Hip Fracture, Open Repair

ORG: S-615 (ISC)
Link to Codes

MCG Health
Inpatient & Surgical Care
30th Edition

Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Procedure

- Procedure is indicated for **1 or more** of the following(1)(2)(3)(4):
  - Hip fracture[A](1)(2)(3)(5)
  - Partial fracture (stress fracture) of femoral neck and **1 or more** of the following(3)(6):
    - Compression sided fracture with hip effusion
    - Compression sided fracture involving 50% or more of femoral neck
    - Tension side fracture line observed on imaging (eg, MRI)
    - Child or adolescent with transverse stress fracture of the femoral neck(3)

Alternatives to Procedure

- Alternatives include(1)(2)(3)(4)(5)(7):
  - Nonoperative therapy for bed-bound, nonambulatory, or severely ill patient(11)
  - Nonoperative therapy for stable periprosthetic fracture(12)
  - Nonoperative therapy for low-risk stress fracture(6)
  - Spica casting for hip fracture in young child(13)
  - Closed reduction, internal fixation(3)(5)
  - Hemiarthroplasty. See Hip: Displaced Fracture of Femoral Neck, Hemiarthroplasty ISC guideline.
  - Arthroplasty. See Hip Arthroplasty ISC.
  - For acetabular fracture, combined procedure (hip arthroplasty with open repair and reduction)(14)(15)

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 • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Hip Fracture, Open Repair: Readmission Risk Assessment • Discharge planning	• **Clinical Indications met[B]**	• Bed rest	• IV fluids • IV medications	• X-ray • DVT prophylaxis[C]	• Prophylactic antibiotics • Multimodal analgesia, possible PCA or epidural analgesics
2	• Floor • Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Hip Fracture, Open Repair: Readmission Risk Assessment	• **Tolerates mobilization** • **No evidence of new neurovascular compromise of lower extremity**	• **Up to chair** • **Limited ambulation[D]**	• Diet as tolerated • Parenteral or oral medications	• Gait training • Physical therapy • DVT prophylaxis	• Multimodal analgesia
3	• Floor • Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Hip Fracture, Open Repair: Readmission	• **Hemodynamic stability** • **Mental status improved or at baseline** • **Pain absent or managed**	• **Progressive ambulation[E]** • **Increasing activity tolerated**	• Parenteral or oral medications • Diet as tolerated	• Gait training if needed • Physical therapy • DVT prophylaxis	• **PCA and epidural analgesics absent[F]**

	Risk Assessment					
4	• Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Hip Fracture, Open Repair: Readmission Risk Assessment • Floor to discharge • Complete discharge planning	• **Hemodynamic stability** • **Mental status at baseline** • **No evidence of postoperative or surgical site infection** • **No evidence of new neurovascular compromise of lower extremity** • **Pain absent or managed** • **Discharge plans and education understood**	• **Ambulatory or acceptable for next level of care[G]**	• **Oral hydration[H]** • **Oral medications or regimen acceptable for next level of care** • **Oral diet or acceptable for next level of care**	• Physical therapy • DVT prophylaxis	• **DVT prophylaxis arranged for next level of care** • Possible oral analgesics
(1)(2)(3)(5)(20)(21)NNN						

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[I](2)(21)(25):
  - Failure to meet discharge criteria (recovery milestones within final day in Optimal Recovery Course)
    - Expect brief stay extension.
  - Inability to ambulate
    - Medical comorbidities or inability to achieve adequate surgical fixation may result in failure to achieve desired mobilization and ambulation goals.
    - Expect brief stay extension.
  - Multiple injuries(27)
    - Extended stay may be necessary if indicated for other injuries.
  - Open fractures
    - Open fractures may require repeat debridement, delayed closure, skin grafting, and other surgical procedures.
    - Expect brief stay extension.
  - Delirium(28)(29)(30)
    - Anticipate delayed ambulation as well as evaluation and possible treatment of underlying cause.
    - Expect brief stay extension.
    - See Mental Status Change: Common Complications and Conditions ISC guideline as appropriate.
  - Unstable comorbidities(31)(32)(33)(34)
    - Patient with unstable medical comorbidities (eg, heart failure, COPD) may require ongoing inpatient care.
    - Expect brief stay extension.
  - Complications of procedure(25)(35)
    - Complications (eg, myocardial infarction, Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury), urinary tract infection, surgical site infection, venous thromboembolism, pressure injury, pneumonia) may require ongoing inpatient care.

- Anticipate delayed ambulation as well as evaluation and treatment of complication.
- Expect brief to moderate stay extension.

See Common Complications and Conditions ISC for further information.

