

Cardiology GRG

GRG: MG-C (ISC GRG)

MCG Health

General Recovery
Care

30th Edition

Medical Admission Case

Management GRG  GRG

Note: An appropriate Optimal Recovery Guideline (ORG) should be identified and used whenever possible. This General Recovery Guideline (GRG) is intended to aid only in situations in which no ORG appears applicable.

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Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Admission to Inpatient Care

- Hospital admission is needed for appropriate care of the patient because of **1 or more** of the following(1)(2)(3):
 - Hemodynamic instability (4)(5)(6)(7)
 - Bradycardia that is symptomatic (eg, dizziness, Hypotension) and persists despite observation care(8)
 - ☐ Symptomatic (eg, dizziness, presyncope, syncope, confusional state due to hypoperfusion, or heart failure symptoms) first-degree,^[A] second-degree, or third-degree atrioventricular block, and **ALL** of the following(8)(9)(10):
 - Block not readily reversible (eg, in observation care)^[B]
 - Block requires hospital care beyond placement of permanent pacemaker (ie, absent other issues or complications, successful placement of a permanent pacemaker does not routinely require inpatient care)
 - ☐ Asymptomatic type II second-degree atrioventricular heart block (Mobitz type II)^[C] or third-degree atrioventricular heart block and **ALL** of the following^[B](8)(9)(10):
 - Block not readily reversible (eg, in observation care)^[B]
 - Block requires hospital care beyond placement of permanent pacemaker (ie, absent other issues or complications, successful placement of a permanent pacemaker does not routinely require inpatient care)
 - Permanent pacemaker malfunction requiring adjustment, repair, or replacement not feasible in observation care (eg, infection requiring lead removal with need for prolonged telemetry monitoring, or temporary pacemaker placement)(12)
 - Cardiac injury (eg, contusion) requiring monitoring or treatment beyond observation care (eg, longer-term monitoring for arrhythmia needed)^[D](13)(14)
 - ☐ Pericardial effusion and **1 or more** of the following(15):
 - Evidence of actual or impending cardiac tamponade (eg, Hemodynamic instability, worsening dyspnea or Tachypnea, increased jugular venous pressure, pulsus paradox, electrical alternans, or echocardiogram findings)(16)
 - Hemopericardium^[E]
 - Pericardial effusion that is enlarging
 - Pneumopericardium^[F](15)(18)(20)(21)

- ☐ Aortic stenosis and **1 or more** of the following(7)(22):
 - Hemodynamic instability
 - Pulmonary edema resulting in Hypoxemia
 - Tachypnea or dyspnea that persists despite observation care
 - Decompensated aortic stenosis requiring invasive hemodynamic monitoring (eg, right heart catheterization for initiation of vasodilator therapy)(23)
- ☐ Aortic regurgitation and **1 or more** of the following(7)(22)(23):
 - Hemodynamic instability
 - Pulmonary edema resulting in Hypoxemia
 - Tachypnea or dyspnea that persists despite observation care
- ☐ Mitral stenosis and **1 or more** of the following(7)(22):
 - Hemodynamic instability
 - Pulmonary edema resulting in Hypoxemia
 - Tachypnea or dyspnea that persists despite observation care
 - Significant hemoptysis (eg, greater than 100 mL in 24 hours, or any amount associated with airway obstruction, Respiratory distress, or Hypoxemia)(22)(24)(25)(26)(27)
- ☐ Mitral regurgitation and **1 or more** of the following(7)(28):
 - Hemodynamic instability
 - Pulmonary edema resulting in Hypoxemia
 - Tachypnea or dyspnea that persists despite observation care
- Prosthetic valve thrombosis(23)
- Prosthetic valve with significant paravalvular leak (eg, symptomatic, worsening)(29)
- ☐ Initial inpatient care needed for anticoagulation therapy (eg, due to valvular disease), as indicated by **ALL** of the following:
 - Temporary subtherapeutic anticoagulation unacceptable
 - Inpatient anticoagulation needed
- Severe surgical or device complication (eg, valve replacement complication, left ventricular assist device or ICD dysfunction or failure, hemothorax, device thrombosis, infection) requiring inpatient care(30)(31)(32)(33)(34)(35)
- Stress-related cardiomyopathy (Takotsubo syndrome) requiring inpatient treatment (eg, Hypotension, pulmonary edema with Hypoxemia, ventricular arrhythmia)(36)
- ☐ Nonbacterial thrombotic endocarditis (also known as Libman-Sacks, verrucous, or marantic endocarditis) and **1 or more** of the following(37)(38):
 - Hemodynamic instability
 - New heart failure attributable to valvular dysfunction
 - Pulmonary edema resulting in Hypoxemia
 - Acute embolic event
- ☐ Cyanotic heart disease and **1 or more** of the following(3)(39)(40):
 - Acute onset of Hypoxemia
 - Exacerbation (eg, worsening oxygenation) that persists despite observation care
 - Exacerbation (eg, worsening oxygenation) that is not appropriate for observation care (ie, too severe)
- ☐ Complications of transplanted heart, as indicated by **1 or more** of the following(41)(42):
 - Acute graft rejection requiring inpatient management (eg, IV immunosuppression, vasoactive agent)(43)(44)(45)
 - Acute graft heart failure, as indicated by **1 or more** of the following(44)(46):
 - Hemodynamic instability
 - Cardiac arrhythmias of immediate concern (47)
 - Pulmonary edema that is very severe (eg, invasive or noninvasive assisted ventilation needed, imminent, or likely, or need for 100% oxygen to keep oxygen saturation above 90%)
- ☐ Pulmonary edema and **ALL** of the following:
 - New need for oxygen therapy to keep oxygen saturation above 90% (or increased FiO₂ need from baseline)
 - Has not improved sufficiently in observation care with IV diuretics or other heart failure treatments
 - Altered mental status that is severe or persistent
 - Increased creatinine (new on laboratory test) with reduction of more than 50% in estimated glomerular filtration rate from baseline  eGFR - Adult Calculator or  eGFR - Pediatric Calculator
 - Progressively (ongoing) rising creatinine (known from past laboratory test) with reduction of more than 25% in estimated glomerular filtration rate from baseline  eGFR - Adult Calculator or  eGFR - Pediatric Calculator
 - Acute renal failure (stage 3 acute kidney injury)
 - Acute peripheral ischemia (eg, examination shows pulseless, cool, mottled, or cyanotic extremity)
 - Pulmonary artery catheter monitoring needed
- Infection requiring inpatient management (eg, Hemodynamic instability, Altered mental status, new organ dysfunction, need for IV antimicrobial treatment)(48)

- Cardiac allograft vasculopathy requiring inpatient management (eg, evidence of cardiac ischemia)(42)(49)(50)
- Other complication of transplanted heart (eg, stroke, severe valvular dysfunction) requiring inpatient management(41)(51)
- Inpatient palliative care needed.(52)(53)(54) See Inpatient Palliative Care Criteria [GRG](#).
- **Cardiology** condition, symptom, or finding for which observation care has failed or is not considered appropriate. See General Criteria: Observation Care [ISC](#), General Admission Criteria [GRG](#), or Pediatric General Admission Criteria [GRG](#) guideline as appropriate.

Supplemental Medicare Criteria

Note: These criteria are to be considered for Medicare patients if none of the standard Clinical Indications for Admission to Inpatient Care apply.

- Patient with Medicare coverage requires inpatient admission, as indicated by **1 or more** of the following(55):
 - Admitting clinician expects patient to require hospital care for less than 2 midnights but, based on complex medical factors documented in medical record, judges that inpatient care is necessary (case-by-case exception). The medical record must contain sufficient documentation to make clear the rationale for the exception.
 - Patient has need for intubation and mechanical ventilation that is new (ie, did not present to hospital already on mechanical ventilation).
 - Treatment plan for hospital admission includes procedure designated by CMS as inpatient only (ie, on Inpatient Only List).
 - Patient has already received medically necessary hospital care that meets 2-midnight benchmark (excluding activities such as triage/intake, delays in provision of care, or time added due to patient or family convenience). The medical record must contain sufficient documentation to make clear the medical necessity for hospital care across 2 or more midnights.

