

Foot: Transmetatarsal Amputation

ORG: S-500 (ISC)

[Link to Codes](#)

MCG Health

Inpatient & Surgical Care
30th Edition

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Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Procedure

- Procedure is indicated for **1 or more** of the following:**NNNN**
 - ☐ Treatment of foot ulcer or severe infection, gangrene, or osteomyelitis and **ALL** of the following(3)(12)(13)(14)(15):
 - Nonoperative therapy (eg, wound care, offloading devices, antibiotics) has been tried and failed or is not appropriate.[A](3)(4)(12)
 - ☐ Alternative operative approach cannot be used because of **1 or more** of the following:
 - More distal amputation has failed or is not appropriate.(1)(2)(4)(12)
 - Debridement has failed (if indicated).(3)(4)(15)
 - Revascularization has failed, is not appropriate, or is not feasible (inoperable).(2)(3)(4)(12)
 - Neuropathy (eg, Charcot foot)(3)(13)

- o Severe trauma(1)(6)
- o Malignancy(1)(7)(16)
- o Severe burn(8)(9)
- o Severe frostbite(10)(11)(17)
- o Ischemic necrosis (eg, secondary to vasoconstrictor therapies, warfarin therapy, complication of arterial lines)(18)

Alternatives to Procedure

- Alternatives include:
 - o Offloading devices (eg, orthoses, removable knee-high or ankle-high devices, shoe modifications)(3)(19)
 - o Debridement or excision with possible use of skin grafts, free flaps, or pedicle flaps(17)(20)(21)
 - o Continued medical management or palliative care(5)(12)(22)(23)
 - o Achilles tendon lengthening procedure. See Ankle: Heel Cord Lengthening or Shortening [ISC guideline](#).
 - o Negative pressure wound therapy(3)(21)
 - o Thrombolytic therapy for frostbite(11)
 - o Lower extremity angioplasty, thrombolysis, endovascular revascularization, or vascular bypass and reconstruction procedure(2)(24)(25)
 - o Toe or other distal amputation(1)(5)(26)
 - o Foot reconstruction(27)(28)(29)
 - o More proximal amputation, including(30):
 - Disarticulation of foot at ankle through tibia and fibula (Syme amputation)(1)(20)(31)
 - Below knee amputation. See Leg Amputation, Above or Below Knee [ISC guideline](#).(21)

Operative Status Criteria

Goal Length of Stay: 3 days postoperative

- Inpatient

Hospitalization

Optimal Recovery Course

Day	Level of Care	Clinical Status	Activity	Routes	Interventions	Medications
1	• OR to floor • Social Determinants of Health Assessment • Adult Readmission Risk Assessment • Discharge planning	• Clinical Indications met[B]	• Possible assisted ambulation postoperatively	• IV fluids • IV medications • Diet as tolerated postoperatively	• Possible leg elevation	• Perioperative antibiotics

2	- Floor - Social Determinants of Health Assessment - Adult Readmission Risk Assessment	Hemodynamic stability	Assisted ambulation	- IV or oral hydration - IV or oral medications	- Wound management - Gait training	Antibiotics absent[C]
3	- Floor - Social Determinants of Health Assessment - Adult Readmission Risk Assessment	Wound intact No evidence of postoperative or surgical site infection	Increased ambulation	Oral hydration Oral medications Oral diet	Wound management	
4	- Social Determinants of Health Assessment - Adult Readmission Risk Assessment - Floor to discharge - Complete discharge planning	Hemodynamic stability Adequate supported ambulation Wound intact No evidence of postoperative or surgical site infection Pain absent or managed Discharge plans and education understood	Ambulatory or acceptable for next level of care	Oral hydration[D] Oral medications or regimen acceptable for next level of care Oral diet or acceptable for next level of care	Wound management	

(1)(2)(12)(33)(34)N

Recovery Milestones are indicated in **bold**.

Goal Length of Stay: 3 days postoperative

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

Extended Stay

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

- Extended stay beyond goal length of stay may be needed for(1)(34):
 - Failure to meet discharge criteria (recovery milestones within final day in Optimal Recovery Course)

- Expect brief stay extension.
- Severe infections (eg, extensive soft tissue damage, Bacteremia, hemodynamic instability)
 - Anticipate complex wound care, need for debridement, or skin grafting.
 - Anticipate possible transfer to recovery facility for care when patient is stable.
 - Expect brief stay extension.
- Active comorbidities (eg, diabetes, anemia, Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury))(27)(35)(36)(37)
 - Management of complicating conditions may prolong hospitalization.
 - Expect brief stay extension.

See Common Complications and Conditions [ISC](#) for further information.