Discharge

Discharge Planning

- Discharge planning includes[J]:
  - Assessment of needs and planning for care, including(37)(38):
    - 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(39)(40):
      - Medication management, adherence instruction, and side effects assessment(41)
      - Neurovascular status assessment
      - Pain management(42)
      - Rehabilitation therapy or equipment coordination
      - Wound or dressing management(43)
  - Early identification of anticipated discharge destination; options include(38)(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(38)(44)(48):
    - Patient and caregiver education complete.
      - See Teach-Back Tool SR for further information.
      - See Hip Fracture, Open Repair: Patient Education for Clinicians SR for further information.
    - Medication reconciliation completion includes(41)(49):
      - 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)(50)
      - 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(51):
        - 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(52)
        - Orthopedic surgeon(2)
        - Rehabilitation therapy services(4)(53)
        - Specialists for management of comorbidities as needed(39)
        - Other
    - Outpatient testing and procedure plans made, which may include(40):
        - Bone densitometry
        - Laboratory testing
        - Other
    - Referrals made for assistance or support, which may include:
        - Community services(40)
        - Financial, for follow-up care, medication, and transportation(54)
        - Tobacco use treatment(55)
        - Other
    - Medical equipment and supplies coordinated (ie, delivered or delivery confirmed), which may include:
        - Ambulation devices (eg, cane, crutches, walker)(56)
        - Antiembolic or compression stockings(56)
        - Bath and toilet aids(39)
        - Syringes and needles for subcutaneous injections(4)(57)
        - Wound care equipment and supplies(58)
        - Other

Discharge Destination

- Post-hospital levels of admission may include:
    - Home.
    - Home healthcare. See Home Care Indications for Admission Section HC in Hip Fracture, Open Repair guideline in Home Care.
    - Recovery facility care. See Recovery Facility Care Indications for Admission Section RFC in Hip Fracture, Open Repair guideline in Recovery Facility Care.
    - Inpatient rehabilitation facility. See Inpatient Rehabilitation Facility (Acute Rehabilitation) Indications for Admission Section RFC in Inpatient Rehabilitation Facility (Acute Rehabilitation): Hip Fracture guideline in Recovery Facility Care.

Evidence Summary

Criteria

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

For hip fractures, a specialty society guideline and an orthopedic surgery textbook note that most will require operative management, with open repair as one of the recommended treatment options.(1)(2) **(EG 2)** For subtrochanteric fractures, a narrative review recommends early open repair with internal fixation, to allow for early mobilization and improved outcomes.(5) **(EG 2)**

For partial fractures (stress fractures) of the femoral neck, a narrative review states that surgical open repair with prophylactic fracture fixation can be used to prevent progression or complications associated with the fracture. Surgical management is recommended for compression-sided fractures with hip effusion, compression-sided fractures involving 50% or more of the femoral neck, or in patients with a tension-sided fracture line observed on imaging.(6) **(EG 2)** An orthopedic surgery textbook recommends internal fixation for a child or adolescent with a transverse stress fracture of the femoral neck.(3) **(EG 2)**

Alternatives

For hip fracture, a specialty society guideline recommends arthroplasty over fixation for displaced (unstable) femoral neck fractures.(1) **(EG 2)** An orthopedic surgery textbook states that patients who have trochanteric fractures with comminution, significant displacement, poor bone quality, or pre-existing damaged hip joints or bone disease (eg, arthritis, Paget disease, avascular necrosis of the femoral head) may have a poor response to internal fixation and therefore should be considered for total hip arthroplasty.(7) **(EG 2)**

A multicenter randomized controlled trial including 102 patients (mean age 64 years) with low-energy displaced femoral neck fractures randomized to undergo internal fixation or total hip arthroplasty found that 84% of the patients who underwent internal fixation were either converted to a total hip arthroplasty during the index procedure or required a subsequent reoperation within 24 months of the initial procedure.(8) **(EG 1)** A network meta-analysis of 33 randomized studies, encompassing 5703 participants (mean age 79 years) with displaced or nondisplaced femoral neck fracture treated with either cannulated screw open fixation (CS), dynamic hip screw open fixation (DS), hip hemiarthroplasty (HA), or total hip arthroplasty (THA), found that THA and HA had superior quality-of-life and hip functional scores and the open fixation procedures had a higher likelihood of failure (eg, failure of bone osteosynthesis after open reduction and internal fixation, or prosthetic failure or loosening) and need for reoperation.(9) **(EG 1)** A meta-analysis of 3 studies, encompassing 400 patients with nondisplaced femoral neck fracture randomized to open reduction and internal fixation or hemiarthroplasty, found that the internal fixation group had a higher risk of implant-related complications (20.1% vs 6.0%, relative risk 3.18 (95% confidence interval 1.72 to 5.88)) and worse 3-month functional and quality-of-life scores; however, there were no significant differences in functional or quality-of-life measures between groups at 24 months.(10) **(EG 2)**

