Musculoskeletal Surgery or Procedure GRG

GRG: SG-MS (ISC GRG)

MCG Health
General Recovery Care
30th Edition
Surgical Admission Case Management GRG GRG

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

Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Procedure

- Surgery or other procedure covered by this guideline is indicated for **1 or more** of the following:
  - Acute or subacute osteoporotic vertebral fracture with significant pain (eg, limiting performance of activities of daily living) that persists despite nonoperative treatment (eg, analgesics, physical therapy)[A](1)
  - Cervical spine fracture and **1 or more** of the following:
    - Occipital condyle fracture with craniocervical instability[B](2)(3)

- C1 (atlas) fracture and **1 or more** of the following:
  - Nonunion despite nonoperative therapy (eg, halo device)[C](2)(4)(5)
  - Disruption of the transverse atlantal ligaments, alar ligaments, or joint capsule(2)
  - Fracture involving both the anterior and posterior arch (type 2 C1 fracture) with lateral mass displacement greater than or equal to 7 mm(2)(3)(5)
  - Lateral mass fracture with displacement greater than or equal to 2 mm(2)(3)
- C2 (axis) odontoid fracture and **1 or more** of the following(6):
  - Nonunion despite nonoperative treatment[D](2)(4)(5)(7)
  - Comminuted fracture(2)(5)
  - Child with greater than 50% odontoid opposition, or unable or unwilling to be treated with Minerva cast or halo(8)
  - Upper avulsion fracture of the odontoid tip (type 1) with craniocervical dissociation(9)
  - Fracture at the base of the odontoid (type 2)(2)(5)(7)(10)
  - Odontoid fracture involving the vertebral body of the atlas (type 3) with instability(5)(9)
  - Odontoid fracture that is displaced (more than 5 mm)(2)(5)(9)
  - Odontoid fracture with inability to maintain fracture alignment with immobilization(2)(9)
  - Odontoid fracture that is pathologic or is associated with neurologic injury(9)
  - Bilateral pars fractures with unilateral or bilateral C2 to C3 facet dislocation(2)
- Traumatic spondylolisthesis of C2 vertebrae (hangman's fracture)[E] and **1 or more** of the following:
  - Nonunion despite nonoperative treatment(2)(11)(12)
  - Radiographic or clinical instability present despite immobilization(2)
  - Anterior displacement of C2 on C3 vertebrae(2)(11)(12)
  - Fracture with severe angulation (greater than 11 degrees)(11)(12)
  - Presence of C2 to C3 facet dislocation[F](2)(11)
- Subaxial cervical fracture (C3 to C7) and **1 or more** of the following:
  - Subaxial injury classification severity score of 4 or greater[G](2)(13)
  - Translational fracture with displaced vertebral body (eg, AO fracture classification type C)(2)(13)
  - Facet fracture with dislocation or subluxation(2)(13)
  - Discontinuous "floating" lateral mass fracture (AO fracture classification type F3)(13)
  - Fracture in patient with ankylosing spondylitis(2)(13)(14)
  - Evidence of instability or pending instability(2)(3)(13)
  - Spinal cord compromise(13)
  - Pain that persists despite nonoperative treatment(13)
  - Nonunion despite nonoperative treatment (eg, failure of closed reduction, nonunion or new or worsening neurologic deficit despite trial of immobilization)(13)
- Fracture due to malignancy or infection(15)

- Thoracic vertebral fracture and **1 or more** of the following(2)(3)(16):
  - Trauma requiring surgical intervention (eg, traumatic disk damage, incomplete burst fracture)(1)
  - Transverse process fracture extending into transverse foramina with damage, or potential for damage, to vertebral arteries(17)
  - Failure of nonoperative treatment (eg, ongoing pain, brace-treated fracture with increasing angulation deformity, new evidence of instability, nonunion)
  - Fracture in patient with ankylosing spondylitis(2)(14)
  - Burst fracture with nerve root involvement(2)
  - Extension injury to the anterior tension band(2)
  - Subluxation or dislocation of the spine

- Fracture dislocation or distraction(2)
- Evidence of instability or pending instability(2)
- Spinal cord compromise(2)
- Fracture due to malignancy or infection(15)

− Lumbar vertebral fracture and **1 or more** of the following(2)(3):

- Fracture dislocation (eg, floating facet fracture)(2)
- Fracture distraction(2)
- Burst fracture with nerve root or cauda equina involvement(1)
- Flexion distraction injury with segmental kyphosis or neurologic symptoms(2)
- Failure of nonoperative treatment (eg, persistent pain, nonunion)
- Compression fracture with acute or chronic collapse causing spinal canal compromise
- Subluxation or dislocation of the spine
- Evidence of instability or pending instability(2)
- Spinal cord compromise
- Fracture due to malignancy or infection(15)

− Thoracic radiculopathy (eg, herniated disk) and **ALL** of the following(18)(19):

- Patient has significant (eg, impacts activities or sleep) symptoms due to nerve root compression (eg, pain, weakness).
- MRI or other neuroimaging finding correlates with clinical signs and symptoms and demonstrates spinal stenosis or nerve root compression (eg, disk abnormality, facet joint hypertrophy).
- Failure of 3-month trial of nonoperative treatment (eg, NSAIDs, analgesics, physical therapy)

− Thoracic myelopathy (eg, herniated disk) and **ALL** of the following(18)(19):

- Signs or symptoms of myelopathy (eg, muscle weakness, bowel or bladder incontinence, spasticity)
- MRI or other neuroimaging finding correlates with clinical signs and symptoms and demonstrates cord compression (eg, herniated disk, osteophyte).