Discharge

Discharge Planning

- Discharge planning includes[E]:
 - Assessment of needs and planning for care, including(39)(40):
 - Develop and modify treatment plan (involving multiple providers) as needed.
 - Evaluate and address preadmission functioning as needed.
 - Evaluate and address psychosocial status issues as indicated. See Psychosocial Assessment [SR](#) for further information.
 - Evaluate and address social determinants of health (eg, housing, food). See Social Determinants of Health Screening Tool [SR](#) for further information.
 - Evaluate and address patient or caregiver preferences as indicated.
 - Identify skilled services needed at next level of care, with specific attention to:
 - Neurovascular status assessment(1)
 - Pain management(41)
 - Rehabilitation therapy or equipment coordination(42)
 - Wound or dressing management(43)
 - Early identification of anticipated discharge destination; options include(40)(44):
 - Home; considerations include:
 - Home safety assessment. See Home Safety Assessment [SR](#) for further information.
 - ☐ Patient safe to go home; examples include(45)(46)(47):
 - Medical status stable for patient's condition
 - Functional care can safely be provided with available resources.
 - Mental status stable for patient's condition
 - Medication availability confirmed and reconciliation complete
 - Patient/caregiver education completed with written discharge instructions provided
 - Community resources identified and referrals made, as needed
 - Home care arranged, if indicated
 - Necessary medical equipment delivery arranged or available in home, if indicated
 - Necessary medical supplies ordered, or patient/caregiver can obtain, if indicated
 - Access to follow-up care

- Self-management ability if appropriate. See Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) Assessment [SR](#) for further information.
- Caregiver need, ability, and availability
- Post-acute skilled care or custodial care as indicated. See Discharge Planning Tool [SR](#) for further information.
- Transitions of care plan complete, including(40)(44)(48):
 - Patient and caregiver education complete.
 - See Teach-Back Tool [SR](#) for further information.
 - See Foot: Transmetatarsal Amputation: Patient Education for Clinicians [SR](#) for further information.
- Medication reconciliation completion includes(49)(50):
 - Compare patient's discharge list of medications (prescribed and over-the-counter) against provider's admission or transfer orders.
 - Assess each medication for correlation to disease state or medical condition.
 - Report medication discrepancies to prescribing provider, attending physician, and primary care provider, and ensure accurate medication order is identified.
 - Provide reconciled medication list to all treating providers.
 - Confirm that patient or caregiver can acquire medication.
 - Educate patient and caregiver.
 - Provide complete medication list to patient and caregiver.
 - Importance of presenting personal medication list to all providers at each care transition, including all provider appointments
 - Reason, dosage, and timing of medication (eg, use "teach-back" techniques)(51)
 - Encourage communication between patient, caregiver, and pharmacy for obtaining prescriptions, setting up home medication delivery, and reviewing for drug-drug interactions.
 - See Medication Reconciliation Tool [SR](#) for further information.
- Plan communicated to patient, caregiver, and all members of care team, including(52):
 - Inpatient care and service providers
 - Primary care provider
 - All post-discharge care and service providers
- Appointments planned or scheduled, which may include:
 - Primary care provider(53)
 - Foot and nail care by trained care provider(4)
 - Orthopedic surgeon(1)
 - Orthoses provider(1)
 - Rehabilitation therapy services(43)
 - Specialists for management of comorbidities as needed(4)
 - Vascular surgeon(54)
 - Other
- Outpatient testing and procedure plans made, which may include:
 - Other
- Referrals made for assistance or support, which may include:
 - Financial, for follow-up care, medication, and transportation(55)
 - Self-help or support groups(56)
 - Tobacco use treatment(57)

- Other
- Medical equipment and supplies coordinated (ie, delivered or delivery confirmed), which may include:
 - Ambulation devices (eg, cane, crutches, walker)(58)
 - Orthoses(1)
 - Wound care equipment and supplies(59)
 - Other

Discharge Destination

- Post-hospital levels of admission may include:
 - Home.
 - Home healthcare. See Home Care Indications for Admission Section [HC](#) in Foot: Transmetatarsal Amputation guideline in Home Care.
 - Recovery facility care. See Recovery Facility Care Indications for Admission Section [RFC](#) in Foot: Transmetatarsal Amputation guideline in Recovery Facility Care.

Evidence Summary

Criteria

The evidence for the clinical indications found in this guideline includes 14 published peer reviewed articles, 1 specialty society or other evidence-based guideline, and 3 book sections.

For treatment of foot ulcer or severe infection, gangrene, or osteomyelitis, an orthopedic surgery textbook supports transmetatarsal amputation if the injury involves multiple digits and some of the dorsal skin proximal to the metatarsophalangeal joints.(1) **(EG 2)** A surgery textbook and a narrative review state that transmetatarsal amputation may be indicated for treatment of foot ulcers with moderate to severe infection or when more distal amputation has failed or is not appropriate.(2)(3) **(EG 2)** An orthopedic surgery textbook notes that amputation may be necessary for patients who have irreparable vascular disease, have uncontrolled infection, and are not candidates for other surgical management.(4) **(EG 2)** A narrative review notes that transmetatarsal amputation may be considered after foot-sparing surgery (eg, debridement, resection of infected and necrotic bone without amputation) has failed.(5) **(EG 2)**

For severe trauma that results in compartment syndrome of the foot, a narrative review notes that transmetatarsal amputation may be necessary if another surgical intervention, such as fasciotomy, is not successful in relieving the pressure.(6) **(EG 2)**