Hospitalization

A systematic review and meta-analysis of 21 randomized studies, encompassing 2148 participants undergoing hip fracture surgery treated with or without tranexamic acid, found that tranexamic acid reduced the need for blood transfusion (risk ratio 0.56, 95% confidence interval 0.46 to 0.68) without increasing the risk of venous thromboembolism, myocardial infarction, cerebrovascular thromboembolic events, or mortality.(22) **(EG 1)**

Readmission risk and reduction: Multivariate analysis of 1081 patients age 65 years or older who underwent hip fracture repair found that 30-day readmission was independently associated with history of dementia and history of arrhythmia with pacemaker placement. (23) **(EG 2)** Multivariate analysis of a study including 7859 patients with a hip fracture who underwent open reduction and internal fixation found that postoperative delirium was an independent risk factor for readmission within 30 days.(24) **(EG 2)**

Length of Stay

Analysis of national hospital discharge data for a pediatric population shows 77% of patients undergoing open repair of hip fracture were discharged in 3 days or less.(21) **(EG 3)** Analysis of national hospital discharge data shows 41% of adult patients undergoing open repair of hip fracture were discharged in 3 days or less.(21) **(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(59); 42 CFR 419.22(60); 42 CFR 422.101(61)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(62); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(63); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(64); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(65)

Medicare Coverage Determinations: Medicare Coverage Database(66)

References

1. Management of Hip Fractures in Older Adults. Evidence-Based Clinical Practice Guideline [Internet] American Academy of Orthopaedic Surgeons. 2021 Dec Accessed at: https://www.aaos.org/. [accessed 2025 Sep 04] [Context Link 1, 2, 3, 4, 5, 6]
2. Weinlein JC. Fractures and dislocations of the hip. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:2909-2957.e11. [Context Link 1, 2, 3, 4, 5, 6, 7, 8]