- Need for procedure due to thoracic spine tumor(20)
- Need for procedure due to thoracic spine infection(20)(21)(22)

− Vertebral body tethering[H] and **ALL** of the following(24):

- Skeletally immature patient(23)(24)
- Vertebral body tethering required for **1 or more** of the following
    - Flexible thoracic or thoracolumbar curvature (major Cobb angle) up to 65 degrees(24)
    - Revision required due to tether breakage or overcorrection(24)(25)

- Other spinal procedure required (eg, congenital or idiopathic deformity or disease)(26)(27)

− Pelvic fracture and **1 or more** of the following(8)(28)(29)(30):

- Open or unstable pelvic fracture
- Pelvic fracture with associated pelvic trauma (eg, laceration of urethra or bladder, retroperitoneal bleeding)
- Closed pelvic fracture not responsive to nonoperative treatment (eg, persistent pain)
- Closed pelvic fracture with compression of sacral spinal canal

− Fracture (other than vertebral, pelvic), dislocation, or skeletal injury requiring repair or reduction (and not covered specifically in its own guideline[I]) and **1 or more** of the following(6)(8)(31)(32)(33)(34)(35)(36):

- Closed, open, percutaneous, or arthroscopic reduction(15)
- Internal fixation(15)
- External fixation(15)
- Other operative repair (eg, drilling and bone grafting, transarticular fusion)(15)(34)(37)

- Tumor requiring resection or biopsy (eg, of bone, soft tissue)(38)(39)(40)
- Removal of implanted device needed (eg, infection, complication, pain)(41)(42)(43)
- Osteomyelitis or other infection requiring bone resection or debridement(41)(44)(45)(46)
- Limb reconstruction or amputation needed (eg, vascular disease, trauma, infection, neoplasm)[J](39)(47)(48)(49)(50)
- Fasciotomy needed (eg, for compartment syndrome)(51)(52)(53)(54)(55)(56)

− Medial or lateral unicompartmental knee arthroplasty needed, as indicated by **1 or more** of the following(57)(58):

- Unicompartmental degenerative joint disease, as indicated by **ALL** of the following:
  - Presence of significant radiographic findings of degenerative joint disease(57)(59)
  - Optimal medical management has been tried and failed (eg, weight loss, analgesics, NSAIDs, physical therapy, activity modification).(57)(60)
  - Treatment indicated due to disabling pain or functional disability(57)
- Unicompartmental osteonecrosis(59)(61)
- Unicompartmental posttraumatic joint destruction(62)
- Partial resection of knee required for treatment of malignancy(63)
- Replacement (revision) of previous arthroplasty needed (eg, infection, implant failure)(58)(64)

− Patellofemoral arthroplasty[K] needed, as indicated by **1 or more** of the following(57)(65):

- Patellofemoral degenerative joint disease, as indicated by **ALL** of the following:
  - Presence of significant radiographic findings
  - Optimal medical management has been tried and failed.(60)
  - Patient has failed or is not candidate for more conservative (joint-preserving) procedure.
  - Treatment indicated due to disabling pain or functional disability
- Patellofemoral posttraumatic destruction
- Chondromalacia of the patella or trochlea
- Dysplasia of the patella or trochlea
- Replacement (revision) of previous arthroplasty needed (eg, infection, implant failure)(66)

− Ankle arthroplasty needed, as indicated by **1 or more** of the following(67)(68)(69)(70)(71):

- Degenerative joint disease,[L] as indicated by **ALL** of the following:
  - Presence of significant radiographic findings consistent with ankle arthritis
  - Optimal medical management has been tried and failed.(60)
  - Patient has failed or is not candidate for fusion or more conservative (joint-preserving) procedure.(72)(73)
  - Treatment indicated due to disabling pain or functional disability
- Osteonecrosis not amenable to medical therapy or joint-preserving surgery(74)
- Revision ankle arthroplasty for failed ankle arthroplasty (eg, persistent pain)[M]

− Ankle arthrodesis (open) needed, as indicated by **ALL** of the following(71)(75)(76)(77):

- Clinically significant functional impairment
- Nonoperative therapy has been tried and failed (eg, NSAIDs, orthosis, physical therapy, injections).(60)
- Arthroscopic procedure not clinically appropriate