For malignancy, a cohort study found that patients may require transmetatarsal amputation for sarcoma of the foot if chemotherapy and radiotherapy do not produce significant tumor response or if the neurovascular anatomy of the distal extremity is complex.(7) **(EG 2)**

For severe burn injuries, a systematic review and cohort study found that the need for foot amputation is rare, but patients with comorbidities such as diabetes or peripheral arterial disease are at higher risk.(8)(9) **(EG 2)**

For severe frostbite, cohort studies found that transmetatarsal amputation may be necessary, especially in patients at high altitude, for patients who experience a delay in receiving medical attention, or in patients who have contraindications to thrombolytic therapy.(10)(11) **(EG 2)**

Length of Stay

Analysis of national hospital discharge data shows 31% of hospitalized patients with a principal procedure of transmetatarsal amputation were discharged in 3 days or less.(34) **(EG 3)**

Rationale

Use of this MCG care guideline helps the clinician identify, for a given procedure, which patient-specific factors and clinical conditions are appropriate for that procedure. The evidence-based clinical criteria assist the clinician in the decision to appropriately perform a procedure, evaluating whether the potential benefits of a procedure outweigh the potential risks. For Medicare enrollees, surgical MCG care guidelines also identify which procedures CMS has designated as inpatient only.

Use of these evidence-based clinical criteria to support decision making around the need for a given procedure is of benefit to the patient, as all procedures come with inherent risk that must be balanced by anticipated clinical benefit. Utilizing evidence-based clinical criteria enables a more accurate and patient-specific decision-making process. In addition, the use of evidence-based guidelines can help reduce unwarranted variation in care, such as divergent clinical thresholds to perform a procedure for clinically similar patients that vary across geographic regions, between facilities, and among individual clinicians.

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(60); 42 CFR 419.22(61); 42 CFR 422.101(62)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(63); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(64); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(65); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(66)

Medicare Coverage Determinations: Medicare Coverage Database(67)

References

1. Richardson DR. Amputations of the foot. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:698-719.e2. [Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]
2. Mills JL Sr, Pallister ZS. Peripheral arterial disease. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:1767-1791. [Context Link 1, 2, 3, 4, 5]
3. Armstrong DG, Tan TW, Boulton AJM, Bus SA. Diabetic Foot Ulcers: A Review. Journal of the American Medical Association 2023;330(1):62-75. DOI: 10.1001/jama.2023.10578. [Context Link 1, 2, 3, 4, 5, 6, 7, 8] View abstract...
4. Bettin CC. Diabetic foot. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:4314-4344.e4. [Context Link 1, 2, 3, 4, 5, 6, 7]
5. Sohrabi K, Belczyk R. Surgical treatment of diabetic foot and ankle osteomyelitis. Clinics in Podiatric Medicine and Surgery 2022;39(2):307-319. DOI: 10.1016/j.cpm.2021.11.003. [Context Link 1, 2, 3] View abstract...
6. Lutter C, Schoffl V, Hotfiel T, Simon M, Maffulli N. Compartment syndrome of the foot: an evidence-based review. Journal of Foot and Ankle Surgery 2019;58(4):632-640. DOI: 10.1053/j.jfas.2018.12.026. [Context Link 1, 2] View abstract...