Alternatives to Admission

- Alternatives include(2)(23)(31)(37):
 - Outpatient care in emergency department, observation care (see General Criteria: Observation Care [ISC](#) guideline as appropriate), rapid treatment site, urgent care center, or medical office(14)(52)(56)
 - Care may include(7)(52)(57)(58):
 - History, physical examination, and laboratory tests
 - Oximetry, ABG, and chest x-ray
 - ECG or cardiac monitoring
 - IV diuretics or antihypertensives with observation of response
 - Oral medications (eg, antianginal agents, lipid-lowering agents, renin-angiotensin inhibitors, beta-blockers)
 - Discontinuation or adjustment of medications that could cause cardiac conduction abnormality or hypotension(9)(10)(59)
 - Nuclear perfusion testing
 - Angiogram or other imaging
 - Cardiac stress testing(9)
 - Echocardiogram
 - Antimicrobial treatment(60)
 - Cardioversion(56)
 - Pacemaker adjustment
 - Pulmonary artery catheterization(58)
 - Disposition may include:
 - Discharge when studies confirm low-risk condition or diagnosis that is appropriate for outpatient treatment (eg, nonemergent noncardiovascular chest pain)(61)
 - Drug therapy when condition is appropriate for outpatient treatment; examples include:
 - Antianginal agents for ischemia(57)(62)
 - Low-molecular-weight heparin on outpatient basis with anticoagulation monitoring regimen
 - Ambulatory ECG monitoring(9)(11)
 - Outpatient treatment with return for subsequent procedure such as anticoagulation with subsequent cardioversion, or permanent pacemaker placement(9)(11)(56)
 - Use of multidisciplinary outpatient care team to address patient's needs(52)
 - Home care(52)
 - Nursing visit with frequent assessment as needed
 - Laboratory testing
 - Oral, parenteral, or rectal medications(57)
 - Home blood pressure monitoring
 - Patient education
 - Coordination of further diagnostic evaluation
 - Palliative care,(52) including continuous care(52)(53)(54)
 - Recovery facility(52)

- Frequent nursing care, observation, and laboratory monitoring
- IV medications
- Oxygen and respiratory treatments
- Weight and fluid balance
- Physical therapy and rehabilitation
- Palliative care, including respite care(52)(53)(54)

Hospitalization

General Recovery Course

Stage	Level of Care	Clinical Status	Interventions
1	• ICU or intermediate care[K] • Social Determinants of Health Assessment • Discharge planning. See Discharge Planning Tool SR.	• Clinical Indications met[L]	• Inpatient interventions as needed
2	• Floor • Social Determinants of Health Assessment	• No ICU or intermediate care needs • Pulmonary and peripheral edema absent or improved • Arrhythmias absent or improved	• Inpatient interventions continue • Transition to oral routes • Taper off IV medications
3	• Activity level acceptable • Social Determinants of Health Assessment • Floor to discharge • Complete discharge planning	• Hemodynamic stability • Cardiovascular status acceptable • Cardiac inflammation absent or controlled • General Discharge Criteria met	• Intake acceptable • No inpatient interventions needed

(7)(15)(31)(52)(56)

Recovery Milestones are indicated in **bold**.

Benchmark Length of Stay (BLOS): Access diagnosis and procedure code-specific BLOS via Search functions.

Discharge Criteria

- Continued inpatient stay is needed until **1 or more** of the following are present:
 - Acceptable patient status for next level of care is achieved.
 - **ALL** of the following are present:
 - ☐ 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(63)(64):
 - Tachycardia absent
 - Hypotension absent
 - No evidence of inadequate perfusion (eg, no myocardial ischemia)
 - No other hemodynamic abnormalities (eg, no Orthostatic hypotension)
 - ☐ Cardiovascular status acceptable, as indicated by **ALL** of the following:
 - Cardiac rhythm acceptable, as indicated by **1 or more** of the following(65):
 - Normal sinus or paced rhythm
 - Sinus arrhythmia or supraventricular arrhythmia (eg, atrial fibrillation) with ventricular rate controlled, and no need for cardioversion(66)
 - No severe cardiac arrhythmias noted (eg, sustained ventricular tachycardia, ventricular fibrillation)(65)
 - No severe cardiac or peripheral ischemia(57)(67)
 - Heart failure or other cardiovascular disease is **1 or more** of the following(52):
 - Not present
 - At baseline
 - Manageable at next level of care
 - Cardiac inflammation absent or controlled

- ☐ Activity level acceptable, as indicated by **1 or more** of the following:
 - Patient ambulatory and can perform ADL as appropriate for age and development
 - Activity at baseline
 - Activity level acceptable for next level of care
- ☐ Intake acceptable, as indicated by **1 or more** of the following(68):
 - Oral hydration, medications, and diet
 - Enteral hydration, medications, and diet
 - Administration routes performable at next level of care
- ☐ No inpatient interventions needed; examples include:
 - Vital signs, neurologic signs, or vascular checks more often than feasible at next level of care
 - Cardiac monitoring
 - IV anticoagulation, antiarrhythmics, or platelet inhibitors
 - Acute thrombolytics
 - Urgent or emergent surgery
 - Temporary pacemaker
 - Urgent or emergent cardioversion
 - Urgent or emergent electrophysiologic study and procedure
 - Urgent or emergent pacemaker or implantable cardioverter-defibrillator implantation
 - Urgent or emergent cardiac catheterization or angioplasty
 - Urgent or emergent cardiac stress test or other evaluation
- ☐ General Discharge Criteria [GRG](#) met or Pediatric General Discharge Criteria [GRG](#) met (if either is relevant or necessary for patient's condition)

Case Management

See Medical Admission Case Management [GRG](#) [GRG](#) for further information.

Discharge Destination

- Post-hospital levels of admission may include:
 - Home.
 - Home healthcare. See Medical Admission Home Care [GRG](#) [HC](#) or Geriatric Admission Home Care [GRG](#) [HC](#) for further information.
 - Recovery facility care. See Medical Admission Recovery Facility Care [GRG](#) [RFC](#) or Geriatric Admission Recovery Facility Care [GRG](#) [RFC](#) for further information.
 - Inpatient rehabilitation facility. See Inpatient Rehabilitation Facility (IRF) Admission Recovery Facility Care [GRG](#) [RFC](#) for further information.

Evidence Summary

Criteria

The evidence for the clinical indications found in this guideline includes 35 published peer reviewed articles, 6 specialty society or other evidence-based guidelines, and 13 book sections.

Rationale

Use of this MCG care guideline helps the clinician identify patient-specific complex clinical factors that make it reasonable to expect a necessity for hospital care across 2 or more midnights. The evidence-based clinical criteria assist the clinician in the decision to appropriately admit a patient to inpatient care. For Medicare enrollees, MCG care guidelines also support the clinician in the decision to appropriately admit a patient to inpatient care when there is not an expectation of 2 or more midnights of hospital care (eg, CMS' Two-Midnight Rule exceptions).

Use of these evidence-based clinical criteria to support decision making around the need for inpatient treatment is of clinical benefit to the patient and is crucial for quality patient care. Use of evidence-based clinical criteria ensures patients receive the most appropriate care for their specific condition, reduces unnecessary risks, promotes recovery, and provides a standard that can reduce disparities in care. Evidence-based clinical criteria not only help align treatment decisions with best practice, but they can also help reduce unwarranted variation in care by fostering consistency and equality in healthcare provision across regions and facilities. Appropriate use of the evidence-based clinical criteria in conjunction with the Supplemental Medicare Criteria ensures Medicare patients receive full access to Medicare benefits (eg, inpatient care), without risk of delay or decreased access, based on variables such as clinical severity

of illness, length of provision of medically necessary hospital-level care, or satisfaction of specified Medicare criteria as directed by CMS. Use of these criteria will help ensure that the patient receives necessary care in the appropriate setting.

Related CMS Coverage Guidance

This guideline supplements but does not replace, modify, or supersede existing Medicare regulations or applicable National Coverage Determinations (NCDs) or Local Coverage Determinations (LCDs).