- Bone repositioning procedure (eg, wedge osteotomy, bone augmentation) needed (eg, congenital or posttraumatic deformity, articular damage)(49)(78)(79)(80)

− Sacroiliac joint fusion[N][O][P] needed, as indicated by **ALL** of the following(83)(84)(92):

- Significant low back pain (eg, impacts quality of life and/or significantly limits activities of daily living) that persists despite at least 6 months of nonoperative treatment (eg, NSAIDs, physical therapy)(83)(92)(93)(94)(95)

- Alternative source of pain not judged more likely than sacroiliac joint (eg, hip osteoarthritis, L5-S1 spine degeneration, tumor, infection, fracture)(83)(92)(93)
- Sacroiliac joint provisionally diagnosed as etiology of pain due to positive response (pain) to 3 or more provocative examination maneuvers that stress the sacroiliac joint (eg, flexion, abduction, and external rotation (FABER) test; sacral thrust; thigh thrust; pelvic gapping test; pelvic compression; Gaenslen test)[Q](83)(92)(93)(94)(95)
- Image-guided intra-articular injection of local anesthetic results in at least a 50% reduction in pain.[Q](83)(92)(93)(94)(95)

- Procedure required for musculoskeletal congenital or acquired dysfunction (eg, tendon repair, transfer or length change, distraction osteogenesis, bursectomy)(51)(78)(96)(97)(98)

Alternatives to Procedure

- Alternatives may include(32)(60)(96)(97)(99):
  - Emergency department reduction of fracture or dislocation(2)(8)(33)(51)
  - Nonoperative treatment of stable nondisplaced fractures(2)(6)(8)(33)(51)
  - Use of cane, walker, and other activity modification as appropriate(44)
  - Anti-inflammatory medication
  - Intra-articular, epidural, or systemic steroids(100)
  - Exercise, physical therapy, and weight reduction as appropriate(8)(26)(32)(101)
  - Conservative (palliative) treatment for pathologic fractures(38)(39)
  - Radiation or chemotherapy for tumors(38)(39)(40)
  - Medical management of chronic diseases(26)(44)(102)

Operative Status Criteria

Search by CPT® code for specific procedure Benchmark Length of Stay (BLOS).

Note: The definition of an ambulatory procedure depends on payer-provider contractual agreement or regulatory language (eg, CMS' Two-Midnight Rule). An ambulatory procedure may include one postoperative overnight stay in a facility; therefore, a Benchmark Length of Stay (BLOS) of ambulatory refers to patients discharged the day of or the day after the procedure. Depending on various patient and procedural factors, some patients undergoing a procedure with an ambulatory BLOS require inpatient care (eg, medical necessity for hospital-based care across 2 or more postoperative midnights).

The Ambulatory Surgery Exception Criteria GRG can help with this determination.

- Ambulatory: Benchmark Length of Stay (BLOS) = A
- Inpatient, as indicated by **1 or more** of the following:
  - Benchmark Length of Stay (BLOS) = 2 or more days postoperative (eg, medical necessity for hospital-based care across 2 or more postoperative midnights)
  - Procedure is usually performed on ambulatory basis, but inpatient stay is needed. See Ambulatory Surgery Exception Criteria GRG.
  - Medicare patient, and specific procedure is on CMS Inpatient Only List

Hospitalization

General Recovery Course

Stage	Level of Care	Clinical Status	Interventions
1	• OR to ICU or intermediate care[R] • Social Determinants of Health Assessment • Discharge planning. See Discharge Planning Tool SR.	• **Clinical Indications met[S]** • **Procedure completed**	• Inpatient interventions as needed
2	• Floor • Social Determinants of Health Assessment	• **No ICU or intermediate care needs**	• Inpatient interventions continue • Transition to oral routes
3	• **Activity level acceptable** • Social Determinants of Health Assessment • Floor to discharge • **Complete discharge planning**	• **Hemodynamic stability** • **Operative site and other wounds acceptable** • **Temperature status acceptable** • **No infection, or status acceptable** • **No blood loss, or problem resolved** • **Pain and nausea absent or adequately managed** • **Vascular, soft tissue, and wound status acceptable** • **Fracture or injury absent or status acceptable** • **No spinal surgery, or status acceptable** • **General Discharge Criteria met**	• **Intake acceptable** • **No inpatient interventions needed**

(8)(26)(31)(32)(33)(38)(44)(51)(96)(97)(103)(104)

Recovery Milestones are indicated in **bold**.