7. Erstad DJ, et al. Amputation for extremity sarcoma: contemporary indications and outcomes. *Annals of Surgical Oncology* 2018;25(2):394-403. DOI: 10.1245/s10434-017-6240-5. [Context Link 1, 2] View abstract...
8. Sharma A, Perrault D, Makarewicz NS, Pham T, Sheckter C, Gurtner G. Foot burns and diabetes: a systematic review of current clinical studies and proposal of a new treatment algorithm. *Journal of Burn Care and Research* 2023;Online. DOI: 10.1093/jbcr/irad019. [Context Link 1, 2] View abstract...
9. Bartley CN, Atwell K, Purcell L, Cairns B, Charles A. Amputation following burn injury. *Journal of Burn Care and Research* 2019;40(4):430-436. DOI: 10.1093/jbcr/irz034. [Context Link 1, 2] View abstract...
10. Carceller A, Javierre C, Rios M, Viscor G. Amputation risk factors in severely frostbitten patients. *International Journal of Environmental Research and Public Health* 2019;16(8):1351. DOI: 10.3390/ijerph16081351. [Context Link 1, 2] View abstract...
11. Shenaq DS, Beederman M, O'Connor A, Teele M, Robinson MR, Gottlieb LJ. Urban frostbite: strategies for limb salvage. *Journal of Burn Care and Research* 2019;40(5):613-619. DOI: 10.1093/jbcr/irz062. [Context Link 1, 2, 3] View abstract...
12. Senneville E, et al. IWGDF/IDSA guidelines on the diagnosis and treatment of diabetes-related foot infections (IWGDF/IDSA 2023). *Clinical Infectious Diseases* [Internet] 2023 Oct Accessed at: <https://www.idsociety.org/practice-guideline/diabetic-foot-infections/>. [accessed 2025 Sep 03] DOI: 10.1093/cid/ciad527. [Context Link 1, 2, 3, 4, 5, 6, 7] View abstract...
13. Harris RC, Fang W. Transmetatarsal amputation outcomes when utilized to address foot gangrene and infection: a retrospective chart review. *Journal of Foot and Ankle Surgery* 2021;60(2):269-275. DOI: 10.1053/j.jfas.2020.08.006. [Context Link 1, 2] View abstract...
14. Ogbeide OA, et al. Evolving trends in the management of diabetic foot ulcers: a narrative review. *Cureus* 2024;16(7):e65095. DOI: 10.7759/cureus.65095. [Context Link 1] View abstract...
15. Raspovic KM, Johnson MJ, Wukich DK. A stepwise approach to nonoperative and operative management of the diabetic foot ulceration. *Physical Medicine and Rehabilitation Clinics* 2022;33(4):833-844. DOI: 10.1016/j.pmr.2022.06.004. [Context Link 1, 2] View abstract...
16. Fanfan D, Alvarez JC, Gonzalez MR, Larios F, Shae J, Pretell-Mazzini J. Foot and ankle soft tissue sarcomas-treatment and oncologic outcomes: a systematic review of the literature. *Foot and Ankle International* 2023;44(11):1199-1207. DOI: 10.1177/10711007231198516. [Context Link 1] View abstract...
17. Coward A, Endorf FW, Nygaard RM. Revision surgery following severe frostbite injury compared to similar hand and foot burns. *Journal of Burn Care and Research* 2022;43(5):1015-1018. DOI: 10.1093/jbcr/irac082. [Context Link 1, 2] View abstract...
18. Bridges CS, et al. Acute compartment syndrome in pediatric patients on extracorporeal membrane oxygenation support. *Journal of Pediatric Orthopedics* 2024;44(3):e285-e291. DOI: 10.1097/BPO.0000000000002592. [Context Link 1] View abstract...
19. Kurze C, Farn CJ, Siow J. The interdisciplinary approach: preventive and therapeutic strategies for diabetic foot ulcers. *Foot and Ankle Clinics* 2022;27(3):529-543. DOI: 10.1016/j.fcl.2022.03.001. [Context Link 1] View abstract...
20. Yammine K. Conservative surgery in the management of diabetic foot complications (excluding Charcot). The role of the orthopedic surgeon. *Journal of Clinical Orthopaedics and Trauma* 2024;55:102513. DOI: 10.1016/j.jcot.2024.102513. [Context Link 1, 2] View abstract...
21. Frieders-Justin V, Eckmann C, Glaser B. Appropriate surgical management in skin and soft tissue infections. *Current Opinion in Infectious Diseases* 2025;DOI: 10.1097/QCO.0000000000001088. [Context Link 1, 2, 3] View abstract...
22. Sibona A, et al. A single center's 15-year experience with palliative limb care for chronic limb threatening ischemia in frail patients. *Journal of Vascular Surgery* 2022;75(3):1014-1020.e1. DOI: 10.1016/j.jvs.2021.09.032. [Context Link 1] View abstract...
23. Wukich DK, et al. Guidelines on the diagnosis and treatment of active Charcot neuro-osteoarthropathy in persons with diabetes mellitus (IWGDF 2023). *Diabetes/Metabolism Research and Reviews* 2024;40(3):Online. DOI: 10.1002/dmrr.3646. [Context Link 1] View abstract...
24. Anderson JL, et al. Management of patients with peripheral artery disease (compilation of 2005 and 2011 ACCF/AHA guideline recommendations): a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* 2013;127(13):1425-1443. DOI: 10.1161/CIR.0b013e31828b82aa. (Reaffirmed 2025 Jul) [Context Link 1] View abstract...
25. Arslan B, Madassery S. How to approach below-the-ankle arterial interventions. *Seminars in Interventional Radiology* 2023;40(2):172-176. DOI: 10.1055/s-0043-1768607. [Context Link 1] View abstract...

