Cardioverter-Defibrillator Insertion RRG

RRG: M-157-RRG (ISC)
Link to Codes

MCG Health
Inpatient & Surgical Care
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Clinical Indications for Procedure and Care

- Insertion of implantable cardioverter-defibrillator (ICD) with possible electrophysiologic study is indicated for **ALL** of the following:
  - Patient has cardiac condition that requires ICD placement, as indicated by **1 or more** of the following:
    - Cardiac arrest due to ventricular fibrillation or ventricular tachycardia without known treatable precipitating cause (eg, myocardial ischemia, electrolyte disorder)
    - Sustained (lasting 30 seconds or longer) ventricular tachycardia and left ventricular ejection fraction less than or equal to 35%
    - Child with sustained ventricular tachycardia inadequately controlled with medication or catheter ablation, and with no evidence of incessant ventricular tachyarrhythmias[A]
  - Patient within 48 hours of a myocardial infarction and **1 or more** of the following:
    - Cardiac arrest followed by total revascularization and **ALL** of the following:
      - Single or recurrent episode of ventricular fibrillation, polymorphic ventricular tachycardia, or sustained (30 seconds or greater) monomorphic ventricular tachycardia
      - Left ventricular ejection fraction 35% or less
    - Nonobstructive coronary artery disease (no revascularization indicated) and **1 or more** of the following:
      - Single episode of ventricular fibrillation or polymorphic ventricular tachycardia and left ventricular ejection fraction 35% or less
      - Recurrent episodes of ventricular fibrillation or polymorphic ventricular tachycardia and left ventricular ejection fraction 49% or less
    - Ventricular fibrillation or polymorphic ventricular tachycardia and obstructive coronary artery disease not amenable to revascularization
  - Patient within 40 days of MI and **1 or more** of the following:
    - Sustained (lasting more than 30 seconds) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia not believed to be due to reversible etiology (eg, myocardial ischemia, electrolyte abnormality)

- Syncope presumed to be due to ventricular arrhythmia[C] and inducible sustained (lasting 30 seconds or more) ventricular tachycardia

− New York Heart Association (NYHA) class I heart failure and **ALL** of the following:
  - Left ventricular ejection fraction less than or equal to 30%
  - Recovery of left ventricular function not expected
  - Patient having permanent pacemaker placed

− NYHA class II or III heart failure and **ALL** of the following:
  - Left ventricular ejection fraction less than or equal to 35%
  - Recovery of left ventricular function not expected
  - Patient having permanent pacemaker placed

− NYHA class IV heart failure and **ALL** of the following:
  - Patient is ambulatory (not bed bound).
  - Patient is a candidate for cardiac transplant, left ventricular assist device, or cardiac resynchronization therapy.

− Pre-existing cardiomyopathy (more than 30 days prior to myocardial infarction) and **1 or more** of the following:
  - Left ventricular ejection fraction 30% or less due to old infarction with NYHA class I heart failure
  - Left ventricular ejection fraction 35% or less due to old infarction with NYHA class II or III heart failure
  - Left ventricular ejection fraction 35% or less due to nonischemic cardiomyopathy with NYHA class II or III heart failure

- Left ventricular ejection fraction 40% or less and **1 or more** of the following:
  - Indication for permanent pacemaker (eg, complete heart block, sick sinus syndrome)
  - Nonsustained ventricular tachycardia[D] and **ALL** of the following:
    - Ventricular tachycardia occurs 4 or more days post myocardial infarction.
    - Inducible sustained ventricular tachycardia following revascularization
- Left ventricular ejection fraction less than 30% and **ALL** of the following:
  - Coronary artery obstruction not amenable to revascularization
  - Nonsustained ventricular tachycardia occurring 4 or more days post myocardial infarction

− Patient with history of MI more than 40 days ago and revascularized (bypass surgery or percutaneous intervention) within last 90 days, and **1 or more** of the following:

- Sustained (lasting 30 seconds or more) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia not believed to be due to reversible etiology (eg, myocardial ischemia, severe electrolyte abnormality)
- Syncope presumed to be due to ventricular arrhythmia[C] and inducible sustained (lasting 30 seconds or more) ventricular tachycardia
- Patient requires permanent pacemaker and **ALL** of the following:
  - Left ventricular ejection fraction less than or equal to 40%
  - Recovery of left ventricular ejection fraction not expected
- Left ventricular ejection fraction 35% or less and **1 or more** of the following:
  - Pre-existing cardiomyopathy on guideline-directed medical therapy for 3 or more months prior to revascularization
  - No known pre-existing cardiomyopathy
- Left ventricular ejection fraction less than 40% and inducible sustained ventricular tachycardia

− Patient with history of MI more than 40 days ago, not revascularized in last 90 days, and **1 or more** of the following:

- Sustained (lasting 30 seconds or more) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia not believed to be due to reversible etiology (eg, myocardial ischemia, severe electrolyte abnormality)
- Episode of polymorphic ventricular tachycardia
- Episode of ventricular fibrillation
- Syncope presumed to be due to ventricular arrhythmia[C] and inducible sustained (lasting 30 seconds or more) ventricular tachycardia

- Syncope presumed to be due to ventricular arrhythmia[C] and left ventricular ejection fraction less than 50%
- Exercise testing-induced ventricular tachycardia that is sustained (30 seconds or greater), polymorphic, or hemodynamically significant[B]
- Exercise testing-induced ventricular fibrillation
- NYHA class I, II, or III heart failure with left ventricular ejection fraction 35% or less
- Left ventricular ejection fraction 36% to 40% and **ALL** of the following:
  - Nonsustained[D] ventricular tachycardia
  - Implantable cardioverter-defibrillator appropriate, as indicated by **1 or more** of the following:
    - Inducible sustained ventricular tachycardia
    - NYHA class II or III heart failure
    - NYHA class I heart failure and electrophysiologic study not performed (eg, contraindicated, refused)
- Left ventricular ejection fraction less than or equal to 40% and patient having permanent pacemaker placed

− Ischemic cardiomyopathy[E] (known coronary artery disease) and **1 or more** of the following:

- Sustained (lasting 30 seconds or more) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia not believed to be due to reversible etiology (eg, myocardial ischemia, severe electrolyte abnormality)
- Polymorphic ventricular tachycardia
- Ventricular fibrillation
- Syncope presumed to be due to ventricular arrhythmia[C] and inducible sustained (lasting 30 seconds or more) ventricular tachycardia
- Exercise testing-induced ventricular tachycardia that is sustained (30 seconds or greater), polymorphic, or hemodynamically significant[B]
- Exercise testing-induced ventricular fibrillation
- NYHA class I heart failure with left ventricular ejection fraction less than or equal to 30%
- NYHA class II or III heart failure with left ventricular ejection fraction less than or equal to 35%
- Left ventricular ejection fraction less than 40% and inducible sustained ventricular tachycardia

− Syncope presumed to be due to ventricular arrhythmia[C] and **1 or more** of the following:

- Inducible sustained ventricular tachycardia
- Left ventricular ejection fraction less than or equal to 35%
- Cardiac amyloidosis
- Arrhythmogenic right ventricular dysplasia or cardiomyopathy
- Hypertrophic cardiomyopathy
- Left ventricular hypertrophy with left ventricular ejection fraction less than 50%
- Left ventricular noncompaction
- Advanced structural heart disease (eg, valvular heart disease, congenital heart disease)

− Nonischemic cardiomyopathy and **1 or more** of the following:

- Syncope presumed[C] to be due to ventricular tachycardia
- Stable ventricular tachycardia not due to reversible causes
- Induced or spontaneous ventricular tachycardia that is hemodynamically significant (eg, Hypotension)[B] or sustained (lasting 30 seconds or longer)
- Polymorphic ventricular tachycardia
- Ventricular fibrillation
- NYHA class I to III heart failure and **ALL** of the following:
  - Left ventricular ejection fraction less than or equal to 35%
  - Patient treated for at least 3 months with guideline-directed medical therapy[F]
- NYHA class IV heart failure and **1 or more** of the following:

- Heart transplant candidate
- Left ventricular assist device candidate or device has been implanted
- Candidate for cardiac resynchronization therapy (ie, device will incorporate both pacing and defibrillation capabilities)

- Chagas disease[G]
- Myotonic dystrophy
- Heart failure due to amyloidosis[H]
- Giant cell myocarditis
- Peripartum cardiomyopathy and **ALL** of the following:
  - Persists more than 3 months post partum
  - Left ventricular ejection fraction 35% or less
- Acute lymphocytic myocarditis and left ventricular ejection fraction 35% or less

− Patient has genetic condition that increases risk of sudden cardiac death, as indicated by **1 or more** of the following:

− Long QT syndrome and **1 or more** of the following:

- Sustained (longer than 30 seconds) ventricular tachycardia
- Ventricular fibrillation
- Syncope presumed to be due to ventricular arrhythmia[C]
- Child with symptomatic ventricular arrhythmia in whom beta-blocker therapy is ineffective or not tolerated, and alternative therapies (eg, cardiac sympathetic denervation, alternative antiarrhythmic agents) are ineffective or inappropriate
- Jervell and Lange-Nielsen syndrome (also known as cardio-auditory-syncope syndrome)[I]
- Primary prophylactic cardioverter-defibrillator appropriate, as indicated by **ALL** of the following:
  - QTc greater than 500 milliseconds while receiving beta-blocker (or greater than 470 milliseconds if not receiving beta-blocker)
  - Patient at increased risk for ventricular arrhythmia, as indicated by **1 or more** of the following:
    - Prior cardiac arrest
    - Age younger than 40 years
    - Symptomatic with onset of symptoms at younger than 10 years of age
    - Genotype LQT2 OR LQT3