3. Sawyer JR, Spence DD. Fractures and dislocations in children. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1492-1639.e23. [Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9]
4. Rudy MD, Grant PJ. The patient with hip fracture. Medical Clinics of North America 2024;108(6):1155-1169. DOI: 10.1016/j.mcna.2024.04.004. [Context Link 1, 2, 3, 4] View abstract...
5. Ganta A, Kandemir U, Konda SR. Subtrochanteric femur fractures: earls and pitfalls. Instructional Course Lectures 2023;72:389-403. [Context Link 1, 2, 3, 4, 5] View abstract...
6. Bernstein EM, Kelsey TJ, Cochran GK, Deafenbaugh BK, Kuhn KM. Femoral neck stress fractures: an updated review. Journal of the American Academy of Orthopedic Surgeons 2022;30(7):302-311. DOI: 10.5435/JAAOS-D-21-00398. [Context Link 1, 2, 3] View abstract...
7. Harkess JW, Crockarell JR Jr. Arthroplasty of the hip. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:178-333 e16. [Context Link 1, 2, 3]
8. Bartels S, et al. Total hip arthroplasty leads to better results after low-energy displaced femoral neck fracture in patients aged 55 to 70 years: A randomized controlled multicenter trial comparing internal fixation and total hip arthroplasty. Journal of Bone and Joint Surgery. American Volume 2022;104(15):1341-1351. DOI: 10.2106/JBJS.21.01411. [Context Link 1] View abstract...
9. Ramadanov N, et al. Cannulated screws versus dynamic hip screw versus hemiarthroplasty versus total hip arthroplasty in patients with displaced and non-displaced femoral neck fractures: a systematic review and frequentist network meta-analysis of 5703 patients. Journal of Orthopaedic Surgery and Research 2023;18(1):Online. DOI: 10.1186/s13018-023-04114-8. [Context Link 1] View abstract...
10. Sattari SA, Guilbault R, MacMahon A, Salem HS, Khanuja HS. Internal fixation versus hemiarthroplasty for nondisplaced femoral neck fractures: a systematic review and meta-analysis. Journal of Orthopaedic Trauma 2023;37(5):e219-e226. DOI: 10.1097/BOT.0000000000002558. [Context Link 1] View abstract...
11. Loggers SAI, Van Lieshout EMM, Joosse P, Verhofstad MHJ, Willems HC. Prognosis of nonoperative treatment in elderly patients with a hip fracture: A systematic review and meta-analysis. Injury 2020;51(11):2407-2413. DOI: 10.1016/j.injury.2020.08.027. [Context Link 1] View abstract...
12. Efird WM, Boyd ED, Schottel PC, Nelms NJ, Blankstein M. Outcomes of nonoperatively treated Vancouver B1 fractures: is failure common? Journal of Arthroplasty 2023;38(7 Suppl 2):S431-S437. DOI: 10.1016/j.arth.2023.03.069. [Context Link 1] View abstract...
13. Patterson JT, Tangtiphaiboontana J, Pandya NK. Management of pediatric femoral neck fracture. Journal of the American Academy of Orthopedic Surgeons 2018;26(12):411-419. DOI: 10.5435/JAAOS-D-16-00362. [Context Link 1] View abstract...
14. Denyer S, Hoyt AK, Eikani C, Cohen J, Brown NM. Thirty-day outcomes after acute total hip arthroplasty combined with internal fixation of acetabular fractures: a multi-institutional database analysis. Journal of the American Academy of Orthopaedic Surgeons. Global Research & Reviews 2023;7(12):Online. DOI: 10.5435/JAAOSGlobal-D-23-00071. [Context Link 1] View abstract...
15. Ebrahimi HDN, Wu CH, Karczewski D, Amini DA, Dahne M, Backer HC. Total hip arthroplasty in acute acetabulum fractures: a systematic review. Archives of Orthopaedic and Trauma Surgery 2023;143(11):6665-6673. DOI: 10.1007/s00402-023-05007-5. [Context Link 1] View abstract...
16. Major Extremity Trauma Research Consortium (METRC), et al. Aspirin or low-molecular-weight heparin for thromboprophylaxis after a fracture. New England Journal of Medicine 2023;388(3):203-213. DOI: 10.1056/NEJMoa2205973. [Context Link 1] View abstract...
17. Falck-Ytter Y, et al. Prevention of VTE in orthopedic surgery patients: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2012;141(2 Suppl):e278S-e325S. DOI: 10.1378/chest.11-2404. (Reaffirmed 2025 Feb) [Context Link 1] View abstract...
18. Forster R, Stewart M. Anticoagulants (extended duration) for prevention of venous thromboembolism following total hip or knee replacement or hip fracture repair. Cochrane Database of Systematic Reviews 2016, Issue 3. Art. No.: CD004179. DOI: 10.1002/14651858.CD004179.pub2. [Context Link 1] View abstract...
19. Leyva H, et al. Aspirin for venous thromboembolism prophylaxis in hip fracture, total knee, and hip arthroplasty. American Journal of Medicine 2025;DOI: 10.1016/j.amjmed.2025.03.020. [Context Link 1] View abstract...
20. Morris JC, Baumgaertner MR, Cooney LM Jr, Morris VA. Medical management of the patient with hip fracture. In: Browner BD, Jupiter JB, Krettek C, Anderson PA, editors. Skeletal Trauma: Basic Science, Management, and Reconstruction. 6th ed. Elsevier; 2020:1763-1778. [Context Link 1]
21. Premier PINC AI™ Healthcare Database (PHD), 01/01/2023-12/31/2024. Premier, Inc. [Context Link 1, 2, 3, 4]
22. Lewis SR, Pritchard MW, Estcourt LJ, Stanworth SJ, Griffin XL. Interventions for reducing red blood cell transfusion in adults undergoing hip fracture surgery: an overview of systematic reviews. Cochrane Database of Systematic Reviews 2023, Issue 6. Art. No.: CD013737. DOI: 10.1002/14651858.CD013737.pub2. [Context Link 1] View abstract...
23. Kates SL, Behrend C, Mendelson DA, Cram P, Friedman SM. Hospital readmission after hip fracture. Archives of Orthopaedic and Trauma Surgery 2015;135(3):329-337. DOI: 10.1007/s00402-014-2141-2. [Context Link 1] View abstract...
24. Malik AT, Quatman CE, Phieffer LS, Ly TV, Khan SN. Incidence, risk factors and clinical impact of postoperative delirium following open reduction and internal fixation (ORIF) for hip fractures: an analysis of 7859 patients from the ACS-NSQIP hip fracture procedure targeted database. European Journal of Orthopaedic Surgery and Traumatology 2019;29(2):435-446. DOI: 10.1007/s00590-018-2308-6. [Context Link 1] View abstract...
25. Schweller E, Mueller J, Santiago Rivera OJ, Villegas SJ, Walkiewicz J. Factors associated with hip fracture length of stay among older adults in a community hospital setting. Journal of the American Academy of Orthopaedic Surgeons. Global Research & Reviews 2023;7(5):Online. DOI: 10.5435/JAAOSGlobal-D-22-00195. [Context Link 1, 2, 3] View abstract...
26. Bohl DD, Shen MR, Hannon CP, Fillingham YA, Darrith B, Della Valle CJ. Serum albumin predicts survival and postoperative course following surgery for geriatric hip fracture. Journal of Bone and Joint Surgery. American Volume 2017;99(24):2110-2118. DOI: 10.2106/JBJS.16.01620. [Context Link 1] View abstract...