26. Hoffer HL, et al. Reulceration and reoperation incidence after isolated partial fifth ray amputations: a multicenter study. *Journal of Foot and Ankle Surgery* 2022;61(2):298-304. DOI: 10.1053/j.jfas.2021.08.007. [Context Link 1] View abstract...
27. McCann L, Zhu S, Pollard JD, Rittman Weintraub ML, Dickinson JD. Success and survivorship following Charcot reconstruction: a review of 151 cases. *Journal of Foot and Ankle Surgery* 2021;60(3):535-540. DOI: 10.1053/j.jfas.2020.04.022. [Context Link 1, 2] View abstract...
28. Yammine K, Assi C. A meta-analysis of the outcomes of resection arthroplasty for resistant hallux diabetic ulcers. *Journal of Foot and Ankle Surgery* 2021;60(4):795-801. DOI: 10.1053/j.jfas.2020.04.025. [Context Link 1] View abstract...
29. Frey CB, Park R, Robinson R, Yoder C. Naggling pain and foot ulcers can be treated into remission. *Endocrinology and Metabolism Clinics of North America* 2023;52(1):119-133. DOI: 10.1016/j.ecl.2022.09.003. [Context Link 1] View abstract...
30. Ron I, et al. Risk factors for a failed transmetatarsal amputation in patients with diabetes. *Journal of Bone and Joint Surgery. American Volume* 2023;105(9):651-658. DOI: 10.2106/JBJS.22.00718. [Context Link 1] View abstract...
31. Braaksma R, Dijkstra PU, Geertzen JHB. Syme amputation: a systematic review. *Foot and Ankle International* 2018;39(3):284-291. DOI: 10.1177/1071100717745313. [Context Link 1] View abstract...
32. Gill AS, Gorski M, Strage KE, Dunn JT, Jerabek M, Hoffman KM. Oral versus intravenous antibiotics for residual osteomyelitis after amputation in the diabetic foot. *Journal of Foot and Ankle Surgery* 2022 Jul-Aug;61(4):735-738. DOI: 10.1053/j.jfas.2021.11.006. [Context Link 1] View abstract...
33. Kotha VS, Ragothaman K, Walters E, Attinger CE, Steinberg JS. Lower extremity amputations in at-risk patients: a focus on tissue viability and function in the compromised limb. *Clinics in Podiatric Medicine and Surgery* 2019;36(3):483-498. DOI: 10.1016/j.cpm.2019.02.011. [Context Link 1] View abstract...
34. Premier PINC AI™ Healthcare Database (PHD), 01/01/2023-12/31/2024. Premier, Inc. [Context Link 1, 2, 3]
35. Zhang LL, et al. Predictors of major adverse limb events after open forefoot amputation in patients with chronic limb-threatening ischemia. *Annals of Vascular Surgery* 2020;66:614-620. DOI: 10.1016/j.avsg.2020.01.099. [Context Link 1] View abstract...
36. Bourrier M, Ferguson TW, Embil JM, Rigatto C, Komenda P, Tangri N. Peripheral artery disease: its adverse consequences with and without CKD. *American Journal of Kidney Diseases* 2020;75(5):705-712. DOI: 10.1053/j.ajkd.2019.08.028. [Context Link 1] View abstract...
37. Plantz MA, Bergman R, Gerlach E, Mutawakkil M, Patel M, Kadakia AR. Comparing perioperative outcomes after transmetatarsal amputation in patients with or without peripheral vascular disease. *Journal of Foot and Ankle Research* 2025;18(1):e70026. DOI: 10.1002/jfa2.70026. [Context Link 1] View abstract...
38. Hudson T. The role of social determinates of health in discharge practices. *Nursing Clinics of North America* 2021;56(3):369-378. DOI: 10.1016/j.cnur.2021.04.004. [Context Link 1] View abstract...
39. Chovanec KA, Arsene C, Beck A, Zachrich K, Liedel B, Wolff-Elliott J. Association of discharge disposition with outcomes. *Population Health Management* 2021;24(1):116-121. DOI: 10.1089/pop.2019.0176. [Context Link 1] View abstract...
40. Centers for Medicare and Medicaid Services. "Condition of participation: Discharge planning." 42 CFR Pt. 482.43 Washington, DC 2025 Jan 01 [accessed 2025 Jul 22] Accessed at: <https://www.ecfr.gov/>. [Context Link 1, 2, 3]
41. Filson R. Musculoskeletal trauma and orthopedic surgery. 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; 2023:1638-1672. [Context Link 1]
42. The intervention. In: Dutton M, editor. *Dutton's Orthopaedic Examination, Evaluation, and Intervention*. 6th ed. McGraw-Hill Education; 2023:343-368. [Context Link 1]
43. Snyder JS, Sump CA. Amputation. In: Snyder JS, Sump CA, editors. *Swearingen's All-in-One Nursing Care Planning Resource*. 6th ed. Elsevier; 2024:489-494. [Context Link 1, 2]
44. Targeted care planning and care transitions. In: Perez R, editor. *CMSA's Integrated Case Management*. 2nd ed. Springer Publishing Company LLC; 2023:178-189. [Context Link 1, 2]
45. Elements of Excellence in Transitions of Care (TOC). TOC Checklist [Internet] National Transitions of Care Coalition. 2006 Accessed at: <https://www.ntocc.org/>. [accessed 2025 Sep 16] [Context Link 1]
46. Medical-surgical nursing. In: Hinkle JL, Cheever KH, Overbaugh KJ, editors. *Brunner & Suddarth's Textbook of Medical-Surgical Nursing*. 15th ed. Wolters Kluwer; 2022:33-55. [Context Link 1]