− Arrhythmogenic right ventricular dysplasia or cardiomyopathy and **1 or more** of the following:

- History of cardiac arrest with ventricular tachycardia or fibrillation
- Sustained (lasting 30 seconds or longer) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia
- Right or left ventricular ejection fraction less than or equal to 35%
- Syncope presumed to be due to ventricular arrhythmia[C]
- Risk factors for sudden cardiac death, as indicated by **1 or more** of the following:
  - Frequent premature ventricular contractions (ie, more than 1000 per 24 hours during ambulatory rhythm monitoring)
  - Family history of premature sudden death
  - Inducible ventricular tachycardia

− Brugada syndrome and[J] **1 or more** of the following:

- Patient has spontaneous type 1 Brugada syndrome ECG pattern[K] and **1 or more** of the following:
  - Sustained (lasting 30 seconds or longer) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia
  - Inducible sustained (lasting 30 seconds or more) ventricular tachycardia or ventricular fibrillation
  - History of cardiac arrest (eg, resuscitated ventricular fibrillation)
  - Syncope presumed to be due to ventricular arrhythmia[C]
- Patient with other than spontaneous type 1 Brugada syndrome ECG pattern[K] and **ALL** of the following:

- Positive response to pharmacologic challenge (eg, procainamide, flecainide, ajmaline, pilsicainide), as indicated by **1 or more** of the following:
  - Ventricular arrhythmia
  - Marked QRS widening
  - Type 1 Brugada syndrome ECG pattern
- Symptomatic or at high risk of ventricular arrhythmia, as indicated by **1 or more** of the following:
  - Sustained (lasting 30 seconds or longer) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia
  - Inducible sustained (lasting 30 seconds or more) ventricular tachycardia
  - History of cardiac arrest (eg, resuscitated ventricular fibrillation)
  - Syncope presumed to be due to ventricular arrhythmia[C]

− Catecholaminergic polymorphic ventricular tachycardia and **1 or more** of the following[L]:
- Adult with sustained (lasting 30 seconds or more) or hemodynamically significant (eg, Hypotension)[B] ventricular tachycardia
- Adult with ventricular fibrillation
- Adult with syncope presumed to be due to ventricular arrhythmia[C]
- Adult with nonsustained ventricular tachycardia receiving beta-blocker, flecainide, or propafenone
- Adult with nonsustained ventricular tachycardia intolerant to medical therapy (ie, beta-blocker, flecainide, or propafenone)
- Child with arrhythmic syncope, or polymorphic/bidirectional ventricular tachycardia despite alternative treatment (eg, beta-blocker, flecainide, cardiac sympathetic denervation)

− Hypertrophic cardiomyopathy and **1 or more** of the following[M]:
- Previous documented cardiac arrest
- Sustained ventricular tachycardia (lasting longer than 30 seconds)
- Ventricular fibrillation
- History of sudden death attributed to hypertrophic cardiomyopathy in first-degree or close relative[N] 50 years of age or younger
- Left ventricular hypertrophy 30 mm or greater in any segment
- Pediatric patient with a maximal wall thickness corresponding to a z score of 20 or greater
- Nonsustained ventricular tachycardia (eg, identified on ambulatory monitoring)
- Adult with syncope suspected to be due to arrhythmia
- Child with unexplained syncope
- Left ventricular ejection fraction less than 50%
- Extensive late gadolinium enhancement on cardiac MRI (eg, 15% of left ventricular mass or greater in adult)[O]
- Adult patient with left ventricular apical aneurysm
- Abnormal blood pressure response with exercise (eg, fall in blood pressure, or failure to rise by 20 mm Hg or more)

- Short QT syndrome[P]
- Noncompaction of left ventricle[Q]

− Lamin A/C mutation and **2 or more** of the following:
- Male sex
- Left ventricular ejection fraction less than or equal to 45%
- Nonsustained[D] ventricular tachycardia

- Lamin A/C mutation, and indication for permanent pacemaker is present

− Phospholamban cardiomyopathy and **1 or more** of the following:
- Left ventricular ejection fraction less than 45%
- Nonsustained ventricular tachycardia

- Filamin-C cardiomyopathy and left ventricular ejection fraction less than 45%
- Other familial cardiomyopathy associated with sudden death

− Cardiac sarcoidosis and **1 or more** of the following:

- Ventricular tachycardia that is hemodynamically significant (eg, Hypotension)[B] or sustained (lasting 30 seconds or longer)
- Ventricular fibrillation
- History of cardiac arrest
- Left ventricular ejection fraction less than or equal to 35% after treatment with optimal medical therapy for heart failure and immunosuppression (if active inflammation is present)
- Left ventricular ejection fraction 36% to 49% and right ventricular ejection fraction less than 40% despite treatment with optimal medical therapy for heart failure and immunosuppression (if active inflammation is present)[R]
- Evidence of myocardial scar by cardiac MRI or PET scan
- Permanent pacemaker required
- Syncope presumably due to ventricular arrhythmia[C]
- Inducible sustained ventricular arrhythmia

− Congenital heart disease and **1 or more** of the following:

- Sustained (lasting 30 seconds or longer) or hemodynamically significant[B] ventricular tachycardia without identified reversible etiology (eg, myocardial ischemia, severe electrolyte abnormality)
- Inducible sustained (lasting 30 seconds or longer) ventricular tachycardia
- Single ventricle or systemic right ventricle with ejection fraction less than or equal to 35%
- Left ventricular ejection fraction 35% or less
- Awaiting heart transplant
- Syncope presumably due to ventricular arrhythmia[C]
- Tetralogy of Fallot and **1 or more** of the following:
    - Left ventricular systolic or diastolic dysfunction
    - QRS duration of 180 milliseconds or more
    - QRS fragmentation (eg, multiple notched R waves)
    - Right ventricular scarring
    - Inducible sustained ventricular tachycardia
    - Other risk for sudden cardiac death (eg, impaired systolic or diastolic function, nonsustained[D] ventricular tachycardia)

- Left ventricular assist device with ventricular tachycardia that is sustained (lasting longer than 30 seconds)
- Muscular dystrophy with progressive cardiac involvement (eg, limb-girdle type 1B or Emery-Dreifuss)

− Post heart transplant and **ALL** of the following:

- Left ventricular dysfunction
- Severe allograft vasculopathy

− Takotsubo cardiomyopathy and **ALL** of the following:

- Ventricular fibrillation, or ventricular tachycardia that is sustained (lasting 30 seconds or longer), hemodynamically significant,[B] or polymorphic
- Ventricular arrhythmia occurs or persists more than 48 hours from symptom onset (eg, chest pain, dyspnea, palpitations)

- Bradycardia-dependent ventricular fibrillation or torsades de pointes[S]

− Cocaine substance abuse disorder and **ALL** of the following:

- Ventricular fibrillation, or ventricular tachycardia that is sustained (lasting 30 seconds or longer), hemodynamically significant,[B] or polymorphic
- Left ventricular ejection fraction less than 50% (eg, due to cocaine-induced cardiomyopathy)

- Patient without contraindication to ICD placement, as indicated by **ALL** of the following:
  - No condition limiting life expectancy to less than 1 year (eg, advanced malignancy)
  - No treatment-refractory class IV heart failure in patient who is not candidate for cardiac transplant or left ventricular assist device
  - No significant psychiatric illness that may be aggravated by device implantation or that may preclude regular follow-up
  - No ongoing IV drug abuse
  - No unresolved infection associated with risk for hematogenous seeding
  - No history of significant nonadherence with medical therapy and follow-up

See* Cardioverter-Defibrillator Insertion *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.

Operative Status Assignment

Goal Length of Stay: Ambulatory

In some situations procedures that might otherwise be performed on an ambulatory basis may require inpatient care. In some cases this need can be identified preoperatively; in other cases this need is due to postoperative events or clinical findings (eg, failure to meet discharge readiness milestones). See Discharge Readiness or Extended Stay section in this guideline, or Ambulatory Surgery Exception Criteria GRG, as appropriate.

- **Operative Status Criteria: Ambulatory**
- **Operative Status Criteria: Inpatient** (eg, medical necessity for hospital-based care across 2 or more postoperative midnights)
- **Operative Status Criteria: Inpatient** (Medicare patient, and specific procedure is on CMS Inpatient Only List)

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[T]: ▪ 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	• 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[DD]:	• Telemetry care admission[GG][HH][II] 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

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[U] MAP Calculator
- Mean arterial pressure[U] 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
- 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[V]
- 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

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[EE][Y]
- High-flow oxygen therapy[FF]
- Peritoneal dialysis
- Frequent pulmonary therapy with endotracheal suctioning (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

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

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[NN]

- 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)
- Calcium[W] greater than 14 mg/dL (3.5 mmol/L) or ionized calcium greater than 10.0 mg/dL (2.50 mmol/L)
- Calcium[W] 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:
  - Short-term electroencephalographic monitoring
  - Patient who requires short-term inpatient monitoring (eg, cardiac, wound site, perfusion)