27. Jones CB, Walker JB. Diagnosis and management of ipsilateral femoral neck and shaft fractures. Journal of the American Academy of Orthopedic Surgeons 2018;26(21):e448-e454. DOI: 10.5435/JAAOS-D-17-00497. [Context Link 1] View abstract...
28. Ouellet JA, et al. Functional outcomes after hip fracture in independent community-dwelling patients. Journal of the American Geriatrics Society 2019;67(7):1386-1392. DOI: 10.1111/jgs.15870. [Context Link 1] View abstract...
29. Hecht G, Slee CA, Goodell PB, Taylor SL, Wolinsky PR. Predictive modeling for geriatric hip fracture patients: early surgery and delirium have the largest influence on length of stay. Journal of the American Academy of Orthopedic Surgeons 2019;27(6):e293-e300. DOI: 10.5435/JAAOS-D-17-00447. [Context Link 1] View abstract...
30. Ravi B, Pincus D, Choi S, Jenkinson R, Wasserstein DN, Redelmeier DA. Association of duration of surgery with postoperative delirium among patients receiving hip fracture repair. JAMA Network Open 2019;2(2):e190111. DOI: 10.1001/jamanetworkopen.2019.0111. [Context Link 1] View abstract...
31. Darbandi AD, Saadat GH, Butler BA, Bokhari F. Clinical outcomes and surgical complications among patients with bleeding disorders after acute hip fracture surgery. Journal of Orthopaedic Trauma 2022;36(2):104-110. DOI: 10.1097/BOT.0000000000002212. [Context Link 1] View abstract...
32. Tseng FJ, Gou GH, Wang SH, Shyu JF, Pan RY. Chronic liver disease and cirrhosis increase morbidity in geriatric patients treated surgically for hip fractures: analysis of the US Nationwide Inpatient Sample. BMC Geriatrics 2022;22(1):Online. DOI: 10.1186/s12877-022-02832-y. [Context Link 1] View abstract...
33. Levitt EB, et al. Risk factors for prolonged hospital stay after femoral neck fracture. Orthopedics 2023;46(4):211-217. DOI: 10.3928/01477447-20230207-02. [Context Link 1] View abstract...
34. Porter SB, et al. Preoperative pressure ulcers, mortality, and complications in older hip fracture surgery patients. Journal of the American Academy of Orthopaedic Surgeons. Global Research & Reviews 2022;6(11):Online. DOI: 10.5435/JAAOSGlobal-D-22-00117. [Context Link 1] View abstract...
35. Goh EL, et al. Prevalence of complications in older adults after hip fracture surgery : a systematic review and meta-analysis. Bone and Joint Journal 2025;107-B(2):139-148. DOI: 10.1302/0301-620X.107B2.BJJ-2024-0251.R1. [Context Link 1] View abstract...
36. 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...
37. 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...
38. 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]
39. Management of patients with musculoskeletal trauma. In: Hinkle JL, Cheever KH, Overbaugh KJ, editors. Brunner & Suddarth's Textbook of Medical-Surgical Nursing. 15th ed. Wolters Kluwer; 2022:1152-1205. [Context Link 1, 2, 3]
40. 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, 2, 3]
41. 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, 2]
42. Morrison J, Morrison M. Management of hip fractures. Critical Care Nursing Clinics of North America 2024;36(4):575-584. DOI: 10.1016/j.cnc.2024.04.007. [Context Link 1] View abstract...
43. Skin integrity and wound care. In: Lynn P, editor. Taylor's Clinical Nursing Skills. 6th ed. Wolters Kluwer; 2023:452-540. [Context Link 1]
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. 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]
51. 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]
52. 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...
53. The intervention. In: Dutton M, editor. Dutton's Orthopaedic Examination, Evaluation, and Intervention. 6th ed. McGraw-Hill Education; 2023:343-368. [Context Link 1]
54. Bragg-Underwood T. Family health. In: Nies MA, editor. Community/Public Health Nursing. 8th ed. Elsevier; 2024:404-427. [Context Link 1]

55. 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]
56. Activity. In: Lynn P, editor. Taylor's Clinical Nursing Skills. 6th ed. Wolters Kluwer; 2023:541-632. [Context Link 1, 2]
57. Medications. In: Lynn P, editor. Taylor's Clinical Nursing Skills. 6th ed. Wolters Kluwer; 2023:196-350. [Context Link 1]
58. 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]
59. 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]
60. 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]
61. 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]
62. 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]
63. 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]
64. 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]
65. 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]
66. 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] Hip fracture includes fracture of the femoral neck, pertrochanteric femur fracture, or intertrochanteric femur fracture.(2) Acetabular fracture may also be treated by open reduction and internal fixation, which may either delay or avoid total hip arthroplasty.(7) [A in Context Link 1]

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

[C] Fondaparinux, low-molecular-weight heparin, or adjusted-dose warfarin is appropriate and should be continued for up to 35 days after surgery. Aspirin may be considered.(16)(17)(18)(19) [C in Context Link 1]