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

Discharge Criteria

- Continued inpatient stay is needed until **1 or more** of the following are present(31)(44)(97)(99):
  - Acceptable patient status for next level of care is achieved.
  - **ALL** of the following are present:
    - Hemodynamic stability, as indicated by **1 or more** of the following:
      - Hemodynamic abnormalities at baseline or acceptable for next level of care
      - Patient hemodynamically stable, as indicated by **ALL** of the following(105)(106):
        - Tachycardia absent
        - Hypotension absent
        - No evidence of inadequate perfusion (eg, no myocardial ischemia)
        - No other hemodynamic abnormalities (eg, no Orthostatic hypotension)

- Operative site and other wounds acceptable, as indicated by **1 or more** of the following(107):
  - Wounds absent
  - Wound site clean and intact, with minimal to no drainage and without signs of infection
  - Current wound care performable at next level of care
- Temperature status acceptable, as indicated by **1 or more** of the following(108)(109)(110):
  - Temperature less than 100.5 degrees F (38.1 degrees C) (oral) and greater than 96.8 degrees F (36 degrees C) (rectal)
  - Temperature as expected for disease process and appropriate for management at next level of care
- No infection, or status acceptable, as indicated by **1 or more** of the following(109)(110)(111)(112)(113):
  - No infection present
  - Infection status acceptable for next level of care, as indicated by **ALL** of the following(114):
    - WBC count normal, stable, or declining with treatment
    - Adequate treatment performable at next level of care
    - Organism and sensitivities identified, or adequate clinical response to empiric therapy
    - Repeat cultures negative or not needed
- No blood loss, or problem resolved, as indicated by **1 or more** of the following(115)(116)(117)(118):
  - No blood loss problem
  - Repeat evaluation shows blood loss resolved sufficiently (eg, hemoglobin at acceptable level and stable)
- Pain and nausea absent or adequately managed, as indicated by **1 or more** of the following(119)(120)(121)(122)(123):
  - No pain or nausea
  - Minimal discomfort on oral medications
  - Pain and nausea managed on regimen performable at next level of care
- Vascular, soft tissue, and wound status acceptable, as indicated by **1 or more** of the following(55)(124)(125)(126):
  - No vascular, soft tissue, or wound problems
  - Status acceptable, as indicated by **ALL** of the following:
    - No significant ischemia
    - No Bacteremia
    - No evidence of compartment syndrome
    - Neuromotor function at baseline or expected level of recovery and appropriate for management at next level of care
    - No new wound dehiscence or hematoma that cannot be managed at next level of care
    - Tissue necrosis absent, or treatment plan appropriate for next level of care
    - Vascular, soft tissue, and wound management appropriate for next level of care
- Fracture or injury absent or status acceptable, as indicated by **1 or more** of the following:
  - No injuries
  - Injury stable, as indicated by **ALL** of the following(99):
    - Fractures, joints, and injuries stabilized as needed (eg, cast, orthoses)
    - Neurologic deficit absent, at baseline, stable, or improving
    - Treatment at next level of care appropriate
- No spinal surgery, or status acceptable, as indicated by **1 or more** of the following:
  - No spinal surgery performed
  - Status acceptable, as indicated by **ALL** of the following(127)(128)(129)(130):
    - No cerebrospinal fluid leak
    - No active bleeding at site

- No severe respiratory abnormalities
- Baseline voiding, or urinary catheter with management plan in place
- Neurologic function at baseline or stable postoperatively

- Activity level acceptable, as indicated by **1 or more** of the following:
  - Patient ambulatory and can perform ADL as appropriate for age and development
  - Activity at baseline
  - Activity level acceptable for next level of care
- Intake acceptable, as indicated by **1 or more** of the following(131):
  - Oral hydration, medications, and diet
  - Enteral hydration, medications, and diet
  - Administration routes performable at next level of care
- No inpatient interventions needed; examples include:
  - Compartment syndrome monitoring
  - Monitoring for gangrene or tissue viability
  - Vital signs, neurologic signs, or vascular checks more often than feasible at next level of care
  - Large areas of debridement or skin grafting planned within 24 hours
  - Open fracture, dislocation, or other wound requiring imminent delayed closure
  - Urgent or emergent repeat operation for complex fractures (eg, secondary bone grafting) or complications (eg, dural laceration)
  - Epidural analgesia
- General Discharge Criteria GRG met or Pediatric General Discharge Criteria GRG met (if either is relevant or necessary for patient's condition)

Case Management

See Surgical Admission Case Management GRG GRG for further information.

Discharge Destination

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

Evidence Summary

Criteria

The evidence for the clinical indications found in this guideline includes 63 published peer reviewed articles, 2 specialty society or other evidence-based guidelines, and 32 book sections.

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(132); 42 CFR 419.22(133); 42 CFR 422.101(134)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(135); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(136); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(137); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(138)

Medicare Coverage Determinations: Medicare Coverage Database(139)