− **Cardiology** diagnoses or procedures, including **1 or more** of the following:

- Angina or chest pain syndrome of undetermined origin with **1 or more** of the following:
  - Systolic blood pressure less than 110 mm Hg
  - Cardiac arrhythmias of immediate concern
  - Pulmonary edema
- New-onset unstable angina at rest or with minimal exertion
- Acute MI or suspected infarction with Hemodynamic stability
- Low-risk patient with ST-segment elevation MI who has undergone successful percutaneous coronary intervention
- Cardiac arrhythmia with Hemodynamic stability
- Atrioventricular block with Hemodynamic stability (until block resolves or permanent pacemaker is placed)
- Hypertensive emergency (eg, systolic blood pressure greater than 180 mm Hg or diastolic blood pressure greater than 120 mm Hg with end organ damage) without further requirement for parenteral therapy (eg, successful
  - 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[OO]
  - 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 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

- 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)

− 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[X]:

- Hemodynamic instability
- Hypotension or requirement for aggressive fluid resuscitation
- Inhalation injury

parenteral treatment in emergency department with change to oral medication)

- Moderate heart failure without Hypotension
- Low-dose inotropic or vasodilator therapy without need for frequent titration[CC]

by **1 or more** of the following[PP]:

- 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
- 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

- 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
- 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[Y]
- New need for intubation (eg, to protect airway)
- New tracheostomy (less than 48 hours old)

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)[QQ]

− 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
- Acute decompensated heart failure[RR]
- 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)[OO]

- Short-term cardiac monitoring after therapeutic or diagnostic procedure requiring conscious sedation or anesthesia
- Acute cerebrovascular event[SS]

- 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
- 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)

- 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) 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[TT] 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,

- 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
  - 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 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)
- 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

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[Z]:
    - Hemodynamic instability
    - Altered mental status
    - 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

- 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)

- 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[AA]:
    - 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[AA]:
    - 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

− **Cardiology** diagnoses or procedures, including **1 or more** of the following:
- Chest pain with **1 or more** of the following:
  - Hemodynamic instability
  - Suspicion of diagnoses needing ICU care (eg, aortic dissection)
  - New unstable or symptomatic arrhythmia or ECG finding (eg, ventricular tachycardia,

ventricular fibrillation, advanced heart block)
- Syncope or near syncope
- Pulmonary edema thought to be due to ischemia
- New or worsening mitral regurgitation murmur, S3, or rales

- Acute MI or unstable angina with complications, as indicated by **1 or more** of the following:
  - Cardiac arrest
  - Persistent chest pain
  - Hemodynamic instability
  - New unstable or symptomatic arrhythmia or ECG finding (eg, ventricular tachycardia, ventricular fibrillation, advanced heart block)
  - Suboptimal reperfusion procedure
  - Syncope or near syncope
  - Pulmonary edema thought to be due to ischemia
  - New or worsening mitral regurgitation murmur, S3, or rales
  - New-onset bundle branch block
  - New high-degree atrioventricular block
  - Respiratory failure (eg, new need for invasive or noninvasive mechanical ventilation)
  - Hemorrhagic complication (eg, intracranial or access site bleed following thrombolysis or antiplatelet therapy)
  - Altered mental status that is severe or persistent
  - Acute renal failure (stage 3 acute kidney injury)

- Complication of cardiac ablation, as indicated by **1 or more** of the following:
    - Pericardial tamponade
    - Hemodynamic instability
    - Thromboembolic stroke
    - Aortic or mitral valve injury
    - Vascular injuries
    - Esophageal perforation
    - Severe arrhythmia
    - Air embolism
    - Pneumothorax
    - Hemorrhage or hemothorax
    - Need for postprocedure invasive hemodynamic monitoring
    - Other severe complication

− Severe complication of percutaneous coronary intervention not amenable to immediate repair in the catheterization laboratory, as indicated by **1 or more** of the following:

- Coronary perforation
- Cardiac tamponade
- Air embolism
- Need for mechanical circulatory support

- Need for invasive hemodynamic monitoring with indwelling pulmonary artery catheter, as indicated by **1 or more** of the following[BB]:
    - Ablation with need for postprocedure invasive hemodynamic monitoring
    - Suspected severe heart failure with unclear diagnosis (eg, pulmonary edema with left ventricular ejection fraction greater than 40%)
    - Severe heart failure with ongoing symptoms or uncertain fluid status following initial diuretic treatment

- Cardiogenic shock due to heart failure
- Hemodynamic guidance needed for device selection and utilization of mechanical circulatory support
- Severe pulmonary hypertension with need for titration of pulmonary vasodilator or inotropic therapy