Code of Federal Regulations (CFR): 42 CFR 412.3(55); 42 CFR 419.22(69); 42 CFR 422.101(70)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(71); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(72); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(73); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(74)

Medicare Coverage Determinations: Medicare Coverage Database(75)

References

1. Rosengart TK, Aberle CM, Ryan C. Acquired heart disease: valvular. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:1711-1742. [Context Link 1]
2. Parent JJ, Ware SM. Diseases of the myocardium. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:2876-2889. [Context Link 1, 2]
3. Bernstein D. General principles of treatment of congenital heart disease. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:2835-2843. [Context Link 1, 2]
4. Sinha SS, Morrow DA, Kapur NK, Kataria R, Roswell RO. 2025 concise clinical guidance: an ACC expert consensus statement on the evaluation and management of cardiogenic shock: a report of the American College of Cardiology Solution Set oversight committee. Journal of the American College of Cardiology 2025;85(16):1618-1641. DOI: 10.1016/j.jacc.2025.02.018. [Context Link 1] View abstract...
5. Kanwar MK, et al. Heart failure related cardiogenic shock: An ISHLT consensus conference content summary. Journal of Heart and Lung Transplantation 2024;43(2):189-203. DOI: 10.1016/j.healun.2023.09.014. [Context Link 1] View abstract...
6. Blumer V, et al. Cardiogenic shock in older adults: a focus on age-associated risks and approach to management: a scientific statement from the American Heart Association. Circulation 2024;149(14):Online. DOI: 10.1161/CIR.0000000000001214. [Context Link 1] View abstract...
7. Keane RR, Menon V, Cremer PC. Acute heart valve emergencies. Cardiology Clinics 2024;42(2):237-252. DOI: 10.1016/j.ccl.2024.02.009. [Context Link 1, 2, 3, 4, 5, 6, 7] View abstract...
8. Patton KK, Olgin JE. Bradyarrhythmias and atrioventricular block. 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; 2022:1312-1320. [Context Link 1, 2, 3, 4]
9. Kusumoto FM, et al. 2018 ACC/AHA/HRS guideline on the evaluation and management of patients with bradycardia and cardiac conduction delay: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. Circulation 2019;140(8):e382-e482. DOI: 10.1161/CIR.0000000000000628. (Reaffirmed 2025 Jun) [Context Link 1, 2, 3, 4, 5, 6, 7, 8] View abstract...
10. Saleh F, Greene EA, Mathison D. Evaluation and management of atrioventricular block in children. Current Opinion in Pediatrics 2014;26(3):279-85. DOI: 10.1097/MOP.0000000000000100. [Context Link 1, 2, 3, 4] View abstract...
11. Sandau KE, et al. Update to practice standards for electrocardiographic monitoring in hospital settings: a scientific statement from the American Heart Association. Circulation 2017;136(19):e273-e344. DOI: 10.1161/CIR.0000000000000527. [Context Link 1, 2, 3] View abstract...
12. Elshazly MB, Tarakji KG. Reimplantation after lead removal. Cardiac Electrophysiology Clinics 2018;10(4):667-674. DOI: 10.1016/j.ccep.2018.04.004. [Context Link 1] View abstract...
13. Scagliola R, Seitun S, Balbi M. Cardiac contusions in the acute care setting: Historical background, evaluation and management. American Journal of Emergency Medicine 2022;61:152-157. DOI: 10.1016/j.ajem.2022.09.005. [Context Link 1, 2] View abstract...
14. Biffi WL, Fawley JA, Mohan RC. Diagnosis and management of blunt cardiac injury: What you need to know. Journal of Trauma and Acute Care Surgery 2024;96(5):685-693. DOI: 10.1097/TA.0000000000004216. [Context Link 1, 2, 3] View abstract...
15. LeWinter MM, Cremer PC, Klein AL. Pericardial diseases. 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; 2022:1615-1634. [Context Link 1, 2, 3, 4]
16. Shanker DA, Gaur A, Warriner D. Pericardial Effusion: Overview of Aetiology, Pathophysiology, Diagnosis, and Management. Cureus 2025;17(9):e92177. DOI: 10.7759/cureus.92177. [Context Link 1] View abstract...
17. Tarantino N, et al. Epicardial ablation complications. Cardiac Electrophysiology Clinics 2020;12(3):409-418. DOI: 10.1016/j.ccep.2020.06.004. [Context Link 1] View abstract...
18. Jouriles N. Pericardial and myocardial disease. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:955-967.e2. [Context Link 1, 2]
19. Shrestha DB, et al. Pulmonary barotrauma in COVID-19: A systematic review and meta-analysis. Annals of Medicine and Surgery 2022;73:Online. DOI: 10.1016/j.amsu.2021.103221. [Context Link 1] View abstract...

20. Dudzinski DM, Mak GS, Hung JW. Pericardial diseases. *Current Problems in Cardiology* 2012;37(3):75-118. DOI: 10.1016/j.cpcardiol.2011.10.002. [Context Link 1] View abstract...
21. Maxson IN, Chandnani HK, Lion RP. The Heart's Halo: caring for pediatric pneumopericardium. *Journal of Pediatric Intensive Care* 2018;7(4):213-215. DOI: 10.1055/s-0038-1653981. [Context Link 1] View abstract...
22. Carabello BA, Kodali S. Valvular heart disease. In: Goldman L, Cooney KA, editors. *Goldman-Cecil Medicine*. 27th ed. Elsevier; 2024:400-413. [Context Link 1, 2, 3, 4]
23. Otto CM, et al. 2020 ACC/AHA guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation* 2020;143(5):e35-371. DOI: 10.1161/CIR.0000000000000923. (Reaffirmed 2025 Mar) [Context Link 1, 2, 3, 4] View abstract...
24. Brown CA. Hemoptysis. In: Walls RM, editor. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 10th ed. Elsevier; 2023:189-193.e2. [Context Link 1]
25. Zimmerman JL, Sanchez R. Massive hemoptysis. In: Parillo JE, Dellinger RP, editors. *Critical Care Medicine: Principles of Diagnosis and Management in the Adult*. 5th ed. Philadelphia, PA: Elsevier; 2019:704-716.e5. [Context Link 1]
26. Prey B, Francis A, Williams J, Krishnadasan B. Evaluation and treatment of massive hemoptysis. *Surgical Clinics of North America* 2022;102(3):465-481. DOI: 10.1016/j.suc.2021.11.002. [Context Link 1] View abstract...
27. Pirotte M, Pirotte A, Koyfman A, Long B. High risk and low incidence diseases: Massive hemoptysis. *American Journal of Emergency Medicine* 2024;85:179-185. DOI: 10.1016/j.ajem.2024.09.013. [Context Link 1] View abstract...
28. Bonow RO, et al. 2020 focused update of the 2017 ACC expert consensus decision pathway on the management of mitral regurgitation. *Journal of the American College of Cardiology* 2020;75(17):2236-2270. DOI: 10.1016/j.jacc.2020.02.005. (Reaffirmed 2025 Jun) [Context Link 1] View abstract...
29. Bricker RS, Cleveland JC, Messenger JC. Mechanical complications of transcatheter aortic valve replacement. *Interventional Cardiology Clinics* 2021;10(4):465-480. DOI: 10.1016/j.iccl.2021.06.007. [Context Link 1] View abstract...
30. Writing Committee Members, et al. 2021 PACES expert consensus statement on the indications and management of cardiovascular implantable electronic devices in pediatric patients: developed in collaboration with and endorsed by the Heart Rhythm Society (HRS), the American College of Cardiology (ACC), the American Heart Association (AHA), and the Association for European Paediatric and Congenital Cardiology (AEPC) Endorsed by the Asia Pacific Heart Rhythm Society (APHRS), the Indian Heart Rhythm Society (IHRS), and the Latin American Heart Rhythm Society (LAHRS). *JACC. Clinical Electrophysiology* 2021;7(11):1437-1472. DOI: 10.1016/j.jacep.2021.07.009. (Reaffirmed 2025 Jul) [Context Link 1] View abstract...
31. Chung MK, Daubert JP. Pacemakers and implantable cardioverter-defibrillators. 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; 2022:1321-1348. [Context Link 1, 2, 3]
32. Sennhauser S, Sridharan L. Left Ventricular Assist Device Emergencies: Diagnosis and Management. *Critical Care Clinics* 2024;40(1):159-177. DOI: 10.1016/j.ccc.2023.06.004. [Context Link 1] View abstract...
33. Teuteberg JJ, et al. The Society of Thoracic Surgeons Intermacs 2019 annual report: the changing landscape of devices and indications. *Annals of Thoracic Surgery* 2020;109(3):649-660. DOI: 10.1016/j.athoracsur.2019.12.005. [Context Link 1] View abstract...
34. Kirklin JK, et al. American Association for Thoracic Surgery/International Society for Heart and Lung Transplantation guidelines on selected topics in mechanical circulatory support. *Journal of Thoracic and Cardiovascular Surgery* 2020;159(3):865-896. DOI: 10.1016/j.jtcvs.2019.12.021. [Context Link 1] View abstract...
35. Hollis IB, et al. An ISHLT consensus statement on strategies to prevent and manage hemocompatibility related adverse events in patients with a durable, continuous-flow ventricular assist device. *Journal of Heart and Lung Transplantation* 2024;43(8):1199-1234. DOI: 10.1016/j.healun.2024.04.065. [Context Link 1] View abstract...
36. Singh T, Khan H, Gamble DT, Scally C, Newby DE, Dawson D. Takotsubo syndrome: pathophysiology, emerging concepts, and clinical implications. *Circulation* 2022;145(13):1002-1019. DOI: 10.1161/CIRCULATIONAHA.121.055854. [Context Link 1] View abstract...
37. Mason JC. Rheumatic diseases and the cardiovascular system. 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; 2022:1809-1828. [Context Link 1, 2, 3]
38. Ahmed O, et al. Non-bacterial thrombotic endocarditis: a clinical and pathophysiological reappraisal. *European Heart Journal* 2025;46(3):236-249. DOI: 10.1093/eurheartj/ehae788. [Context Link 1, 2] View abstract...
39. Valente AM, Dorfman AL, Babu-Narayan SV, Krieger EV. Congenital heart disease in the adolescent and adult. 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; 2022:1541-1586. [Context Link 1]
40. Stout KK, et al. 2018 AHA/ACC guideline for the management of adults with congenital heart disease: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. *Circulation* 2019;139(14):e698-e800. DOI: 10.1161/CIR.0000000000000603. (Reaffirmed 2025 Jun) [Context Link 1] View abstract...
41. Birati EY, Rame JE. Post-heart transplant complications. *Critical Care Clinics* 2014;30(3):629-637. DOI: 10.1016/j.ccc.2014.03.005. [Context Link 1, 2] View abstract...
42. Dipchand AI. Current state of pediatric cardiac transplantation. *Annals of Cardiothoracic Surgery* 2018;7(1):31-55. DOI: 10.21037/acs.2018.01.07. [Context Link 1, 2, 3] View abstract...
43. Demiralp G, Arrigo RT, Cassara C, Johnson MR. Heart transplantation-postoperative considerations. *Critical Care Clinics* 2024;40(1):137-157. DOI: 10.1016/j.ccc.2023.05.004. [Context Link 1] View abstract...

