagulant
    - Recent or planned surgery that increases risk of catastrophic bleeding (eg, neurosurgery, eye surgery)(16)(17)
    - Recent significant GI bleeding with high risk of recurrence (eg, esophageal varices, active peptic ulcer)(16)
    - Cerebral lesion at high risk of bleeding (eg, vascular malformation, recent large ischemic stroke, tumor)(17)
    - Intraspinal tumor(16)
    - History of intracranial bleeding (eg, hemorrhagic stroke)(16)(17)
    - Aortic dissection(16)(17)
    - Pericardial disease(17)
    - Endocarditis(17)
    - Threatened abortion(17)
    - Malignant hypertension, eclampsia, or preeclampsia that is not rapidly controlled(17)
    - Recent major trauma that increases risk of catastrophic bleeding (eg, liver or splenic laceration)
  - Acute pulmonary embolism and very poor cardiopulmonary reserve (eg, pulmonary hypertension), or massive pulmonary embolism[D](3)

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1. Stevens SM, et al. Antithrombotic therapy for VTE disease: second update of the CHEST guideline and expert panel report. Chest 2021;160(6):e545-e608. DOI: 10.1016/j.chest.2021.07.055. (Reaffirmed 2025 Jan)
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Footnotes

A. There is limited and inconsistent evidence that inferior vena cava (IVC) filter placement is beneficial.(1)(2)(3)(4)(5)(6)(7) In general, employment of an IVC filter is justified for venous thromboembolism when there are absolute contraindications to anticoagulation, or venous thromboembolism recurs or progresses despite full, adequate anticoagulation with low-molecular-weight heparin.(1)(2)(3)(4)(5)(6)(7)(8) Filter use in other contexts, such as for primary prophylaxis or thrombus characteristics (eg, size, location, morphology), is unproven and not recommended by evidence-based guidelines, editorials, or reviews.(1)(3)(4)(5)(8)(9)(10)(11) An evidence-based guideline suggests anticoagulation alone and recommends against filter placement for patients with acute pulmonary embolism and hemodynamic compromise.(2) A systematic review and meta-analysis including 11 studies (6 randomized controlled trials, 5 prospective observational studies, 4204 patients) that examined the utility of IVC filter placement found that patients receiving filters had a lower risk for subsequent pulmonary embolism (1.9% vs 4.6%) and a higher risk of deep venous thrombosis (4.7% vs 2.7%), with no difference in pulmonary embolism mortality or overall mortality.(12) The authors concluded that the evidence base is limited and that, pending further evidence, use of IVC filters be directed to those with current guideline-recommended indications (ie, contraindications to anticoagulation, recurrence despite anticoagulation).(12) Considering the known potential adverse consequences of filter use

(eg, increased rate of subsequent deep venous thrombosis, venous insufficiency, thrombus formation on filter, vessel or organ perforation, device migration or embolization(13)(14)) and the uncertainty of benefit in most contexts, whenever possible, a retrievable filter should be used (eg, patient with time-limited contraindications to anticoagulation), with arrangements made for retrieval when the contraindication to anticoagulation is no longer present.(1)(2)(3)(4)(5)(7)(8) Temporary (as opposed to retrievable) filters are tethered to a femorally placed central venous catheter; they can be placed if the contraindication to anticoagulation is expected to be brief and then removed when the catheter is pulled without requiring interventional radiology guidance.(5) Newer filter technologies with novel materials are also available that can spontaneously bioconvert filters to an open (nonfiltering) IVC stent configuration, or to completely absorb over a 32-week period for patients in whom the risk for venous thromboembolism or contraindication to anticoagulation is anticipated to be temporary.(5)

B. Several of the contraindications to anticoagulation require clinical judgment and patient-specific assessment of risk, as precise terms and quantification are not agreed upon or established (eg, what is meant by recent surgery or GI bleed).(1)(3)(4)(5) Filters cannot be placed in children weighing less than 22 lb (10 kg).(8)