- Hemodynamic instability due to cardiac cause (eg, valve disease, arrhythmia, ischemia, conduction abnormality)
- Hypertensive emergency (eg, systolic blood pressure greater than 180 mm Hg or diastolic blood pressure greater than 120 mm Hg with end organ damage), with need for **1 or more** of the following:
    - IV antihypertensive therapy
    - Invasive hemodynamic monitoring (eg, arterial catheter)
- Infective endocarditis with **1 or more** of the following:
    - Hemodynamic instability
    - Valvular dysfunction with heart failure
    - Need for inotropic agent
    - Severe arrhythmia
    - Intracranial mycotic aneurysm
    - Hemorrhagic stroke
    - Altered mental status that is severe or persistent
    - Acute respiratory failure
    - Requirement for frequent hemodynamic measurements
    - Acute kidney injury (stage 2)
    - Acute renal failure (stage 3 acute kidney injury)
    - Acute ischemic end organ damage (eg, small bowel infarction)

- Need for acute surgical valve repair or replacement
- Severe pulmonary edema (eg, severe mitral regurgitation)

- Pericardial tamponade
- Acute hemopericardium
- Severe heart failure, as indicated by **1 or more** of the following:
  - Hemodynamic instability
  - Respiratory failure
  - Severe arrhythmias
  - Evidence of cardiac ischemia
  - Acute kidney injury (stage 2)
  - Acute renal failure (stage 3 acute kidney injury)
  - Need for intravenous inotropic or vasopressor agent[CC]
  - Need for pulmonary artery catheter placement
  - Need for mechanical circulatory support (eg, left ventricular assist device, intra-aortic balloon pump)
- Myocarditis with **1 or more** of the following:
  - Hemodynamic instability
  - Respiratory failure
  - Severe arrhythmias
  - Need for cardiac assist device (eg, left ventricular assist device or extracorporeal membrane oxygenator)
- Syncope with **1 or more** of the following:
  - Hemodynamic instability
  - Severe arrhythmia or ECG finding (eg, ventricular tachycardia, ventricular fibrillation, advanced heart block)
  - Suspicion of diagnoses needing ICU care (eg, acute aortic dissection, massive pulmonary

embolism, internal hemorrhage, critical aortic stenosis) ▪ Electrical storm, as indicated by **1 or more** of the following: • Three or more episodes of sustained ventricular tachycardia within 24 hours • Patient has implantable cardioverter-defibrillator (ICD) with 3 or more ICD interventions (shocks or antitachycardia pacing) within 24 hours. ▪ Acute aortic syndrome ▪ Status post cardiac arrest		

Hospitalization

Goal Length of Stay: Ambulatory

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**
  - **Stable cardiac rhythm**
  - **Insertion site stable**
  - **ICD functioning properly**
  - **Pneumothorax absent**
  - **Pain absent or managed**
  - **Ambulatory or acceptable for next level of care**
  - **Oral hydration[UU]**
  - **Oral medications or regimen acceptable for next level of care**
  - **Oral diet or acceptable for next level of care**
  - **Discharge plans and education understood**

See Cardioverter-Defibrillator Insertion 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).

- Inpatient stay (eg, need for hospital-based care beyond postoperative day 1) may be needed for:
  - Failure to meet discharge criteria (recovery milestones in Optimal Recovery Course)
    - Expect brief stay extension.
  - Lead or generator problems
    - Lead or generator problems may require further investigation or lead repositioning.
    - Anticipate evaluation and plan on postoperative day 1.
    - Expect brief stay extension.
  - Thoracic complications (eg, hemothorax, hemoptysis, pneumothorax)
    - Expect brief stay extension.
  - Infection
    - Anticipate diagnostic imaging (eg, echocardiogram), cultures, and intravenous antibiotic therapy.
    - Anticipate possible device extraction.
    - Expect brief to moderate stay extension.
  - Patient discontinuing antiarrhythmic agents before electrophysiologic study
    - Patient discontinuing antiarrhythmic agents before electrophysiologic study may require hospitalization for monitoring.
    - Expect brief stay extension.
  - Cardiac arrest or persistent arrhythmia
    - Anticipate cardiac monitoring and treatment (eg, ablation, medication).
    - Expect brief to moderate stay extension.
  - Unstable comorbidities (eg, heart failure, renal insufficiency)
    - Anticipate treatment of specific comorbidity.
    - 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[VV]
- 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* Cardioverter-Defibrillator Insertion *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 Cardioverter-Defibrillator Insertion guideline in Home Care.