References

1. Hoffmann J, Preston G, Whaley J, Khalil JG. Vertebral augmentation in spine surgery. Journal of the American Academy of Orthopedic Surgeons 2023;31(10):477-489. DOI: 10.5435/JAAOS-D-22-00958. [Context Link 1, 2, 3, 4] View abstract...
2. Williams KD. Fractures, dislocations, and fracture-dislocations of the spine. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1832-1923. [Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39]
3. Preston-Suni K, Kaji AH. Spinal trauma. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:340-367.e2. [Context Link 1, 2, 3, 4, 5, 6, 7]
4. Cloney MB, et al. Simultaneous traumatic fractures of the atlas and axis: presentation, management, and outcomes from a series of 103 consecutive patients. World Neurosurgery 2025;195:123580. DOI: 10.1016/j.wneu.2024.123580. [Context Link 1, 2] View abstract...
5. Joaquim AF, et al. The AO Spine Upper Cervical Injury Classification System (AO UCIC) - an umbrella review of traumatic axis injuries factors that may affect treatment decision. Global Spine Journal 2025;15(7):3415-3425. DOI: 10.1177/21925682251333300. [Context Link 1, 2, 3, 4, 5, 6, 7] View abstract...
6. Eseonu K, Oduoza U, Fakouri B, Liantis P. Fractures of the odontoid peg of the cervical spine. Injury 2020;51(11):2429-2436. DOI: 10.1016/j.injury.2020.07.052. [Context Link 1, 2, 3] View abstract...
7. Leister I, et al. A predictive model to identify treatment-related risk factors for odontoid fracture nonunion using machine learning. Spine 2023;48(3):164-171. DOI: 10.1097/BRS.0000000000004510. [Context Link 1, 2] View abstract...

8. 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]
9. Carvalho AD, Figueiredo J, Schroeder GD, Vaccaro AR, Rodrigues-Pinto R. Odontoid fractures: a critical review of current management and future directions. Clinical Spine Surgery 2019;32(8):313-323. DOI: 10.1097/BSD.0000000000000872. [Context Link 1, 2, 3, 4, 5] View abstract...
10. Johnstone T, et al. Type II odontoid fractures in the elderly presenting to the emergency department: an assessment of factors affecting in-hospital mortality and discharge to skilled nursing facilities. Spine Journal 2024;24(4):682-691. DOI: 10.1016/j.spinee.2023.11.023. [Context Link 1] View abstract...
11. Elias C, Daoud A, Nasser Z, Daoud R, Elias E. Halo, Collar, Anterior or Posterior Fusion? Comparative Outcomes in Typical and Atypical Hangman's Fractures: A Systematic Review of fusion rate and complication profile. World Neurosurgery 2025;124530. DOI: 10.1016/j.wneu.2025.124530. [Context Link 1, 2, 3, 4, 5, 6] View abstract...
12. Botros M, Singh A, Shaikh H, Ramirez G, Molinari RW, Puvanesarajah V. Atypical Hangman's Fractures: An Institutional Study of 51 Patients With Atypical Traumatic Spondylolisthesis of C2. Global Spine Journal 2025;15(1):175-183. DOI: 10.1177/21925682241284559. [Context Link 1, 2, 3] View abstract...
13. Amorosa LF, Vaccaro AR. Subaxial cervical spine trauma. In: Browner BD, Jupiter JB, Krettek C, Anderson PA, editors. Skeletal Trauma: Basic Science, Management, and Reconstruction. 6th ed. Elsevier; 2020:9948-987. [Context Link 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
14. El Tecle NE, Abode-Iyamah KO, Hitchon PW, Dahdaleh NS. Management of spinal fractures in patients with ankylosing spondylitis. Clinical Neurology and Neurosurgery 2015;139:177-82. DOI: 10.1016/j.clineuro.2015.10.014. [Context Link 1, 2] View abstract...
15. Whittle AP. General principles of fracture treatment. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:2758-2811.e8. [Context Link 1, 2, 3, 4, 5, 6, 7]
16. Rabb CH, et al. Congress of Neurological Surgeons systematic review and evidence-based guidelines on the evaluation and treatment of patients with thoracolumbar spine trauma: operative versus nonoperative treatment. Neurosurgery 2019;84(1):E50-E52. DOI: 10.1093/neuros/nyy361. [Context Link 1] View abstract...
17. Nagasawa DT, et al. Isolated transverse process fractures: a systematic analysis. World Neurosurgery 2017;100:336-341. DOI: 10.1016/j.wneu.2017.01.032. [Context Link 1] View abstract...
18. Yoon WW, Koch J. Herniated discs: when is surgery necessary? EFORT Open Reviews 2021;6(6):526-530. DOI: 10.1302/2058-5241.6.210020. [Context Link 1, 2] View abstract...
19. Bouthors C, Benzakour A, Court C. Surgical treatment of thoracic disc herniation: an overview. International Orthopaedics 2019;43(4):807-816. DOI: 10.1007/s00264-018-4224-0. [Context Link 1, 2] View abstract...
20. Williams KD. Infections and tumors of the spine. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1924-1956.e7. [Context Link 1, 2]
21. Berbari EF, et al. 2015 Infectious Diseases Society of America (IDSA) clinical practice guidelines for the diagnosis and treatment of native vertebral osteomyelitis in adults. Clinical Infectious Diseases 2015;61(6):e26-e46. DOI: 10.1093/cid/civ482. (Reaffirmed 2025 Jun) [Context Link 1] View abstract...
22. Schwab JH, Shah AA. Spinal epidural abscess: diagnosis, management, and outcomes. Journal of the American Academy of Orthopedic Surgeons 2020;28(21):e929-e938. DOI: 10.5435/JAAOS-D-19-00685. [Context Link 1] View abstract...
23. Chatelain LS, Simon AL, Khalife M, Ferrero E. Pediatric spinal alignment and spinal development. North American Spine Society Journal 2024;20:Online. DOI: 10.1016/j.xnsj.2024.100548. [Context Link 1, 2, 3, 4] View abstract...
24. Alasadi H, Rajjoub R, Alasadi Y, Wilczek A, Lonner BS. Vertebral body tethering for adolescent idiopathic scoliosis: a review. Spine Deformity 2024;12(3):561-575. DOI: 10.1007/s43390-023-00806-7. [Context Link 1, 2, 3, 4, 5, 6] View abstract...
25. Tetreault TA, et al. The fate of the broken tether: how do curves treated with vertebral body tethering behave after tether breakage? Spine 2024;Online. DOI: 10.1097/BRS.0000000000005072. [Context Link 1] View abstract...
26. Warner WC Jr, Sawyer JR. Scoliosis and kyphosis. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1998-2196.e28. [Context Link 1, 2, 3, 4]
27. Passias PG, et al. Efficacy of varying surgical approaches on achieving optimal alignment in adult spinal deformity surgery. Spine 2024;49(1):22-28. DOI: 10.1097/BRS.0000000000004784. [Context Link 1] View abstract...