C. True recurrence or progression while fully anticoagulated is unusual. Insufficient anticoagulation (eg, nonadherence or subtherapeutic heparin or warfarin dosing) is more common. If adherence is assured, an evidence-based specialty society guideline suggests that, prior to consideration of an inferior vena cava (IVC) filter, patients being treated with other than low-molecular-weight heparin be switched to low-molecular-weight heparin, at least temporarily. If already on low-molecular-weight heparin, an increase in dose by 25% to 33% is suggested.(1) For patients who have cancer and recurrent venous thromboembolism, a specialty society guideline suggests either continuing therapeutic low-molecular-weight heparin or increasing dosing to supratherapeutic levels, and recommends against placement of an IVC filter based on low-certainty evidence suggesting lack of benefit and potential harm.(15)

D. A precise definition of very poor cardiopulmonary reserve is not agreed upon. A proposed definition of massive pulmonary embolism is acute pulmonary embolism with sustained hypotension (SBP less than 90 mm Hg for at least 15 minutes or requiring inotropic support, and not due to a cause other than pulmonary embolism (eg, arrhythmia, hypovolemia, sepsis, or left ventricular dysfunction)).(3) This is an area of controversy, with one evidence-based specialty society guideline suggesting against filter placement for patients with acute pulmonary embolism and hemodynamic compromise due to questionable efficacy and the potential of harm from the procedure.(2)

Inpatient anticoagulation needed

- Contraindication to outpatient use of medication with rapid anticoagulation effect (eg, IV unfractionated heparin and warfarin indicated),[A] as indicated by **ALL** of the following(1)(2)(4)(5):
  - Contraindication to use of low-molecular-weight heparin, as indicated by **1 or more** of the following:
    - Current or history of heparin-induced thrombocytopenia
    - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 $x10^9$/L))
    - Allergy to heparin, low-molecular-weight heparin, or product components
    - Need for neuraxial anesthesia or spinal puncture anticipated
    - Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)
  - Contraindication to use of fondaparinux, as indicated by **1 or more** of the following:
    - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 $x10^9$/L))
    - Allergy to fondaparinux, related drugs, or product components
    - Renal failure (creatinine clearance less than 30 mL/min/1.73m^2 (0.50 mL/sec/1.73m^2) or on dialysis) eGFR - Adult Calculator eGFR - Pediatric Calculator
    - Pregnancy(4)
    - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)
    - Mechanical heart valve
    - Need for neuraxial anesthesia or spinal puncture anticipated
    - Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)

- BMI greater than or equal to 50[B]

- Contraindication to use of oral direct thrombin inhibitor (eg, dabigatran) or oral factor Xa inhibitor (eg, apixaban, edoxaban, rivaroxaban), as indicated by **1 or more** of the following[C][D](11):
  - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 x10^9/L))
  - Allergy to medication or product components
  - Pregnancy or breast-feeding[D](4)(11)
  - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)(12)
  - Renal failure (creatinine clearance less than 15 mL/min/1.73m^2 (0.25 mL/sec/1.73m^2) or on dialysis)[D](11) eGFR - Adult Calculator eGFR - Pediatric Calculator
  - Mechanical heart valve[D](11)(13)
  - Atrial fibrillation with rheumatic mitral stenosis[D](11)
  - Thrombotic antiphospholipid syndrome[D](11)
  - Left ventricular thrombus[D](11)
  - Catheter-associated deep venous thrombosis[D](11)
  - Cerebral venous sinus thrombosis[D](11)
  - Need for neuraxial anesthesia or spinal puncture anticipated
  - BMI greater than or equal to 50[B]

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1. Stevens SM, et al. Antithrombotic therapy for VTE disease: second update of the CHEST guideline and expert panel report. Chest 2021;160(6):e545-e608. DOI: 10.1016/j.chest.2021.07.055. (Reaffirmed 2025 Jan)
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Footnotes