Footnotes

[A] ICD placement in patients with incessant recurrent ventricular arrhythmia may precipitate "ICD storm," commonly defined as 3 or more episodes of ICD therapy (shock or pacing) over 24 hours. [A in Context Link 1]

[B] Hemodynamically significant ventricular tachycardia is defined as ventricular tachycardia that results in Hypotension, angina, dyspnea, presyncope, syncope, or acute heart failure symptoms. [B in Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]

[C] Ventricular arrhythmia as the etiology of syncope is largely a diagnosis of exclusion, when alternative common etiologies (eg, vasovagal syncope, postural hypotension due to illness or dehydration, supraventricular arrhythmia) are judged unlikely through careful history taking (eg, cardiac history, details of syncopal episode), ECG, and directed testing based upon clinical judgment. [C in Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]

[D] Nonsustained ventricular tachycardia is defined as 3 or more consecutive ventricular complexes at a rate of greater than or equal to 100 beats per minute, lasting less than 30 seconds, and terminating spontaneously, without associated hemodynamically significant symptoms (eg, Hypotension). [D in Context Link 1, 2, 3, 4]

[E] In this context, ischemic cardiomyopathy includes patients who are not described elsewhere in this guideline. Specifically, patients with history of MI or recent revascularization (within last 90 days) are not included here. [E in Context Link 1, 2]

[F] Evidence-based specialty society guidelines state that it is imperative that patients with nonischemic cardiomyopathy be on guideline-directed medical therapy for at least 3 months before an AICD is placed as primary prevention (eg, no history of sustained ventricular tachycardia or fibrillation, no syncope presumed to be due to ventricular arrhythmia). [F in Context Link 1]

[G] Evidence for the use of ICD placement in Chagas disease is limited to observational data, registries, and extrapolation of criteria from other cardiomyopathies. [G in Context Link 1]

[H] A systematic review recommends ICD placement for patients with amyloidosis who have survived a cardiac arrest or have experienced nonsustained ventricular arrhythmia, and have an expected survival of more than 1 year. [H in Context Link 1]

[I] Jervell and Lange-Nielsen syndrome is a rare condition characterized by congenital deafness with prolonged QT syndrome. ICD placement should be considered, as the risk of sudden cardiac death has been reported to be as high as 35% by age 40 years despite pharmacologic therapy. [I in Context Link 1]

[J] Brugada syndrome is an inherited disease characterized by ST-segment elevation in V_1 through V_3, with inverted T-waves, right bundle branch block, and a susceptibility to ventricular tachycardia in a structurally normal heart. [J in Context Link 1]

[K] A type 1 Brugada ECG pattern has prominent J-point elevations with coved ST elevations in 2 or more right precordial leads (V_1 to V_3) of 2 mm or greater that curve downward into an inverted T-wave. A type 2 Brugada ECG pattern is characterized by a 2 mm or greater J-point elevation and an ST elevation of 1 mm or greater in the right precordial leads with a "saddleback" appearance terminating an upward T-wave. A type 3 Brugada ECG pattern is characterized by an ST elevation less than 1 mm in the right precordial leads with either a coved or saddleback appearance. Only type 1 patterns are considered diagnostic; types 2 or 3 are suggestive and require confirmation by pharmacologic challenge testing. [K in Context Link 1, 2]

[L] Catecholaminergic polymorphic ventricular tachycardia is caused by genetic defects in myocardial calcium storage or release and usually presents in childhood. [L in Context Link 1]

[M] Referral to a hypertrophic cardiomyopathy center is recommended. [M in Context Link 1]

[N] For purposes of risk assessment, "close relatives" include second-degree relatives or multiple third-degree relatives. [N in Context Link 1]

[O] MRI with gadolinium enhancement measures the degree of replacement fibrosis in the left ventricle of patients with hypertrophic cardiomyopathy. A threshold of 15% or greater is associated with a high risk of sudden death in adults. Thresholds of enhancement that determine high risk of sudden death in the pediatric population have not been defined; however, a specialty society guideline states that extensive late gadolinium enhancement on MRI in children can be used as part of risk stratification for shared decision-making. [O in Context Link 1]

[P] Short QT syndrome is characterized by a consistently short QT interval (QTc of 340 milliseconds or less) accompanied by atrial or ventricular arrhythmias. [P in Context Link 1]

[Q] Noncompaction of the left ventricle is a congenital cardiomyopathy characterized by a loose "noncompacted" myocardium and prominent left ventricular trabeculae with deep intertrabecular recesses. [Q in Context Link 1]

[R] For patients with cardiac sarcoidosis and biventricular heart failure, a specialty society guideline states that there are no data to inform the duration of a trial of medical therapy, but suggests remeasuring ejection fraction measurements after a trial of at least 3 months of optimal heart failure medications and immunosuppression (if indicated) prior to placement of an AICD. [R in Context Link 1]

[S] Bradycardia-dependent torsades de pointes is a polymorphic form of ventricular tachycardia, usually occurring in the setting of a prolonged QTc interval (eg, greater than 0.48 seconds), triggered by bradycardia or a premature ventricular contraction-induced pause. [S in Context Link 1]