[D] Limited ambulation includes assisted walking with crutches or walker. Children who have unstable internal fixation may require a spica or long leg cast, which will delay ambulation.(3) [D in Context Link 1]

[E] Progressive ambulation includes walking with crutches or walker. [E in Context Link 1]

[F] Use Multimodal analgesia or individual analgesic agent as indicated. [F in Context Link 1]

[G] Patient is ambulatory with crutches or walker or near baseline activity for age and development. [G in Context Link 1]

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

[I] An adjusted multivariate analysis of 145 patients undergoing hip fracture repair found that independent factors associated with prolonged hospital stays included malnutrition (albumin less than 3.4 g/dL (34 g/L); odds ratio (OR) 1.23 (95% confidence interval (CI) 1.07 to 1.42)), current smoking (OR 1.44, 95% CI 1.10 to 1.88), and history of thromboembolic event (OR 1.25, 95% CI 1.02 to 1.54).(25)(26) [I in Context Link 1]

[J] Discharge instructions should be given in the patient's and caregiver's native language using trained language interpreters whenever possible.(36) [J 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/1.73m^2 (1.25 mL/sec/1.73m^2).(1) eGFR - Adult Calculator eGFR - Pediatric Calculator

D. The use of urine output as an indicator of acute kidney injury is important, as change in urine output can occur before a noticeable rise in creatinine.(1)(3) It is also suggested that urine output can identify patients with acute kidney injury that may otherwise be missed.(1)(3) However, urine output as a metric is only valid under the appropriate conditions. For example, the patient must not be hypovolemic, there must not be urinary obstruction, and the collection and measurement of urinary output must be complete and accurate.(1)(3) Use of urinary output to define acute kidney injury can be inaccurate in obese patients due to the nonlinear relationship between body weight and urine output. For example, in a 100-kg (220-lb) patient, urine output of 45 mL/hr over 12 hours (adequate output) would qualify as stage 2 acute kidney injury.(1)(3)

E. ECG findings include peaked T-waves, PR interval greater than 0.20 seconds, QRS interval greater than 0.12 seconds, and arrhythmia.(6)(7)

Acute renal failure (stage 3 acute kidney injury)

- Acute[A] kidney injury (stage 3),[B] as indicated by **1 or more** of the following[C](1)(2)(3):
  - Acute[A] rise in serum creatinine to 3 times its baseline value[D] or higher
  - Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%) and serum creatinine is greater than 4 mg/dL (354 micromoles/L)

- In child younger than 18 years, estimated GFR less than 35 mL/min/1.73m^2 (0.58 mL/sec/1.73m^2)

eGFR - Pediatric Calculator and **1 or more** of the following:

- Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%)
- Within past 48 hours, rise in serum creatinine greater than 0.3 mg/dL (26.5 micromoles/L)

- Decreased urine output,[E] as indicated by **ALL** of the following:
  - Assessment of urine output appropriate (eg, adequate volume status, no urinary obstruction)
  - Oligoanuria, as indicated by **1 or more** of the following:
    - Urine output less than 0.3 mL/kg/hr for 24 hours
    - Anuria (urine output less than 0.1 mL/kg/hr) for 12 hours
- Initiation of renal replacement therapy required(4)

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/1.73m^2 (1.25 mL/sec/1.73m^2).(1) eGFR - Adult Calculator eGFR - Pediatric Calculator

E. The use of urine output as an indicator of acute kidney injury is important, as change in urine output can occur before a noticeable rise in creatinine.(1)(3) It is also suggested that urine output can identify patients with acute kidney injury that may otherwise be missed.(1)(3) However, urine output as a metric is only valid under the appropriate conditions. For example, the patient must not be hypovolemic, there must not be urinary obstruction, and the collection and measurement of urinary output must be complete and accurate.(1)(3) Use of urinary output to define acute kidney injury can be inaccurate in obese patients due to the nonlinear relationship between body weight and urine output. For example, in a 100-kg (220-lb) patient, urine output of 45 mL/hr over 12 hours (adequate output) would qualify as stage 2 acute kidney injury.(1)(3)

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 sdults. 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.

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/emermed-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. Zakrison 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. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
2. Ramgopal S, Sepanski RJ, Martin-Gill C. Empirically derived age-based vital signs for children in the out-of-hospital setting. Annals of Emergency Medicine 2023;81(4):402-412. DOI: 10.1016/j.annemergmed.2022.09.019.