28. Beebe MJ. Fractures of the acetabulum and pelvis. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:2958-3030 e6. [Context Link 1]
29. Decker S, Winkelmann M, Bellabarbara C, Bransford RJ, Knipp BS. Pelvic ring injuries. In: Browner BD, Jupiter JB, Krettek C, Anderson PA, editors. Skeletal Trauma: Basic Science, Management, and Reconstruction. 6th ed. Elsevier; 2020:1108-1195. [Context Link 1]
30. Bond MC, Abraham MK. Pelvic injuries. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:562-579.e2. [Context Link 1]
31. Dawson J, Atassi O, Sun D, Sheth M. Emergency care of musculoskeletal injuries. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:440-483. [Context Link 1, 2, 3]
32. Rudloff MI. Fractures of the lower extremity. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:2812-2908.e17. [Context Link 1, 2, 3, 4]
33. Perez EA. Fractures of the shoulder, arm, and forearm. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:3031-3126.e9. [Context Link 1, 2, 3, 4]
34. Arvesen JE, Burnett Z, Israel H, Watson JT, Cannada LK. High-energy midfoot fracture-dislocations: staged treatment with an external fixator. Journal of Surgical Orthopaedic Advances 2019;28(1):24-30. [Context Link 1, 2] View abstract...
35. Arthur RY, Johnson JP. Surgical treatment of sacral nonunions. Injury 2023;54(7):Online. DOI: 10.1016/j.injury.2023.05.006. [Context Link 1] View abstract...
36. Higgins MJ, et al. Pediatric orthopaedic surgeons manage pediatric diaphyseal clavicle fractures differently than nonpediatric Orthopaedic Specialists. Journal of Pediatric Orthopedics 2025;45(3):e224-e228. DOI: 10.1097/BPO.0000000000002858. [Context Link 1] View abstract...
37. Lu Y, Pan Y, Canavese F, Lin R, Lai J, Chen S. Lateral open wedge osteotomy and lateral condyle fusion In situ for children with condyle nonunion and cubitus valgus deformity. Journal of Pediatric Orthopedics 2025;45(2):68-74. DOI: 10.1097/BPO.0000000000002829. [Context Link 1] View abstract...
38. Heck RK Jr, Toy PC. Malignant tumors of bone. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1009-1048.e7. [Context Link 1, 2, 3, 4]
39. Biermann JS, et al. Bone Cancer. NCCN Clinical Practice Guidelines in Oncology [Internet] National Comprehensive Cancer Network (NCCN). v. 2.2025; 2025 Feb 28 Accessed at: https://www.nccn.org/. [accessed 2025 Mar 20] [Context Link 1, 2, 3, 4]
40. Wodajo F, Colman M, Getty P. AAOS clinical practice guideline summary: treatment of metastatic carcinoma and myeloma of the femur. Journal of the American Academy of Orthopedic Surgeons 2023;31(3):e118-e129. DOI: 10.5435/JAAOS-D-21-00888. [Context Link 1, 2] View abstract...
41. Cleveland KB. General principles of infection. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:792-816.e4. [Context Link 1, 2]
42. Weinlein JC. Delayed union and nonunion of fractures. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:3192-3227.e9. [Context Link 1]
43. Patel R. Periprosthetic joint infection. New England Journal of Medicine 2023;388(3):251-262. DOI: 10.1056/NEJMra2203477. [Context Link 1] View abstract...
44. Dabov GD. Osteomyelitis. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:817-841.e6. [Context Link 1, 2, 3, 4, 5]
45. Carroll R. Vertebral osteomyelitis and epidural abscess. Medical Clinics of North America 2025;109(3):601-614. DOI: 10.1016/j.mcna.2024.12.007. [Context Link 1] View abstract...
46. Rao V, Snapp WK, Crozier JW, Bhatt RA, Schmidt ST, Kalliainen LK. Limited flexor sheath incision and drainage in the emergency department in the management of early pyogenic flexor tenosynovitis. Hand (N Y) 2023;18(2):320-327. DOI: 10.1177/1558944721999729. [Context Link 1] View abstract...
47. Toy PC. General principles of amputations. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:680-697.e4. [Context Link 1]
48. Ford MC. Amputations of the lower extremity. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:720-732.e1. [Context Link 1]