A. Patients using low-molecular-weight heparin, fondaparinux, an oral direct thrombin inhibitor, or an oral factor Xa inhibitor achieve full anticoagulation rapidly (eg, a few hours after first dose).(1)(2)(3)
B. The clinical utility of factor Xa inhibitors or direct thrombin inhibitors in patients with a BMI greater than or equal to 50 is unclear, due to a relative paucity of data in these patients.(6)(7)(8) While some do advocate the use of factor Xa inhibitors or direct thrombin inhibitors in this patient group, others suggest that absent clear evidence of efficacy, it is preferable to use heparin (low-molecular-weight or unfractionated) transitioning to warfarin because of the long established ability to carefully adjust dosage based on measurement of anticoagulant effect (eg, via measurement of anti-factor Xa level, prothrombin/INR).(6)(7)(8)
C. With caution and dose adjustment, apixaban can be administered to patients with stage 5 renal failure (creatinine clearance less than 15 mL/min/1.73m^2 (0.25 mL/sec/1.73m^2)) or who are receiving hemodialysis.(5)(9)(10) Rivaroxaban and edoxaban are not recommended for patients with stage 5 or hemodialysis-dependent renal failure.
D. A systematic review of relevant randomized controlled trials concludes that direct oral anticoagulants (ie, oral factor Xa and oral thrombin inhibitors) should not be standard treatment for patients with mechanical heart valves, atrial fibrillation with rheumatic mitral stenosis, or thrombotic antiphospholipid syndrome.(11) For these indications, use of a vitamin K antagonist (eg, warfarin) is preferred.(11) The review further concludes that the efficacy and safety of direct oral anticoagulants is uncertain in patients with left ventricular thrombus, catheter-associated deep venous thrombosis, or cerebral venous sinus thrombosis.(11) Concerning patients with end-stage renal disease, the review states that the choice of an anticoagulant should be individualized due to the lack of definitive data, balancing the pros and cons of a direct oral anticoagulant and vitamin K antagonist-based anticoagulation.(11) Patients who are pregnant or breast-feeding should avoid direct oral anticoagulants pending further study concerning safety.(11)

Orthostatic hypotension

- Orthostatic hypotension,[A][B] as indicated by **1 or more** of the following(1)(2)(3):
  - Fall in SBP of 20 mm Hg or more 1 to 3 minutes after patient sits or stands from recumbent position
  - Fall in DBP of 10 mm Hg or more 1 to 3 minutes after patient sits or stands from recumbent position

References

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Footnotes

A. Concomitant measurements of the heart rate are important to measure to help diagnose subtypes of orthostatic hypotension (eg, the lack of a compensatory increase in heart rate is typical of autonomic failure and an exaggerated tachycardia may be reflective of volume depletion). However, the heart rate is not a component of the definition of orthostatic hypotension, which relies upon blood pressure alone.(1)(2)(3)

B. Criteria based upon clinician acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

Patient at high risk for bleeding complications upon initiation of anticoagulation

- Patient at high risk for acute complications (eg, hemorrhage) upon initiation of anticoagulation, as indicated by **1 or more** of the following(1)(2):
  - Gastrointestinal bleeding within preceding 14 days(1)
  - Major surgery (eg, intra-abdominal, intrathoracic, CNS, vascular, orthopedic) within preceding 14 days(1)
  - Stroke (hemorrhagic or ischemic) within preceding 4 weeks(1)
  - Bleeding disorder not readily reversible (eg, coagulopathy from liver disease)(1)(3)
  - Thrombocytopenia (platelet count less than 75,000/mm^3 (75 x10^9/L))(1)
  - Uncontrolled hypertension (eg, systolic blood pressure greater than 180 mm Hg or diastolic blood pressure greater than 110 mm Hg)(1)
  - Intracranial or intraspinal tumor(2)
  - Aortic dissection(2)
  - Known increased risk of gastrointestinal bleed (eg, esophageal varices, current ulcer)(3)
  - Personal or family history of significant bleeding or allergic, autoimmune (thrombocytopenia), or coagulopathic reaction in response to anticoagulation
  - Personal or family history of significant bleeding tendency or bleeding disorder(1)
  - Recent or ongoing blood loss (not due to anticoagulation) at time of initiation of anticoagulation (eg, need to anticoagulate despite blood loss)(2)
  - Other risk factor thought to place patient at high risk such that ability to rapidly reverse anticoagulation is necessary (eg, discontinue parenteral unfractionated heparin, use of reversal agent)