47. Transition of care. In: Gillingham DC, editor. Foundations of Case Management. Blue Bayou Press; 2021:137-144. [Context Link 1]
48. Becker C, et al. Interventions to improve communication at hospital discharge and rates of readmission: a systematic review and meta-analysis. JAMA Network Open 2021;4(8):e2119346. DOI: 10.1001/jamanetworkopen.2021.19346. [Context Link 1] View abstract...
49. The nursing process in drug therapy and patient safety. In: Tucker RG, editor. Karch's Focus on Nursing Pharmacology. 9th ed. Wolters Kluwer; 2023:47-57. [Context Link 1]
50. Adverse drug reactions and medication errors. In: Burchum JR, Rosenthal LD, editors. Lehne's Pharmacology for Nursing Care. 12th ed. Elsevier; 2025:64-75. [Context Link 1]
51. Safe medication preparation. In: Perry AG, Potter PA, Ostendorf WR, Laplante N, editors. Clinical Nursing Skills and Techniques. 11th ed. Elsevier; 2025:586-607. [Context Link 1]
52. The case manager's roles, functions, and activities. In: Gillingham DC, editor. Foundations of Case Management. Blue Bayou Press; 2021:9-14. [Context Link 1]
53. Anderson TS, Ayanian JZ, Herzig SJ, Souza J, Landon BE. Gaps in primary care follow-up after hospital discharge among Medicare beneficiaries. Journal of the American Geriatrics Society 2025;DOI: 10.1111/jgs.19496. [Context Link 1] View abstract...
54. Woelfel SL, Armstrong DG, Shin L. Wound care. In: Sidawy AN, Perler BA, editors. Rutherford's Vascular Surgery and Endovascular Therapy. 10th ed. Elsevier; 2023:1569-1585.e3. [Context Link 1]
55. Bragg-Underwood T. Family health. In: Nies MA, editor. Community/Public Health Nursing. 8th ed. Elsevier; 2024:404-427. [Context Link 1]
56. Morris BC. Patient and caregiver teaching. 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; 2023:49-62. [Context Link 1]
57. Harding MM. Substance use disorders in acute care. 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; 2023:162-178. [Context Link 1]
58. Activity. In: Lynn P, editor. Taylor's Clinical Nursing Skills. 6th ed. Wolters Kluwer; 2023:541-632. [Context Link 1]
59. Management of patients with dermatologic disorders. In: Hinkle JL, Cheever KH, Overbaugh KJ, editors. Brunner & Suddarth's Textbook of Medical-Surgical Nursing. 15th ed. Wolters Kluwer; 2022:1815-1864. [Context Link 1]
60. 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]
61. 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]
62. 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]
63. 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]
64. 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]
65. 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]
66. 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]
67. 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] Nonoperative therapy may be inappropriate in cases that require urgent surgical evaluation. An evidenced-based guideline recommends that urgent surgical consultation should be obtained in cases of severe infection or in cases of moderate diabetes-related foot infection with evidence of extensive gangrene, necrotizing infection, subfascial abscesses, compartment syndrome, or severe lower limb ischemia. A moderate infection is an infection with no systemic manifestations that involves tissue deeper than skin and subcutaneous tissues (eg, tendon, muscle, joint, bone), and/or erythema extending 2 cm or more from the wound margin. A severe infection is an infection with associated systemic manifestations, including 2 or more of the following: temperature greater than 100.4 degrees F (38 degrees C) or less than 96.8 degrees F (36 degrees C); heart rate greater than 90 beats per minute; respiratory rate greater than 20 breaths per minute or a PaCO₂ less than 32 mm Hg (4.3 kPa); or WBC count greater than 12,000/mm³ (12 x10⁹/L), less than 4000/mm³ (4 x10⁹/L), or greater than 10% immature (band) forms.(12) [A in Context Link 1]

[B] See Clinical Indications for Procedure in this guideline. [B in Context Link 1]

[C] Antibiotics may be stopped unless needed for underlying condition prompting surgery and may be administered orally or intravenously.(1)(32) [C in Context Link 1]

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

[E] Discharge instructions should be given in the patient's and caregiver's native language using trained language interpreters whenever possible.(38) [E in Context Link 1]

Definitions

Acute kidney injury (stage 2)

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

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. Jones DW, et al. 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM guideline for the prevention, detection, evaluation and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation 2025;DOI: 10.1161/CIR.0000000000001356.
5. Flynn JT, et al. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. Pediatrics 2017;140(3):e20171904. DOI: 10.1542/peds.2017-1904. (Reaffirmed 2025 Jul)
6. Mirvis DM, Goldberger AL. Electrocardiography. 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; 2022:141-174.e3.
7. Mount DB. Fluid and electrolyte disturbances. 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; 2022:338-356.

Footnotes

- A. A specialty society practice guideline defines acute kidney injury as a change in renal function that is known or presumed to have occurred over the previous 7 days.(1)
- B. In determining the stage of acute kidney injury (eg, stage 2 vs stage 3), patients should be staged according to the criteria that give them the highest stage.(1)
- C. If the baseline serum creatinine is not known, absent known or suspected chronic kidney disease, a baseline serum creatinine can be approximated by assuming an estimated GFR of 75 mL/min/1.73m² (1.25 mL/sec/1.73m²).⁽¹⁾  eGFR - Adult Calculator  eGFR - Pediatric Calculator
- D. The use of urine output as an indicator of acute kidney injury is important, as change in urine output can occur before a noticeable rise in creatinine.⁽¹⁾⁽³⁾ It is also suggested that urine output can identify patients with acute kidney injury that may otherwise be missed.⁽¹⁾⁽³⁾ However, urine output as a metric is only valid under the appropriate conditions. For example, the patient must not be hypovolemic, there must not be urinary obstruction, and the collection and measurement of urinary output must be complete and accurate.⁽¹⁾⁽³⁾ Use of urinary output to define acute kidney injury can be inaccurate in obese patients due to the nonlinear relationship between body weight and urine output. For example, in a 100-kg (220-lb) patient, urine output of 45 mL/hr over 12 hours (adequate output) would qualify as stage 2 acute kidney injury.⁽¹⁾⁽³⁾
- E. ECG findings include peaked T-waves, PR interval greater than 0.20 seconds, QRS interval greater than 0.12 seconds, and arrhythmia.⁽⁶⁾⁽⁷⁾