44. Gavrila EI, et al. Primary graft dysfunction after heart transplantation: current evidence and implications for clinical practice. *Current Cardiology Reports* 2025;27(1):24. DOI: 10.1007/s11886-024-02153-z. [Context Link 1, 2] View abstract...
45. Kliegman RM, et al. Pediatric heart and heart-lung transplantation. In: Kliegman RM, et al., editors. *Nelson Textbook of Pediatrics*. 22nd ed. Elsevier; 2025:2902-2906. [Context Link 1]
46. Quader M, et al. Primary graft dysfunction after heart transplantation: Outcomes and resource utilization. *Journal of Cardiac Surgery* 2019;34(12):1519-1525. DOI: 10.1111/jocs.14274. [Context Link 1] View abstract...
47. Isath A, et al. Trends, burden, and impact of arrhythmias on cardiac transplant recipients: a 16-year nationwide study. *Current Problems in Cardiology* 2023;48(3):Online. DOI: 10.1016/j.cpcardiol.2022.101504. [Context Link 1] View abstract...
48. Alsaeed M, Husain S. Infections in heart and lung transplant recipients. *Infectious Disease Clinics of North America* 2024;38(1):103-120. DOI: 10.1016/j.idc.2023.11.003. [Context Link 1] View abstract...
49. Laks JA, Dipchand AI. Cardiac allograft vasculopathy: A review. *Pediatric Transplantation* 2022;26(3):Online. DOI: 10.1111/petr.14218. [Context Link 1, 2] View abstract...
50. Ortega-Legaspi JM, Bravo PE. Diagnosis and management of cardiac allograft vasculopathy. *Heart* 2022;108(8):586-592. DOI: 10.1136/heartjnl-2020-318063. [Context Link 1] View abstract...
51. Sakusic A, Rabinstein AA. Neurological complications in patients with heart transplantation. *Seminars in Neurology* 2021;41(4):447-452. DOI: 10.1055/s-0041-1726285. [Context Link 1] View abstract...
52. Heidenreich PA, et al. 2022 AHA/ACC/HFSA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation* 2022;145(18):e895-e1032. DOI: 10.1161/CIR.0000000000001063. (Reaffirmed 2025 Jan) [Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12] View abstract...
53. Blume ED, et al. Palliative care across the life span for children with heart disease: a scientific statement from the American Heart Association. *Circulation. Cardiovascular Quality and Outcomes* 2023;16(2):Online. DOI: 10.1161/HCQ.000000000000114. [Context Link 1, 2, 3, 4, 5] View abstract...
54. Chuzi S, et al. Integration of palliative care into heart failure care: consensus-based recommendations from the Heart Failure Society of America. *Journal of Cardiac Failure* 2025;31(3):559-573. DOI: 10.1016/j.cardfail.2024.10.435. [Context Link 1, 2, 3, 4, 5] View abstract...
55. Centers for Medicare and Medicaid Services. "Admissions." 42 CFR 412.3 Washington, DC 2025 Jul [accessed 2025 Jul 22] Accessed at: <https://www.ecfr.gov/current/title-42/chapter-IV/subchapter-B/part-412>. [Context Link 1, 2]
56. Miller JM, Ellenbogen KA. Therapy for 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; 2022:1208-1244. [Context Link 1, 2, 3, 4]
57. Rao SV, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation* 2025;DOI: 10.1161/CIR.0000000000001309. (Reaffirmed 2025 Mar 04) [Context Link 1, 2, 3, 4] View abstract...
58. Amdani S, et al. Evaluation and management of chronic heart failure in children and adolescents with congenital heart disease: a scientific statement from the American Heart Association. *Circulation* 2024;150(2):Online. DOI: 10.1161/CIR.0000000000001245. [Context Link 1, 2] View abstract...
59. Shen WK, et al. 2017 ACC/AHA/HRS guideline for the evaluation and management of patients with syncope: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, and the Heart Rhythm Society. *Circulation* 2017;136(5):e60-e122. DOI: 10.1161/CIR.0000000000000499. (Reaffirmed 2025 Jul) [Context Link 1] View abstract...
60. Holland TL, Bayer AS, Fowler VG. Endocarditis and intravascular infections. In: Bennett JE, Dolin R, Blaser MJ, editors. *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases*. 9th ed. Philadelphia, PA: Elsevier; 2020:1068-1108.e12. [Context Link 1]
61. Gulati M, et al. 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation* 2021;144(22):e368-e454. DOI: 10.1161/CIR.0000000000001029. (Reaffirmed 2025 Jun) [Context Link 1] View abstract...
62. Writing Committee Members, et al. 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA guideline for the management of patients with chronic coronary disease: a report of the American Heart Association/American College of Cardiology joint committee on clinical practice guidelines. *Journal of the American College of Cardiology* 2023;82(9):833-955. DOI: 10.1016/j.jacc.2023.04.003. [Context Link 1] View abstract...
63. 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. [Context Link 1]
64. 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. [Context Link 1] View abstract...
65. Yealy DM, Kosowsky JM. Dysrhythmias. In: Walls RM, editor. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 10th ed. Elsevier; 2023:890-920.e2. [Context Link 1, 2]
66. Joglar JA, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. *Journal of the American College of Cardiology* 2024;149(1):Online. DOI: 10.1016/j.jacc.2023.08.017. (Reaffirmed 2025 Mar) [Context Link 1] View abstract...
67. Aufderheide TP. Peripheral arteriovascular disease. In: Walls RM, editor. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 10th ed. Elsevier; 2023:1008-1021.e3. [Context Link 1]
68. Hoffer LJ, Bistrian BR, Driscoll DF. Enteral and parenteral nutrition. 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; 2022:2539-2546. [Context Link 1]
69. Centers for Medicare and Medicaid Services. "Hospital services excluded from payment under the hospital outpatient prospective payment system." 42 CFR 419.22 Washington, DC 2023 Jul [accessed 2025 Jul 22] Accessed at: <https://www.ecfr.gov/>. [Context Link 1]