Hip Fracture, Open Repair: Readmission Risk Assessment

- Risk of readmission is increased by presence of **1 or more** of the following(1)(2):
  - History of pacemaker placement(1)
  - Dementia(1)
  - Postoperative delirium(2)

References

1. Kates SL, Behrend C, Mendelson DA, Cram P, Friedman SM. Hospital readmission after hip fracture. Archives of Orthopaedic and Trauma Surgery 2015;135(3):329-337. DOI: 10.1007/s00402-014-2141-2.
2. Malik AT, Quatman CE, Phieffer LS, Ly TV, Khan SN. Incidence, risk factors and clinical impact of postoperative delirium following open reduction and internal fixation (ORIF) for hip fractures: an analysis of 7859 patients from the ACS-NSQIP hip fracture procedure targeted database. European Journal of Orthopaedic Surgery and Traumatology 2019;29(2):435-446. DOI: 10.1007/s00590-018-2308-6.

Hypotension

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

References

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

Footnotes

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

Hypotension absent

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

References

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

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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 (SpO_2) of less than 90% or arterial blood gas partial pressure of oxygen (PaO_2) of less than 60 mm Hg (8.0 kPa) on room air[A][B]

- Patient without baseline need for supplemental oxygen who now requires supplemental oxygen to keep SpO_2 greater than 89% or PaO_2 greater than 59 mm Hg (7.9 kPa)[A]
- Patient with baseline need for supplemental oxygen who now requires increased supplemental oxygen to maintain oxygenation at baseline or acceptable level

References

1. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35.
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 (SpO_2) may underestimate arterial saturation (SaO_2), especially in people with dark skin pigmentation, thick skin, cold body temperature, or who are wearing colored nail polish, and thus may not accurately detect hypoxemia.(2) Where appropriate, pulse oximetry should be measured after warming fingers or removing nail polish. Pulse oximetry results should be assessed within the context of the patient's clinical presentation, and performance of an arterial blood gas considered for a more accurate assessment of oxygenation if indicated.(2) Specific target values may require adjustment when care is delivered at high altitude.(3)

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

Multimodal analgesia

- Multimodal analgesia involves the utilization of 2 or more analgesic agents with different mechanisms of action in order to provide additive or synergistic pain control, while minimizing side effects and reliance on opioids.(1)(2)(3)

References

1. D'Souza RS, Johnson RL. Regional and multimodal treatments of perioperative pain. In: Benzon H, editor. Practical Management of Pain. 6th ed. Philadelphia, PA 19103-2899: Elsevier; 2023:355-373.e8.
2. George S, Johns M. Review of nonopioid multimodal analgesia for surgical and trauma patients. American Journal of Health-System Pharmacy 2020;77(24):2052-2063. DOI: 10.1093/ajhp/zxaa301.
3. Finnerup NB. Nonnarcotic methods of pain management. New England Journal of Medicine 2019;380(25):2440-2448. DOI: 10.1056/NEJMra1807061.

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.

Pediatric Readmission Risk Assessment

- Risk of readmission is increased by presence (upon admission or during hospital stay) of **1 or more** of the following(1):
  - 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)
  - Presence of complex chronic condition (eg, cerebral palsy, congenital malformations, muscular dystrophy, cystic fibrosis, autoimmune disease, malignancy, genetic disorder)[A](1)(3)(4)
  - Potential barriers to postdischarge clinical care (eg, unstable home environment, ability of caregivers to adhere to treatment plan unclear, impaired access to care or medication, active substance abuse in patient or caregiver)(1)(4)
  - Inpatient admission within previous 6 months(5)
  - Two or more emergency department visits within previous 6 months(1)(4)(6)

References

1. Proprietary health insurance data sources, 2022; and Medicare 100% Standard Analytical File, 2022.
2. Feinstein JA, Hall M, Davidson A, Feudtner C. Pediatric complex chronic condition system version 3. JAMA Network Open 2024;7(7):Online. DOI: 10.1001/jamanetworkopen.2024.20579.
3. Toomey SL, et al. Potentially preventable 30-day hospital readmissions at a children's hospital. Pediatrics 2016;138(2):Online. DOI: 10.1542/peds.2015-4182.
4. Ehwerhemuepha L, Finn S, Rothman M, Rakovski C, Feaster W. A novel model for enhanced prediction and understanding of unplanned 30-day pediatric readmission. Hospital Pediatrics 2018;8(9):578-587. DOI: 10.1542/hpeds.2017-0220.
5. Carroll AR, et al. Validation of 30-day pediatric hospital readmission risk prediction models. JAMA Network Open 2025;8(2):e2459684. DOI: 10.1001/jamanetworkopen.2024.59684.
6. Goodman DM, et al. Development and validation of an integrated suite of prediction models for all-cause 30-day readmissions of children and adolescents aged 0 to 18 years. JAMA Network Open 2022;5(11):Online. DOI: 10.1001/jamanetworkopen.2022.41513.

Footnotes

A. A complex chronic condition is any medical condition that is expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or one organ system severely enough to require specialty pediatric care.(2)

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.