Acute renal failure (stage 3 acute kidney injury)

- Acute^[A] kidney injury (stage 3),^[B] as indicated by **1 or more** of the following^[C](1)(2)(3):
 - Acute^[A] rise in serum creatinine to 3 times its baseline value^[D] or higher
 - Acute^[A] rise in serum creatinine to at least 1.5 times its baseline value^[D] (increase of 50%) and serum creatinine is greater than 4 mg/dL (354 micromoles/L)
 - In child younger than 18 years, estimated GFR less than 35 mL/min/1.73m² (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/NEJMra2104090.

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⁾

Adult Readmission Risk Assessment

- Risk of readmission is increased by presence (upon admission or during hospital stay) of **1 or more** of the following⁽¹⁾:
 - Acute kidney injury (ie, rise in serum creatinine 2 or more times baseline value within past 7 days)⁽¹⁾
 - Clinically significant comorbid illness that necessitates (during current hospital stay) new or intensified treatment, prolongs length of stay, or impacts discharge level of care (eg, heart failure, COPD, active malignancy, cirrhosis, dementia, psychosis)⁽¹⁾⁽²⁾⁽³⁾
 - Infection complicated by bacteremia or hypotension⁽¹⁾
 - Need for parenteral nutrition or supplemental enteral tube feeding (eg, via gastrostomy tube or jejunostomy tube)⁽¹⁾
 - Need for transfusion of platelets or red blood cells⁽¹⁾
 - New need for dialysis⁽¹⁾

- Potential barriers to postdischarge clinical care (eg, homelessness, lack of transportation, impaired access to care or medication, active substance abuse) (1)
- Frailty (ie, as indicated by a frailty measurement tool)[A][B](1)(4)(5)(6)
- Two or more emergency department visits and/or inpatient admissions within previous 6 months(1)(7)

References

1. Proprietary health insurance data sources, 2022; and Medicare 100% Standard Analytical File, 2022.
2. Barnett ML, Hsu J, McWilliams JM. Patient characteristics and differences in hospital readmission rates. *JAMA Internal Medicine* 2015;175(11):1803-12. DOI: 10.1001/jamainternmed.2015.4660.
3. Berry JG, et al. Age trends in 30 day hospital readmissions: US national retrospective analysis. *British Medical Journal* 2018;360:k497.
4. Sison SDM, et al. A crosswalk of commonly used frailty scales. *Journal of the American Geriatrics Society* 2023;71(10):3189-3198. DOI: 10.1111/jgs.18453.
5. Kim DH, Rockwood K. Frailty in older adults. *New England Journal of Medicine* 2024;391(6):538-548. DOI: 10.1056/NEJMra2301292.
6. Soares MR, Mahanna Gabrielli E, Manjarrez EC. The geriatric patient: frailty, prehabilitation, and postoperative delirium. *Medical Clinics of North America* 2024;108(6):1101-1117. DOI: 10.1016/j.mcna.2024.06.001.
7. Aubert CE, et al. Simplification of the HOSPITAL score for predicting 30-day readmissions. *BMJ Quality and Safety* 2017;26(10):799-805. DOI: 10.1136/bmjqs-2016-006239.

Footnotes

- A. There are numerous measurement tools used to assess for frailty. Some of the more commonly used scales (with score indicating frailty in parentheses) include the following: Frailty Phenotype (3 or higher), 40-item Frailty Index (0.25 or higher), Study of Osteoporotic Fracture Index (2 or higher), Edmonton Frail Scale (8 or higher), FRAIL Scale (3 or higher), Clinical Frailty Scale (5 or higher), and Tilburg Frailty Indicator (5 or higher).(4)
- B. Frailty may be described as a phenotype or as an accumulation of health deficits. The Fried phenotype delineates a clinical syndrome resulting from altered metabolism coupled with abnormal stress responses.(5) This model includes 5 characteristic features: exhaustion (energy level), weakness (hand grip strength), slowness (gait speed), physical inactivity (falls), and weight loss.(5)(6) The presence of 3 or more of these deficits indicates the presence of frailty.(5)(6) Frailty as deficit accumulation considers findings in multiple domains (eg, cognitive, physical, nutritional, laboratory) and high-risk comorbidities.(5)(6) In this model, the degree of frailty is quantified by the number of indicative items present.(5)

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.