70. Centers for Medicare and Medicaid Services. "Requirements relating to basic benefits." 42 CFR 422.101 Washington, DC 2025 Jun 03 [accessed 2025 Jul 23] Accessed at: <https://www.ecfr.gov/>. [Context Link 1]
71. Centers for Medicare and Medicaid Services. Medicare Benefit Policy Manual. Chapter 1 - Inpatient Hospital Services Covered Under Part A Rev. 10892 [Internet] Centers for Medicare and Medicaid Services. 2021 Aug Accessed at: <https://www.cms.gov/manuals/>. [accessed 2025 Sep 09] [Context Link 1]
72. Centers for Medicare and Medicaid Services. Medicare Benefit Policy Manual. Chapter 6 - Hospital Services Covered Under Part B Rev. 12425 [Internet] Centers for Medicare and Medicaid Services. 2023 Dec Accessed at: <http://www.cms.gov/manuals/>. [accessed 2025 Sep 09] [Context Link 1]
73. Centers for Medicare and Medicaid Services. Medicare Benefit Policy Manual. Chapter 15 - Covered Medical and Other Health Services Rev. 13108 [Internet] Centers for Medicare and Medicaid Services. 2025 Apr 11 Accessed at: <https://www.cms.gov/manuals/>. [accessed 2025 Sep 09] [Context Link 1]
74. Centers for Medicare and Medicaid Services. Medicare Program Integrity Manual. Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment Rev. 10365 [Internet] Centers for Medicare and Medicaid Services. 2020 Oct 02 Accessed at: <https://www.cms.gov/medicare/regulations-guidance/manuals/internet-only-manuals-ioms>. [accessed 2025 Sep 09] [Context Link 1]
75. Medicare Coverage Database. [Internet] Centers for Medicare and Medicaid Services. Accessed at: <https://www.cms.gov/medicare-coverage-database/search.aspx>? Updated 2025 [accessed 2025 Oct 23] [Context Link 1]

Footnotes

[A] Patients with first-degree atrioventricular block are usually asymptomatic; however, in severe cases (eg, PR interval greater than 300 msec), dyssynchrony between atrial and ventricular contraction may occur, resulting in symptoms from decreased cardiac output and increased pulmonary congestion.(9) [A in Context Link 1, 2]

[B] Examples of reversible etiologies include increased vagal tone, metabolic abnormalities, and medications.(9)(10) [B in Context Link 1, 2, 3]

[C] Mobitz type I (Wenckebach) second-degree heart block is common, is usually caused by disease within the atrioventricular node, and has a generally benign prognosis. Mobitz type II and high-grade second-degree atrioventricular block are caused by disease distal to the atrioventricular node (infranodal). Patients with distal infranodal second-degree blocks are at risk of developing infranodal third-degree blocks, which are characterized by slow ventricular escape rhythms that may cause hemodynamic instability. Mobitz type II second-degree heart block has been associated with progression to third-degree heart block, syncope, and sudden death, and should be monitored until a pacemaker is placed.(8)(11) [C in Context Link 1, 2]

[D] Most life-threatening arrhythmias caused by cardiac contusions occur within the first 48 hours of injury.(13) [D in Context Link 1]

[E] Causes of hemopericardium include trauma, myocardial infarction with ventricular wall rupture, malignancy, retrograde bleed from aortic dissection, or iatrogenic injury (eg, from a catheter-based cardiac procedure, pacemaker or implantable defibrillator insertion, epicardial intervention, or laparoscopic gastroesophageal surgery).(14)(15)(17) [E in Context Link 1]

[F] Pneumopericardium may be caused by trauma, asthma and other lung diseases associated with high alveolar pressures, fistula, infection with gas-producing organism, vigorous Valsalva maneuvers (eg, during recreational drug inhalation or weightlifting), or be the result of an iatrogenic complication (eg, pericardiocentesis, other cardio-invasive procedure, or high lung inflation pressure).(18) It has also been reported to occur in patients with COVID-19 infection.(19) [F in Context Link 1]

[G] Nonbacterial thrombotic endocarditis is usually asymptomatic unless valvular dysfunction occurs, there is an embolic event, or the valvular vegetations become secondarily infected.(37)(38) [G in Context Link 1]

[H] Due to denervation of a transplanted heart, cardiac allograft vasculopathy resulting in myocardial ischemia may not cause chest pain and therefore may not be noticed until significant heart damage and infarction have occurred, causing symptoms such as heart failure, syncope, cardiac arrhythmias, or cardiac arrest.(42)(49) [H in Context Link 1]

[I] Palliative or formal hospice patient care may be needed on an inpatient basis for symptoms or conditions that cannot be controlled by continuous care at any other level.(52)(53)(54) [I in Context Link 1]

[J] Palliative care or formal hospice enrollment may be indicated for terminal disease or symptom control.(52)(53)(54) [J in Context Link 1]

[K] See Intensive Care Guidelines  GRG and Intermediate Care Guidelines  GRG. [K in Context Link 1]

[L] See Clinical Indications for Admission to Inpatient Care in this guideline. [L in Context Link 1]

Definitions

Activity level acceptable

- Activity level acceptable, as indicated by **1 or more** of the following:
 - Patient ambulatory and can perform ADL as appropriate for age and development
 - Activity at baseline
 - Activity level acceptable for next level of care

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/1.73m² (0.58 mL/sec/1.73m²)
 -  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⁾

References

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)
2. Weisbord SD, Palevsky PM. Prevention and management of acute kidney injury. In: Yu AS, Chertow GM, Luyckx VA, Marsden PA, Skorecki K, Taal MW, editors. Brenner and Rector's The Kidney. 11th ed. Philadelphia, PA: Elsevier; 2020:940-977.e15.
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.
4. Gaudry S, Palevsky PM, Dreyfuss D. Extracorporeal kidney-replacement therapy for acute kidney injury. New England Journal of Medicine 2022;386(10):964-975. DOI: 10.1056/NEJMr2104090.

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/1.73m² (1.25 mL/sec/1.73m²).⁽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

1. Maher PJ. Confusion. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:126-131.e1.
2. Lei C, Smith C. Depressed consciousness and coma. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:117-125.e1.
3. Abraham G, Maher PJ. Delirium and dementia. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1269-1280.e2.
4. Holler-Managan YF. Neurologic evaluation. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:3550-3560.

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.
2. Lei C, Smith C. Depressed consciousness and coma. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:117-125.e1.
3. Abraham G, Maher PJ. Delirium and dementia. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1269-1280.e2.
4. Holler-Managan YF. Neurologic evaluation. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:3550-3560.

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

References

1. Kusumoto FM, et al. 2018 ACC/AHA/HRS guideline on the evaluation and management of patients with bradycardia and cardiac conduction delay: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. Circulation 2019;140(8):e382-e482. DOI: 10.1161/CIR.0000000000000628. (Reaffirmed 2025 Jun)
2. Yealy DM, Kosowsky JM. Dysrhythmias. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:890-920.e2.
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. 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.
2. Dalal AS, Van Hare GF. Disturbances of rate and rhythm of the heart. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:2844-2859.e1.
3. Joglar JA, et al. 2023 HRS Expert Consensus Statement on the management of arrhythmias during pregnancy. Heart Rhythm 2023;20(10):Online. DOI: 10.1016/j.hrthm.2023.05.017.
4. Garan H. Ventricular arrhythmias. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:332-340.
5. Al-Khatib SM, et al. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. Circulation 2018;138(13):e272-e391. DOI: 10.1161/CIR.0000000000000549. (Reaffirmed 2025 Jun)
6. Myerburg RJ, Lampert R. Cardiac arrest and life-threatening arrhythmias. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:312-317.
7. Miller JM, Ellenbogen KA. Therapy for 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; 2022:1208-1244.
8. Patton KK, Olgin JE. Bradyarrhythmias and atrioventricular block. 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; 2022:1312-1320.
9. Tan NY, Witt CM, Oh JK, Cha YM. Left bundle branch block: current and future perspectives. Circulation. Arrhythmia and Electrophysiology 2020;13(4):e008239. DOI: 10.1161/CIRCEP.119.008239.
10. Joglar JA, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. Journal of the American College of Cardiology 2024;149(1):Online. DOI: 10.1016/j.jacc.2023.08.017. (Reaffirmed 2025 Mar)
11. Zimetbaum P, Goldman L. Supraventricular ectopy and tachyarrhythmias. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:322-332.
12. Santucci PA, Wilber DJ. Electrophysiologic procedures and surgery. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:340-347.
13. Pendharkar SS, et al. AHA telemetry guidelines improve telemetry utilization in the inpatient setting. American Journal of Managed Care 2020;26(11):476-481. DOI: 10.37765/ajmc.2020.88525.