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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.
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Tachypnea

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

References

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: M80.051A, M80.052A, M80.059A, M80.851A, M80.852A, M80.859A, M84.351A, M84.352A, M84.353A, M84.359A, M84.451A, M84.452A, M84.453A, M84.459A, M84.551A, M84.552A, M84.553A, M84.559A, M84.651A, M84.652A, M84.653A, M84.659A, M84.750A, M84.751A, M84.752A, M84.753A, M84.754A, M84.755A, M84.756A, M84.757A, M84.758A, M84.759A, S72.001A, S72.001B, S72.001C, S72.002A, S72.002B, S72.002C, S72.009A, S72.009B, S72.009C, S72.011A, S72.011B, S72.011C, S72.012A, S72.012B, S72.012C, S72.019A, S72.019B, S72.019C, S72.021A, S72.021B, S72.021C, S72.022A, S72.022B, S72.022C, S72.023A, S72.023B, S72.023C, S72.024A, S72.024B, S72.024C, S72.025A, S72.025B, S72.025C, S72.026A, S72.026B, S72.026C, S72.031A, S72.031B, S72.031C, S72.032A, S72.032B, S72.032C, S72.033A, S72.033B, S72.033C, S72.034A, S72.034B, S72.034C, S72.035A, S72.035B, S72.035C, S72.036A, S72.036B, S72.036C, S72.041A, S72.041B, S72.041C, S72.042A, S72.042B, S72.042C, S72.043A, S72.043B, S72.043C, S72.044A, S72.044B, S72.044C, S72.045A, S72.045B, S72.045C, S72.046A, S72.046B, S72.046C, S72.051A, S72.051B, S72.051C, S72.052A, S72.052B, S72.052C, S72.059A, S72.059B, S72.059C, S72.061A, S72.061B, S72.061C, S72.062A, S72.062B, S72.062C, S72.063A, S72.063B, S72.063C, S72.064A, S72.064B, S72.064C, S72.065A, S72.065B, S72.065C, S72.066A, S72.066B, S72.066C, S72.091A, S72.091B, S72.091C, S72.092A, S72.092B, S72.092C, S72.099A, S72.099B, S72.099C, S72.101A, S72.101B, S72.101C, S72.102A, S72.102B, S72.102C, S72.109A, S72.109B, S72.109C, S72.111A, S72.111B, S72.111C, S72.112A, S72.112B, S72.112C, S72.113A, S72.113B, S72.113C, S72.114A, S72.114B, S72.114C, S72.115A, S72.115B, S72.115C, S72.116A, S72.116B, S72.116C, S72.121A, S72.121B, S72.121C, S72.122A, S72.122B, S72.122C, S72.123A, S72.123B, S72.123C, S72.124A, S72.124B, S72.124C, S72.125A, S72.125B, S72.125C, S72.126A, S72.126B, S72.126C, S72.131A, S72.131B, S72.131C, S72.132A, S72.132B, S72.132C, S72.133A, S72.133B, S72.133C, S72.134A, S72.134B, S72.134C, S72.135A, S72.135B, S72.135C, S72.136A, S72.136B, S72.136C, S72.141A, S72.141B, S72.141C, S72.142A, S72.142B, S72.142C, S72.143A, S72.143B, S72.143C, S72.144A, S72.144B, S72.144C, S72.145A, S72.145B, S72.145C,

S72.146A, S72.146B, S72.146C, S72.21XA, S72.21XB, S72.21XC, S72.22XA, S72.22XB, S72.22XC, S72.23XA, S72.23XB, S72.23XC, S72.24XA, S72.24XB, S72.24XC, S72.25XA, S72.25XB, S72.25XC, S72.26XA, S72.26XB, S72.26XC, S79.001A, S79.002A, S79.009A, S79.011A, S79.012A, S79.019A, S79.091A, S79.092A, S79.099A [Hide]

ICD-10 Procedure: 0QH604Z, 0QH606Z, 0QH644Z, 0QH646Z, 0QH704Z, 0QH706Z, 0QH744Z, 0QH746Z, 0QS604Z, 0QS605Z, 0QS606Z, 0QS60BZ, 0QS60CZ, 0QS60DZ, 0QS60ZZ, 0QS644Z, 0QS645Z, 0QS646Z, 0QS64BZ, 0QS64CZ, 0QS64DZ, 0QS64ZZ, 0QS704Z, 0QS705Z, 0QS706Z, 0QS70BZ, 0QS70CZ, 0QS70DZ, 0QS70ZZ, 0QS744Z, 0QS745Z, 0QS746Z, 0QS74BZ, 0QS74CZ, 0QS74DZ, 0QS74ZZ, 0SQ90ZZ, 0SQ94ZZ, 0SQB0ZZ, 0SQB4ZZ, XNSA0GA, XNSB0GA [Hide]

CPT®: 27236, 27244, 27245, 27248, 27269

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Build Number: 30.0.2026012500524.025256