Bacteremia

- Bacteremia refers to blood culture isolation of a bacterial species that is likely to be pathologic and not a contaminant.(1)(2)

References

1. Lowy FD. Staphylococcal infections. 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; 2022:1178-1188.
2. Rice LB. Principles of anti-infective therapy. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1840-1845.

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.

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/emmermed-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

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

Footnotes

- A. Criteria based upon clinician-acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.
- B. Interpretation of blood pressure requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline blood pressure, medications, and clinical impact. For example, an elderly patient with heart failure may be prescribed medication with the intentional goal of a reduced pressure. If the patient's baseline SBP is 92 mm Hg to 96 mm Hg, absent signs or symptoms of hypotension, an emergency department SBP of 86 mm Hg should not automatically be categorized as hypotensive. This would hold for mean arterial pressure (MAP) as well. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term hypotension. Whether a blood pressure below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.
- C. The mean arterial pressure (MAP) takes into account both SBP and DBP readings.
- D. Interpretation of blood pressure requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline blood pressure, medications, and clinical impact. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term hypotension. Whether a blood pressure below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Hypotension absent

- Hypotension absent^[A] as indicated by **1 or more** of the following:
 - Hypotension absent in adult patient, as indicated by **1 or more** of the following:
 - Systolic blood pressure greater than or equal to 90 mm Hg^{[A](1)}
 - Mean arterial pressure^[B] greater than or equal to 70 mm Hg  MAP Calculator^{[A](1)(2)}
 - Blood pressure at patient's baseline (eg, healthy adult with low systolic blood pressure), at intentional therapeutic goal (eg, patient with heart failure), or acceptable for next level of care (eg, blood pressure stable and no significant signs or symptoms due to low blood pressure)
 - Hypotension absent in pediatric patient, as indicated by **1 or more** of the following:

- Systolic blood pressure greater than or equal to 110 mm Hg in child 13 to 17 years of age^{[A](3)}
- Systolic blood pressure greater than or equal to 100 mm Hg in child 6 to 12 years of age^{[A](3)}
- Systolic blood pressure greater than or equal to 95 mm Hg in child 3 to 5 years of age^{[A](3)}
- Systolic blood pressure greater than or equal to 90 mm Hg in child 1 or 2 years of age^{[A](3)}
- Systolic blood pressure greater than or equal to 80 mm Hg in infant 6 to 11 months of age^{[A](3)}
- Systolic blood pressure greater than or equal to 70 mm Hg in infant 3 to 5 months of age^{[A](3)}
- Systolic blood pressure greater than or equal to 65 mm Hg in infant 1 or 2 months of age^{[A](3)}
- Blood pressure at patient's baseline (eg, healthy child with low systolic blood pressure), at intentional therapeutic goal, or acceptable for next level of care (eg, blood pressure stable and no significant signs or symptoms due to low blood pressure)

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Puskarch 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. 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. 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.

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⁾

Codes

ICD-10 Diagnosis: C40.30, C40.31, C40.32, C49.20, C49.21, C49.22, C76.50, C76.51, C76.52, C79.51, C79.89, E08.52, E09.52, E10.52, E11.52, E13.52, I70.261, I70.262, I70.263, I70.361, I70.362, I70.363, I70.461, I70.462, I70.463, I70.561, I70.562, I70.563, I70.661, I70.662, I70.663, I70.761, I70.762, I70.763, I73.01, I74.3, I96, M86.071, M86.072, M86.079, M86.171, M86.172, M86.179, M86.271, M86.272, M86.279, M86.371, M86.372, M86.379, M86.471, M86.472, M86.479, M86.571, M86.572, M86.579, M86.671, M86.672, M86.679,

M86.8X7, S91.321A, S91.322A, S91.329A, S91.341A, S91.342A, S91.349A, S97.80XA, S97.81XA, S97.82XA, S98.111A, S98.112A, S98.119A, S98.121A, S98.122A, S98.129A, S98.131A, S98.132A, S98.139A, S98.141A, S98.142A, S98.149A, S98.211A, S98.212A, S98.219A, S98.221A, S98.222A, S98.229A, S98.311A, S98.312A, S98.319A, S98.321A, S98.322A, S98.329A, S98.911A, S98.912A, S98.919A, S98.921A, S98.922A, S98.929A, T25.321A, T25.322A, T25.329A, T25.331A, T25.332A, T25.339A, T25.391A, T25.392A, T25.399A, T34.821A, T34.822A, T34.829A, T34.831A, T34.832A, T34.839A [Hide]

ICD-10 Procedure: 0Y6M0Z4, 0Y6M0Z5, 0Y6M0Z6, 0Y6M0Z7, 0Y6M0Z8, 0Y6M0Z9, 0Y6M0ZB, 0Y6M0ZC, 0Y6M0ZD, 0Y6M0ZF, 0Y6N0Z4, 0Y6N0Z5, 0Y6N0Z6, 0Y6N0Z7, 0Y6N0Z8, 0Y6N0Z9, 0Y6N0ZB, 0Y6N0ZC, 0Y6N0ZD, 0Y6N0ZF [Hide]

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