Cardiovascular status acceptable

- Cardiovascular status acceptable, as indicated by **ALL** of the following:
 - Cardiac rhythm acceptable, as indicated by **1 or more** of the following(1):
 - Normal sinus or paced rhythm
 - Sinus arrhythmia or supraventricular arrhythmia (eg, atrial fibrillation) with ventricular rate controlled, and no need for cardioversion(2)
 - No severe cardiac arrhythmias noted (eg, sustained ventricular tachycardia, ventricular fibrillation)(1)
 - No severe cardiac or peripheral ischemia(3)(4)

- Heart failure or other cardiovascular disease is **1 or more** of the following(5):
 - Not present
 - At baseline
 - Manageable at next level of care

References

- Yealy DM, Kosowsky JM. Dysrhythmias. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:890-920.e2.
- Joglar JA, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. Journal of the American College of Cardiology 2024;149(1):Online. DOI: 10.1016/j.jacc.2023.08.017. (Reaffirmed 2025 Mar)
- Rao SV, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI Guideline for the Management of Patients With Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation 2025;DOI: 10.1161/CIR.0000000000001309. (Reaffirmed 2025 Mar 04)
- Aufderheide TP. Peripheral arteriovascular disease. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1008-1021.e3.
- Heidenreich PA, et al. 2022 AHA/ACC/HFSA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation 2022;145(18):e895-e1032. DOI: 10.1161/CIR.0000000000001063. (Reaffirmed 2025 Jan)

General Discharge Criteria met

- General Discharge Criteria met or Pediatric General Discharge Criteria met (if either is relevant or necessary for patient's condition)

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.
3. Angus DC. Approach to the patient with shock. In: Goldman L, Cooney KA, editors. *Goldman-Cecil Medicine*. 27th ed. Elsevier; 2024:658-665.
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/emered-2015-205532.
5. Weiss SL, Tissieres P, Peters MJ. Shock. In: Kliegman RM, et al., editors. *Nelson Textbook of Pediatrics*. 22nd ed. Elsevier; 2025:600-611.
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.
7. Wardi G, Brice J, Correia M, Liu D, Self M, Tainter C. Demystifying lactate in the emergency department. *Annals of Emergency Medicine* 2020;75(2):287-298. DOI: 10.1016/j.annemergmed.2019.06.027.
8. Kraut JA, Madias NE. Lactic acidosis. *New England Journal of Medicine* 2014;371(24):2309-2319. DOI: 10.1056/NEJMra1309483.
9. Olivieri L, Chasm R. Diabetic ketoacidosis in the pediatric emergency department. *Emergency Medicine Clinics of North America* 2013;31(3):755-773. DOI: 10.1016/j.emc.2013.05.004.
10. Maloney GE, Glauser JM. Diabetes mellitus and disorders of glucose homeostasis. In: Walls RM, editor. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 10th ed. Elsevier; 2023:1543-1558.e2.
11. Arnold TD, Miller M, van Wessem KP, Evans JA, Balogh ZJ. Base deficit from the first peripheral venous sample: a surrogate for arterial base deficit in the trauma bay. *Journal of Trauma* 2011;71(4):793-7; discussion 797. DOI: 10.1097/TA.0b013e31822ad694.
12. Malinoski DJ, Todd SR, Slone S, Mullins RJ, Schreiber MA. Correlation of central venous and arterial blood gas measurements in mechanically ventilated trauma patients. *Archives of Surgery* 2005;140(11):1122-5. DOI: 10.1001/archsurg.140.11.1122.
13. Zakrisson T, McFarlan A, Wu YY, Keshet I, Nathens A. Venous and arterial base deficits: do these agree in occult shock and in the elderly? A Bland-Altman analysis. *Journal of Trauma and Acute Care Surgery* 2013;74(3):936-9. DOI: 10.1097/TA.0b013e318282747a.
14. Alexander PMA, et al. Cardiovascular dysfunction criteria in critically ill children: the PODIUM consensus conference. *Pediatrics* 2022;149(1 Suppl 1):S39-S47. DOI: 10.1542/peds.2021-052888F.
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. Schrager 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. Schrager 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. Schrager 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.

Hypoxemia

- Hypoxemia, as indicated by **1 or more** of the following⁽¹⁾:
 - Patient without baseline need for supplemental oxygen with oxygen saturation (SpO₂) of less than 90% or arterial blood gas partial pressure of oxygen (PaO₂) 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 SpO₂ greater than 89% or PaO₂ 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. Schrager 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. Jamali H, et al. Racial disparity in oxygen saturation measurements by pulse oximetry: evidence and implications. Annals of the American Thoracic Society 2022;19(12):1951-1964. DOI: 10.1513/AnnalsATS.202203-270CME.
3. 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. Pulse oximetry (SpO₂) may underestimate arterial saturation (SaO₂), 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.

Inpatient anticoagulation needed

- Contraindication to outpatient use of medication with rapid anticoagulation effect (eg, IV unfractionated heparin and warfarin indicated),^[A] as indicated by **ALL** of the following⁽¹⁾⁽²⁾⁽⁴⁾⁽⁵⁾:
 - Contraindication to use of low-molecular-weight heparin, as indicated by **1 or more** of the following:
 - Current or history of heparin-induced thrombocytopenia
 - Severe thrombocytopenia (eg, platelet count less than 50,000/mm³ (50 x10⁹/L))
 - Allergy to heparin, low-molecular-weight heparin, or product components
 - Need for neuraxial anesthesia or spinal puncture anticipated
 - Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)
 - Contraindication to use of fondaparinux, as indicated by **1 or more** of the following:
 - Severe thrombocytopenia (eg, platelet count less than 50,000/mm³ (50 x10⁹/L))
 - Allergy to fondaparinux, related drugs, or product components
 - Renal failure (creatinine clearance less than 30 mL/min/1.73m² (0.50 mL/sec/1.73m²) or on dialysis)
 -  eGFR - Adult Calculator  eGFR - Pediatric Calculator
 - Pregnancy⁽⁴⁾
 - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)
 - Mechanical heart valve
 - Need for neuraxial anesthesia or spinal puncture anticipated
 - Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)
 - BMI greater than or equal to 50^[B]
 - Contraindication to use of oral direct thrombin inhibitor (eg, dabigatran) or oral factor Xa inhibitor (eg, apixaban, edoxaban, rivaroxaban), as indicated by **1 or more** of the following^{[C][D](11)}:
 - Severe thrombocytopenia (eg, platelet count less than 50,000/mm³ (50 x10⁹/L))
 - Allergy to medication or product components
 - Pregnancy or breast-feeding^{[D](4)(11)}
 - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)⁽¹²⁾
 - Renal failure (creatinine clearance less than 15 mL/min/1.73m² (0.25 mL/sec/1.73m²) or on dialysis)^{[D](11)}
 -  eGFR - Adult Calculator  eGFR - Pediatric Calculator
 - Mechanical heart valve^{[D](11)(13)}
 - Atrial fibrillation with rheumatic mitral stenosis^{[D](11)}
 - Thrombotic antiphospholipid syndrome^{[D](11)}
 - Left ventricular thrombus^{[D](11)}
 - Catheter-associated deep venous thrombosis^{[D](11)}
 - Cerebral venous sinus thrombosis^{[D](11)}
 - Need for neuraxial anesthesia or spinal puncture anticipated
 - BMI greater than or equal to 50^[B]