References

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Respiratory distress

- Respiratory distress, as indicated by **ALL** of the following(1)(2)(3)(4):
  - Patient with **1 or more** of the following:
    - Dyspnea (difficulty breathing)
    - Tachypnea
    - Abnormal breathing pattern (eg, chest retractions)

- Other evidence of difficulty breathing
- Evidence of respiratory compromise, as indicated by **1 or more** of the following:
  - Hypoxemia
  - Altered mental status
  - Other evidence of respiratory compromise (eg, respiratory acidosis)

References

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Severe pain requiring acute inpatient management

- Severe pain requiring inpatient management, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Inpatient parenteral analgesic agent treatment required,[A] as indicated by **ALL** of the following:
    - Pain insufficiently responsive to nonpharmacologic and oral pharmacologic analgesia (eg, NSAID, oral opioid)
    - Need for parenteral treatment persists despite observation care (eg, adjustments in dosage, frequency, medication, route).
  - Pain control regimen for next level of care not established, as indicated by **ALL** of the following:
    - Regimen used to achieve sufficient pain control is not readily performable at next level of care.
    - Unable to convert patient to regimen performable at next level of care despite observation care (eg, adjustments in dosage, frequency, medication, route)
  - Suspected new or deteriorating disease process as etiology (eg, new site of metastatic disease) requiring inpatient evaluation and treatment (eg, urgent radiation therapy)(7)
  - Palliative procedure planned that necessitates inpatient care for assessment and monitoring needs (eg, celiac block, stent to relieve obstruction)

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Footnotes

A. Many validated instruments are available to quantify pain.(4)(5) A visual analog or numerical rating scale graded from 0 to 10 is often used; moderate pain correlates with a score of 4 to 6 and severe pain is 7 to 10.(4) Different scales may be more appropriate for different disease processes or patient populations.(5)(6)

Tachycardia

- Tachycardia,[A][B] as indicated by **1 or more** of the following:
  - Heart rate greater than 100 beats per minute in adult[A][B](1)
  - Heart rate greater than 85 beats per minute in child 13 to 17 years of age[A][C](2)
  - Heart rate greater than 95 beats per minute in child 6 to 12 years of age[A][C](2)
  - Heart rate greater than 110 beats per minute in child 1 to 5 years of age[A][C](2)
  - Heart rate greater than 120 beats per minute in infant 3 to 11 months of age[A][C](2)
  - Heart rate greater than 150 beats per minute in infant 1 or 2 months of age[A][C](2)

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Anderson CC, Kapoor S, Mark TE. Pediatric parameters and equipment. In: Anderson CC, Kapoor S, Mark TE, editors. The Harriet Lane Handbook: A Manual for Pediatric House Officers. 23rd ed. Elsevier; 2024:i-iii.

Footnotes

A. Criteria based upon clinician acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

B. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. For example, an elderly patient on a beta-blocker medication with a baseline resting heart rate of 60 beats per minute may be clinically tachycardic at a heart rate of 94 beats per minute. Likewise, a patient who is upset, in pain, or nervous in the emergency department with a heart rate of 106 beats per minute may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as chest pain or hypotension) may not be clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

C. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. A patient who is upset, in pain, or nervous in the emergency department with an elevated heart rate may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as hypotension) may not be clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Tachycardia absent