49. Polfer EM, Nanos GP III, Potter BK. Amputations in trauma. In: Browner BD, Jupiter JB, Krettek C, Anderson PA, editors. Skeletal Trauma: Basic Science, Management, and Reconstruction. 6th ed. Elsevier; 2020:2805-2838. [Context Link 1, 2]
50. Retrouvey H, Franks A, Dunn T, Novoa K, Ipaktchi K, Lauder A. Management of self-inflicted nonaccidental amputations of the upper extremity: systematic review. Journal of Hand Surgery 2023;48(10):993-1002. DOI: 10.1016/j.jhsa.2023.06.011. [Context Link 1] View abstract...
51. Azar FM. Traumatic disorders. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:2479-2538.e7. [Context Link 1, 2, 3, 4, 5]
52. Thompson NB. Compartment syndromes and Volkmann contracture. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:3819-3831.e2. [Context Link 1]
53. Shuler MS, Roskosky M, Tomov M, Freedman BA. Compartment syndromes. In: Browner BD, Jupiter JB, Krettek C, Anderson PA, editors. Skeletal Trauma: Basic Science, Management, and Reconstruction. 6th ed. Elsevier; 2020:499-529. [Context Link 1]
54. Lawendy AR, et al. Compartment syndrome: the issues and solutions you need to know about. Instructional Course Lectures 2023;72:343-356. [Context Link 1] View abstract...
55. Osborn PM, Schmidt AH. Diagnosis and management of acute compartment syndrome. Journal of the American Academy of Orthopedic Surgeons 2021;29(5):183-188. DOI: 10.5435/JAAOS-D-19-00858. [Context Link 1, 2] View abstract...
56. Sraj S, Henderson JT, Bramer M, Gelman J. Principles of fasciotomy closure after compartment syndrome release. Journal of the American Academy of Orthopedic Surgeons 2022;30(18):879-887. DOI: 10.5435/JAAOS-D-21-01046. [Context Link 1] View abstract...
57. Mihalko WM. Arthroplasty of the knee. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:406-484.e12. [Context Link 1, 2, 3, 4, 5]
58. Bayoumi T, et al. Ten-year survivorship and patient satisfaction following robotic-arm-assisted medial unicompartmental knee arthroplasty: a prospective multicenter study. Journal of Bone and Joint Surgery. American Volume 2023;105(12):933-942. DOI: 10.2106/JBJS.22.01104. [Context Link 1, 2] View abstract...
59. Harkin W, et al. Clinical outcomes and survivorship of lateral unicompartmental knee arthroplasty: a large single surgeon cohort. Journal of Arthroplasty 2024;39(11):2702-2707. DOI: 10.1016/j.arth.2024.05.067. [Context Link 1, 2] View abstract...
60. Kolasinski SL, et al. 2019 American College of Rheumatology/Arthritis Foundation guideline for the management of osteoarthritis of the hand, hip, and knee. Arthritis Care & Research 2020;72(2):149-162. DOI: 10.1002/acr.24131. (Reaffirmed 2025 Mar) [Context Link 1, 2, 3, 4, 5] View abstract...
61. Schweizer C, Krug T, Herre J, Aldinger PR, Merle C, Waldstein W. Medial unicompartmental knee arthroplasty for osteonecrosis: a cohort study comparing cemented and cementless fixation. Journal of Arthroplasty 2025;DOI: 10.1016/j.arth.2025.08.008. [Context Link 1] View abstract...
62. Schmidt A, et al. Lateral unicompartmental knee arthroplasty is a safe procedure for post-traumatic osteoarthritis after lateral tibial plateau fracture: a case-control study at 10-year follow-up. Knee Surgery, Sports Traumatology, Arthroscopy 2021;29(11):3654-3663. DOI: 10.1007/s00167-020-06359-w. [Context Link 1] View abstract...
63. Liu S, et al. A new joint reconstruction technique in the treatment of giant cell tumors around the knee: Structural allograft and unicompartmental arthroplasty. Journal of Surgical Oncology 2023;128(7):1179-1189. DOI: 10.1002/jso.27406. [Context Link 1] View abstract...
64. Crawford DA, Berend KR, Lombardi AV. Management of the failed medial unicompartmental Knee arthroplasty. Journal of the American Academy of Orthopedic Surgeons 2018;26(20):e426-e433. DOI: 10.5435/JAAOS-D-17-00107. [Context Link 1] View abstract...
65. Ennis HE, Phillips JLH, Jennings JM, Dennis DA. Patellofemoral arthroplasty. Journal of the American Academy of Orthopedic Surgeons 2023;Online. DOI: 10.5435/JAAOS-D-23-00022. [Context Link 1, 2, 3] View abstract...
66. Jones GG, et al. Indications for the addition of a patellofemoral joint arthroplasty following a previous unicondylar knee arthroplasty- a literature review and Delphi consensus. Archives of Orthopaedic and Trauma Surgery 2025;145(1):120. DOI: 10.1007/s00402-024-05738-z. [Context Link 1] View abstract...
67. Murphy GA. Total ankle arthroplasty. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:526-562.e1. [Context Link 1, 2, 3, 4, 5]
68. Yang HY, Wang SH, Lee KB. The HINTEGRA total ankle arthroplasty: functional outcomes and implant survivorship in 210 osteoarthritic ankles at a mean of 6.4 years. Bone and Joint Journal 2019;101-B(6):695-701. DOI: 10.1302/0301-620X.101B6.BJJ-2018-1578.R1. [Context Link 1] View abstract...