References

1. Stevens SM, et al. Antithrombotic therapy for VTE disease: second update of the CHEST guideline and expert panel report. *Chest* 2021;160(6):e545-e608. DOI: 10.1016/j.chest.2021.07.055. (Reaffirmed 2025 Jan)
2. Lip GYH, et al. Antithrombotic therapy for atrial fibrillation: CHEST guideline and expert panel report. *Chest* 2018;154(5):1121-1201. DOI: 10.1016/j.chest.2018.07.040. (Reaffirmed 2025 Jul)
3. Di Nisio M, van Es N, Buller HR. Deep vein thrombosis and pulmonary embolism. *Lancet* 2017;388(10063):3060-3073. DOI: 10.1016/S0140-6736(16)30514-1.
4. Thromboembolism in pregnancy. ACOG Practice Bulletin No. 196. *Obstetrics & Gynecology* 2018 (ACOG reaffirmed 2025);132(1):e1-e17. DOI: 10.1097/AOG.0000000000002706. (Reaffirmed 2025 Jul)
5. Joglar JA, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. *Journal of the American College of Cardiology* 2024;149(1):Online. DOI: 10.1016/j.jacc.2023.08.017. (Reaffirmed 2025 Mar)
6. Dobry P, et al. Treatment of atrial fibrillation and venous thromboembolism with factor Xa inhibitors in severely obese patients. *Journal of Thrombosis and Haemostasis* 2024;22(12):3500-3509. DOI: 10.1016/j.jth.2024.08.009.
7. Martin KA, Beyer-Westendorf J, Davidson BL, Huisman MV, Sandset PM, Moll S. Use of direct oral anticoagulants in patients with obesity for treatment and prevention of venous thromboembolism: Updated communication from the ISTH SSC Subcommittee on Control of Anticoagulation. *Journal of Thrombosis and Haemostasis* 2021;19(8):1874-1882. DOI: 10.1111/jth.15358.
8. Rosovsky RP, et al. Direct Oral Anticoagulants in Obese Patients with Venous Thromboembolism: Results of an Expert Consensus Panel. *American Journal of Medicine* 2023;136(6):523-533. DOI: 10.1016/j.amjmed.2023.01.010.
9. Ellenbogen MJ, Ardesirrouhanifard S, Segal JB, Streiff MB, Deitelzweig SB, Brotman DJ. Safety and effectiveness of apixaban versus warfarin for acute venous thromboembolism in patients with end-stage kidney disease: A national cohort study. *Journal of Hospital Medicine* 2022;17(10):809-818. DOI: 10.1002/jhm.12926.
10. Wetmore JB, Herzog CA, Yan H, Reyes JL, Weinhandl ED, Roetker NS. Apixaban versus warfarin for treatment of venous thromboembolism in patients receiving long-term dialysis. *Clinical Journal of the American Society of Nephrology* 2022;17(5):693-702. DOI: 10.2215/CJN.14021021.

11. Bejjani A, et al. When direct oral anticoagulants should not be standard treatment: JACC state-of-the-art review. *Journal of the American College of Cardiology* 2024;83(3):444-465. DOI: 10.1016/j.jacc.2023.10.038.
12. Carlin S, et al. Anticoagulation for stroke prevention in atrial fibrillation and treatment of venous thromboembolism and portal vein thrombosis in cirrhosis: guidance from the SSC of the ISTH. *Journal of Thrombosis and Haemostasis* 2024;22(9):2653-2669. DOI: 10.1016/j.jtha.2024.05.023.
13. Ryu R, Tran R. DOACs in mechanical and bioprosthetic heart valves: a narrative review of emerging data and future directions. *Clinical and Applied Thrombosis/Hemostasis* 2022;28:Online. DOI: 10.1177/10760296221103578.

Footnotes

- A. Patients using low-molecular-weight heparin, fondaparinux, an oral direct thrombin inhibitor, or an oral factor Xa inhibitor achieve full anticoagulation rapidly (eg, a few hours after first dose).(1)(2)(3)
- B. The clinical utility of factor Xa inhibitors or direct thrombin inhibitors in patients with a BMI greater than or equal to 50 is unclear, due to a relative paucity of data in these patients.(6)(7)(8) While some do advocate the use of factor Xa inhibitors or direct thrombin inhibitors in this patient group, others suggest that absent clear evidence of efficacy, it is preferable to use heparin (low-molecular-weight or unfractionated) transitioning to warfarin because of the long established ability to carefully adjust dosage based on measurement of anticoagulant effect (eg, via measurement of anti-factor Xa level, prothrombin/INR).(6)(7)(8)
- C. With caution and dose adjustment, apixaban can be administered to patients with stage 5 renal failure (creatinine clearance less than 15 mL/min/1.73m² (0.25 mL/sec/1.73m²)) or who are receiving hemodialysis.(5)(9)(10) Rivaroxaban and edoxaban are not recommended for patients with stage 5 or hemodialysis-dependent renal failure.
- D. A systematic review of relevant randomized controlled trials concludes that direct oral anticoagulants (ie, oral factor Xa and oral thrombin inhibitors) should not be standard treatment for patients with mechanical heart valves, atrial fibrillation with rheumatic mitral stenosis, or thrombotic antiphospholipid syndrome.(11) For these indications, use of a vitamin K antagonist (eg, warfarin) is preferred.(11) The review further concludes that the efficacy and safety of direct oral anticoagulants is uncertain in patients with left ventricular thrombus, catheter-associated deep venous thrombosis, or cerebral venous sinus thrombosis.(11) Concerning patients with end-stage renal disease, the review states that the choice of an anticoagulant should be individualized due to the lack of definitive data, balancing the pros and cons of a direct oral anticoagulant and vitamin K antagonist-based anticoagulation.(11) Patients who are pregnant or breast-feeding should avoid direct oral anticoagulants pending further study concerning safety.(11)

Intake acceptable

- Intake acceptable, as indicated by **1 or more** of the following(1):
 - Oral hydration, medications, and diet
 - Enteral hydration, medications, and diet
 - Administration routes performable at next level of care

References

1. Hoffer LJ, Bistrian BR, Driscoll DF. Enteral and parenteral nutrition. 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; 2022:2539-2546.

No inpatient interventions needed

- No inpatient interventions needed; examples include:
 - Vital signs, neurologic signs, or vascular checks more often than feasible at next level of care
 - Cardiac monitoring
 - IV anticoagulation, antiarrhythmics, or platelet inhibitors
 - Acute thrombolytics
 - Urgent or emergent surgery
 - Temporary pacemaker
 - Urgent or emergent cardioversion
 - Urgent or emergent electrophysiologic study and procedure
 - Urgent or emergent pacemaker or implantable cardioverter-defibrillator implantation
 - Urgent or emergent cardiac catheterization or angioplasty
 - Urgent or emergent cardiac stress test or other evaluation

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.
2. Dalal AS, Van Hare GF. Syncope. In: Kliegman RM, et al., editors. *Nelson Textbook of Pediatrics*. 22nd ed. Elsevier; 2025:592-599.
3. Fang JC, O'Gara PT. History and physical examination: an evidence-based approach. 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; 2022:123-140.

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.

Social Determinants of Health Assessment

- Risk of poor health outcomes may be increased by the presence of **1 or more** of the following social determinants of health(1)(2)(3):
 - Housing insecurity, as indicated by **1 or more** of the following:
 - Individual or caregiver's current living situation is **1 or more** of the following(4):
 - Does not have own housing (eg, staying in a hotel, shelter, or with others)
 - Has own housing (eg, house, apartment), but at risk of losing it in the future (ie, behind on rent or mortgage)
 - Has own housing (eg, house, apartment), but has lived in 3 or more places in past year
 - Current housing has **1 or more** of the following:
 - Electrical appliances (eg, stove, refrigerator) not working or unavailable
 - Insufficient heating or cooling
 - Insufficient ventilation
 - Lead paint or pipes
 - Mold
 - Pests (eg, bugs) or rodents
 - Smoke detectors not working or unavailable
 - Food insecurity, as indicated by **1 or more** of the following(5):
 - In the past year, individual or caregiver ran out of food and did not have money to buy more food.