- Tachycardia[A][B] absent, as indicated by **1 or more** of the following:
  - Heart rate less than or equal to 100 beats per minute in adult[A][B](1)
  - Heart rate less than or equal to 85 beats per minute in child 13 to 17 years of age[A][B](2)
  - Heart rate less than or equal to 95 beats per minute in child 6 to 12 years of age[A][B](2)
  - Heart rate less than or equal to 110 beats per minute in child 1 to 5 years of age[A][B](2)
  - Heart rate less than or equal to 120 beats per minute in infant 3 to 11 months of age[A][B](2)
  - Heart rate less than or equal to 150 beats per minute in infant 1 or 2 months of age[A][B](2)

References

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Tachypnea

- Tachypnea,[A][B] as indicated by **1 or more** of the following:
  - Respiratory rate greater than 20 breaths per minute in adult[A][B](1)
  - Respiratory rate greater than 18 breaths per minute in child 13 to 17 years of age[A][B](2)
  - Respiratory rate greater than 22 breaths per minute in child 6 to 12 years of age[A][B](2)
  - Respiratory rate greater than 25 breaths per minute in child 3 to 5 years of age[A][B](2)
  - Respiratory rate greater than 30 breaths per minute in child 1 or 2 years of age[A][B](2)
  - Respiratory rate greater than 40 breaths per minute in infant 6 to 11 months of age[A][B](2)
  - Respiratory rate greater than 45 breaths per minute in infant 3 to 5 months of age[A][B](2)
  - Respiratory rate greater than 55 breaths per minute in infant 1 or 2 months of age[A][B](2)

References

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B. Interpretation of respiratory rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline respiratory rate and whether the respiratory rate is indicative of significant underlying respiratory or other pathology. A mildly increased respiratory rate (eg, 20 to 22 breaths per minute in an adult), absent other indications of serious illness (eg, hypoxemia, metabolic acidosis, decreased tidal volume, pain), may be transitory and not clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachypnea. Whether a respiratory rate above the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment. In addition, the measurement of the respiratory rate is subject to error. A medical textbook states that because there can be significant breath-to-breath variation in respiratory rate, the rate should be assessed for at least 30 seconds, preferably for a full minute.(1) This same textbook also states that new technologies designed to measure the respiratory rate have not proved to be clinically useful.(1)

Tachypnea absent

- Tachypnea[A][B] absent, as indicated by **1 or more** of the following:
  - Respiratory rate less than or equal to 20 breaths per minute in adult[A][B](1)
  - Respiratory rate less than or equal to 18 breaths per minute in child 13 to 17 years of age[A][B](2)
  - Respiratory rate less than or equal to 22 breaths per minute in child 6 to 12 years of age[A][B](2)
  - Respiratory rate less than or equal to 25 breaths per minute in child 3 to 5 years of age[A][B](2)
  - Respiratory rate less than or equal to 30 breaths per minute in child 1 or 2 years of age[A][B](2)
  - Respiratory rate less than or equal to 40 breaths per minute in infant 6 to 11 months of age[A][B](2)
  - Respiratory rate less than or equal to 45 breaths per minute in infant 3 to 5 months of age[A][B](2)
  - Respiratory rate less than or equal to 55 breaths per minute in infant 1 or 2 months of age[A][B](2)

References

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Vital sign abnormality

- Vital sign abnormality, as indicated by **ALL** of the following(1)(2):
  - Vital sign findings not as expected for chronic patient condition or baseline (eg, intentionally low blood pressure in heart failure)
  - Vital sign abnormality, as indicated by **1 or more** of the following:
    - Tachycardia
    - Hypotension
    - Orthostatic hypotension

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Anderson CC, Kapoor S, Mark TE. Pediatric parameters and equipment. In: Anderson CC, Kapoor S, Mark TE, editors. The Harriet Lane Handbook: A Manual for Pediatric House Officers. 23rd ed. Elsevier; 2024:i-iii.

Codes

ICD-10 Diagnosis: I26.01, I26.02, I26.03, I26.04, I26.09, I26.90, I26.92, I26.93, I26.94, I26.99, I27.82, O03.7, O08.2, O88.211, O88.212, O88.213, O88.219, O88.22, O88.23 [Hide]

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