[T] 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. [T in Context Link 1]

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

[V] 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. [V in Context Link 1]

[W] 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. [W in Context Link 1, 2]

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

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

[Z] 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. [Z in Context Link 1]

[AA] 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. [AA in Context Link 1, 2]

[BB] Many indications for pulmonary artery catheterization (right-sided heart catheterization) do not require ongoing hemodynamic monitoring and can be performed as an outpatient in a catheterization laboratory; examples include evaluation of suspected intracardiac shunt or pulmonary hypertension, determination of acute response to pulmonary vasodilator therapy, post-heart transplant patient follow-up, and endomyocardial biopsy. [BB in Context Link 1]

[CC] Low doses of vasopressor or inotropic agents may be administered in some intermediate care units depending on unit capabilities, staffing, and policies. [CC in Context Link 1, 2]

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

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

[FF] 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. [FF in Context Link 1]

[GG] 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. [GG in Context Link 1]

[HH] 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. [HH in Context Link 1]

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

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

[KK] 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. [KK in Context Link 1]

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

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

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

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

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

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

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

[SS] 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. [SS in Context Link 1]

[TT] 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. [TT in Context Link 1]

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

[VV] 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. [VV 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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3. Palevsky PM, et al. KDOQI US commentary on the 2012 KDIGO clinical practice guideline for acute kidney injury. American Journal of Kidney Diseases 2013;61(5):649-72. DOI: 10.1053/j.ajkd.2013.02.349.
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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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1. Kidney Disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO clinical practice guideline for acute kidney injury. Kidney International. Supplement 2012;2(1):1-138. (Reaffirmed 2025 Apr)
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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)

References

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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)

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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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)

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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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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10. Zimetbaum P, Goldman L. Bradycardias and conduction system delays. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:317-322.

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)

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. Koch E, Lovett S, Nghiem T, Riggs RA, Rech MA. Shock index in the emergency department: utility and limitations. Open Access Emergency Medicine 2019;11:179-199. DOI: 10.2147/OAEM.S178358.
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4. Balhara KS, Hsieh YH, Hamade B, Circh R, Kelen GD, Bayram JD. Clinical metrics in emergency medicine: the shock index and the probability of hospital admission and inpatient mortality. Emergency Medicine Journal 2017;34(2):89-94. DOI: 10.1136/emermed-2015-205532.
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6. Singer M, et al. The Third International Consensus definitions for sepsis and septic shock (Sepsis-3). Journal of the American Medical Association 2016;315(8):801-810. DOI: 10.1001/jama.2016.0287.
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15. Ramgopal S. The shock index among children presenting to the emergency department: analysis of nationally representative sample. Journal of Emergency Medicine 2024;67(2):e146-e156. DOI: 10.1016/j.jemermed.2024.03.022.

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)

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. Ramgopal S, Sepanski RJ, Martin-Gill C. Empirically derived age-based vital signs for children in the out-of-hospital setting. Annals of Emergency Medicine 2023;81(4):402-412. DOI: 10.1016/j.annemergmed.2022.09.019.

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)

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. 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

1. Zafren K, Danzl DF. Hypothermia, frostbite, and nonfreezing cold injuries. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1750-1770.e2.

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

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.
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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.

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

1. Shibao C, Lipsitz LA, Biaggioni I, American Society of Hypertension Writing Group. Evaluation and treatment of orthostatic hypotension. Journal of the American Society of Hypertension 2013 Jul-Aug;7(4):317-324. DOI: 10.1016/j.jash.2013.04.006.
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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.

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

1. Braithwaite SA, Wessel AL. Dyspnea. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:194-201.e2.
2. Naureckas ET, Solway J. Disturbances of respiratory function. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:2133-2139.
3. Matthay MA, Ware LB. Acute respiratory failure. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:642-652.
4. Rakoczy K. Acute respiratory failure. In: Gershel JC, Rauch DA, editors. Caring for the Hospitalized Child: A Handbook of Inpatient Pediatrics. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2023:749-754.

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

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.

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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.

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

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.

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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 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

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.

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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)

Codes

ICD-10 Diagnosis: I42.9

ICD-10 Procedure: 02H43KZ, 02H44KZ, 02H63KZ, 02H64KZ, 02H73KZ, 02H74KZ, 02HK3KZ, 02HK4KZ, 02HL3KZ, 02HL4KZ, 02HN3KZ, 02HN4KZ, 0JH608Z, 0JH609Z, 0JH638Z, 0JH639Z, 0JH63FZ, 0JH808Z, 0JH809Z, 0JH838Z, 0JH839Z, 0WHC3GZ, 0WHC4GZ [Hide]

CPT®: 0571T, 0572T, 33216, 33217, 33230, 33231, 33240, 33249, 33270, 33271

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