- In the past year, individual or caregiver worried that they would run out of food before they received money to buy more food.
- Insufficient transportation, as indicated by **1 or more** of the following(6):
 - In the past year, individual or caregiver missed medical appointments or could not get medications due to lack of transportation.
 - In the past year, individual or caregiver missed nonmedical activities, work, or could not get things needed for daily living due to lack of transportation.
- Insufficient utilities, as indicated by **1 or more** of the following(7):
 - Utilities (eg, electricity, water, gas, or oil) are currently shut off or unavailable.
 - In the past year, electric, water, gas, or oil company threatened to shut off services.
- Personal safety risk, as indicated by **2 or more** of the following(5):
 - Individual is sometimes or frequently physically hurt by another person (including family member).
 - Individual is sometimes or frequently insulted or talked down to by another person (including family member).
 - Individual is sometimes or frequently threatened with physical harm by another person (including family member).
 - Individual is sometimes or frequently screamed or cursed at by another person (including family member).
- Insufficient dependent care, as indicated by **1 or more** of the following:
 - In the past year, individual or caregiver was unable to work due to lack of dependent care.
 - In the past year, individual or caregiver was unable to work more (additional) hours due to lack of dependent care.
 - In the past year, individual or caregiver missed medical appointments or could not get medications due to lack of dependent care.
 - In the past year, individual or caregiver missed nonmedical activities (eg, school, church, social activity) due to lack of dependent care.
- Depression risk, as indicated by **ALL** of the following(8):
 - In the past 2 weeks, individual had little interest or pleasure in normal activities on at least several days.
 - In the past 2 weeks, individual felt down, depressed, or hopeless on at least several days.

References

1. Scanlon A, Reinisch C. Social determinants of health. In: Harding MM, Kwong J, Hagler D, Reinisch C, editors. *Lewis's Medical-Surgical Nursing: Assessment and Management of Clinical Problems*. 12th ed. St. Louis, MO: Mosby; 2023:18-20.
2. Billioux A, Verlander K, Anthony S, Alley D. Standardized Screening for Health-Related Social Needs in Clinical Settings: the Accountable Health Communities Screening Tool. [Internet] National Academy of Sciences. 2017 May Accessed at: <https://nam.edu/>. [accessed 2025 Sep 12]
3. Addressing social determinants of health. In: Perez R, editor. *CMSA's Integrated Case Management*. 2nd ed. Springer Publishing Company LLC; 2023:62-75.
4. Sandel M, et al. Unstable housing and caregiver and child health in renter families. *Pediatrics* 2018;14(2):e20172199. DOI: 10.1542/peds.2017-2199.
5. Children's HealthWatch Survey. Screening Instrument [Internet] Children's HealthWatch. 2024 Feb 13 Accessed at: <https://childrenshealthwatch.org/>. [accessed 2025 Mar 31]
6. PRAPARE®: Protocol for Responding to and Assessing Patient Assets, Risks, and Experiences Screening Tool. 2.0 [Internet] Association of Asian Pacific Community Health Organizations (AAPCHO) and National Association of Community Health Centers (NACHC). 2025 Accessed at: <https://prapare.org/the-prapare-screening-tool/>. [accessed 2025 Sep 08]
7. Cook JT, et al. A brief indicator of household energy security: associations with food security, child health, and child development in US infants and toddlers. *Pediatrics* 2008;122(4):e867-75. DOI: 10.1542/peds.2008-0286.
8. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Medical Care* 2003;41(11):1284-92. DOI: 10.1097/01.MLR.0000093487.78664.3C.

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.

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.

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.

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 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⁾

Temporary subtherapeutic anticoagulation unacceptable

- Temporary subtherapeutic anticoagulation unacceptable because of high short-term risk of venous or arterial thromboembolism due to **1 or more** of the following[A][B](1)(3)(4):
 - Venous thromboembolism or left ventricular thrombus within past 3 months(4)
 - Underlying malignancy[C](4)
 - Patient with mechanical cardiac valve[D](1)(3)
 - Underlying hypercoagulable state (eg, protein C or protein S deficiency, antithrombin deficiency, antiphospholipid antibodies, severe thrombophilia)(4)
 - Patient at temporary high risk of thromboembolism (eg, status post orthopedic surgery)(4)
 - Atrial fibrillation and **1 or more** of the following[A]:
 - Recent stroke or transient ischemic attack (eg, within past 3 months) or prior perioperative stroke(1)(4)
 - Rheumatic valvular heart disease(3)(4)
 - CHA2DS2-VASc score of 7 or greater or CHADS2 score of 5 or greater[E](3)(4)

References

1. Joglar JA, et al. 2023 ACC/AHA/ACCP/HRS Guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association joint committee on clinical practice guidelines. Journal of the American College of Cardiology 2024;149(1):Online. DOI: 10.1016/j.jacc.2023.08.017. (Reaffirmed 2025 Mar)
2. Bejjani A, et al. When direct oral anticoagulants should not be standard treatment: JACC state-of-the-art review. Journal of the American College of Cardiology 2024;83(3):444-465. DOI: 10.1016/j.jacc.2023.10.038.
3. Douketis JD, et al. Perioperative management of antithrombotic therapy: an American College of Chest Physicians Clinical Practice Guideline. Chest 2022;162(5):e207-e243. DOI: 10.1016/j.chest.2022.07.025. (Reaffirmed 2025 Jul)
4. Thompson A, et al. 2024 AHA/ACC/ACS/ASNC/HRS/SCA/SCCT/SCMR/SVM guideline for perioperative cardiovascular management for noncardiac surgery: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation 2024;Online. DOI: 10.1161/CIR.0000000000001285. (Reaffirmed 2025 Mar)

Footnotes

- A. Very few patients with atrial fibrillation or atrial flutter (same criteria for anticoagulation apply) require inpatient care or need to have their inpatient stay extended due to a need to achieve immediate therapeutic anticoagulation (ie, stay in the hospital to receive IV unfractionated heparin until warfarin-induced anticoagulation is sufficient). Most patients, including those with clear indications for

long-term anticoagulation, do not need immediate anticoagulation, as the risk of an embolic event within the few days until their warfarin becomes therapeutic is very low (a small fraction of 1% per day).(1) Only patients deemed to be at particular risk for embolization (eg, mechanical valve, recent stroke or transient ischemic attack) are candidates for bridge therapy.(1) In addition, the vast majority of patients are eligible to be anticoagulated through use of an oral direct thrombin inhibitor (eg, dabigatran), an oral coagulation factor Xa inhibitor (eg, rivaroxaban, apixaban, edoxaban), or low-molecular-weight heparin, all of which achieve full anticoagulation rapidly (eg, a few hours after the first dose).(1)

- B. A systematic review of relevant randomized controlled trials concludes that direct oral anticoagulants (ie, oral factor Xa inhibitors and oral thrombin inhibitors) should not be standard treatment for patients with mechanical heart valves, atrial fibrillation with rheumatic mitral stenosis, or thrombotic antiphospholipid syndrome.(2) For these indications, the use of a vitamin K antagonist (eg, warfarin) is preferred.(2) The review further concludes that the efficacy and safety of direct oral anticoagulants are uncertain in patients with left ventricular thrombus, catheter-associated deep venous thrombosis, or cerebral venous sinus thrombosis.(2) Concerning patients with end-stage renal disease, the review states that the choice of an anticoagulant should be individualized due to the lack of definitive data, balancing the pros and cons of direct oral anticoagulant-based and vitamin K antagonist-based anticoagulation.(2) Patients who are pregnant or breast-feeding should avoid direct oral anticoagulants pending further study concerning safety.(2)
- C. A specialty society guideline identifies pancreatic cancer, myeloproliferative disorders, primary brain cancer, gastric cancer, and esophageal cancer as being especially high risk and states that patients with other malignancies may not be at high short-term risk of thromboembolism.(3)
- D. A specialty society guideline concludes that patients with atrial fibrillation and a mechanical cardiac valve are at high short-term risk of arterial thromboembolism.(1) Another specialty society guideline identifies the following features in patients with mechanical heart valves that confer high thrombotic risk: patients with a mitral valve and major risk factors for stroke, patients with mitral or aortic caged ball or tilting-disc valves, and patients with mechanical valves and recent stroke or transient ischemic attack.(3)
- E. Online calculators for the CHA2DS2-VASc score and the CHADS2 score are available at www.mdcalc.com/calc/801/cha2ds2-vasc-score-atrial-fibrillation-stroke-risk and www.mdcalc.com/calc/40/chads2-score-atrial-fibrillation-stroke-risk, respectively.

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