69. Norvell DC, et al. Effectiveness and safety of ankle arthrodesis versus arthroplasty: a prospective multicenter study. Journal of Bone and Joint Surgery. American Volume 2019;101(16):1485-1494. DOI: 10.2106/JBJS.18.01257. [Context Link 1, 2] View abstract...
70. Yoon YK, Park KH, Park JH, Lee W, Han SH, Lee JW. Long-term clinical outcomes and implant survivorship of 151 total ankle arthroplasties using the HINTEGRA prosthesis: a minimum 10-year follow-up. Journal of Bone and Joint Surgery. American Volume 2022;104(16):1483-1491. DOI: 10.2106/JBJS.22.00060. [Context Link 1] View abstract...
71. Goldberg AJ, et al. Total ankle replacement versus arthrodesis for end-stage ankle osteoarthritis: a randomized controlled trial. Annals of Internal Medicine 2022;175(12):1648-1657. DOI: 10.7326/M22-2058. [Context Link 1, 2, 3, 4] View abstract...
72. Alajlan A, Valderrabano V. Joint preserving surgery for valgus ankle osteoarthritis. Foot and Ankle Clinics 2022;27(1):57-72. DOI: 10.1016/j.fcl.2021.11.003. [Context Link 1] View abstract...
73. Lundeen AL, et al. Takedown of ankle fusions and conversion to total ankle replacements. Foot and Ankle International 2022;43(11):1402-1409. DOI: 10.1177/10711007221115170. [Context Link 1] View abstract...
74. Parekh SG, Kadakia RJ. Avascular necrosis of the talus. Journal of the American Academy of Orthopedic Surgeons 2021;29(6):e267-e278. DOI: 10.5435/JAAOS-D-20-00418. [Context Link 1] View abstract...
75. Bettin CC. Ankle arthrodesis. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:563-598.e3. [Context Link 1]
76. Abuhantash M, et al. Arthroscopic versus open ankle arthrodesis: a 5-year follow up. Journal of Bone and Joint Surgery. American Volume 2022;104(13):1197-1203. DOI: 10.2106/JBJS.21.01088. [Context Link 1] View abstract...
77. Glazebrook M, et al. Outcomes of total ankle replacement versus ankle arthrodesis for the treatment of end-stage ankle arthritis: a concise follow-up, at a minimum of 10 years, of a previous report. Journal of Bone and Joint Surgery. American Volume 2025;107(6):552-557. DOI: 10.2106/JBJS.24.00361. [Context Link 1] View abstract...
78. Kelly DM. Congenital and developmental abnormalities of the hip and pelvis. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:1186-1230.e5. [Context Link 1, 2]
79. 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]
80. Liou YL, Lee WC, Kao HK, Yang WE, Chang CH. Genu valgum after distal femur extension osteotomy in children with cerebral palsy. Journal of Pediatric Orthopedics 2022;42(4):e384-e389. DOI: 10.1097/BPO.0000000000002076. [Context Link 1] View abstract...
81. Halperin SJ, et al. Evolving trends in the use of sacroiliac fusion from 2015 to 2020. Spine 2024;49(8):577-582. DOI: 10.1097/BRS.0000000000004684. [Context Link 1, 2, 3] View abstract...
82. Ballatori AM, Shahrestani S, Chen XT, Ton A, Wang JC, Buser Z. Propensity-matched analysis of 1062 patients following minimally invasive versus open sacroiliac joint fusion. Clinical Spine Surgery 2021;34(8):E477-E482. DOI: 10.1097/BSD.0000000000001244. [Context Link 1, 2, 3] View abstract...
83. Abbasi HR, Abd-Elsayed A, Storlie NR. Lateral sacroiliac joint fusion. In: Abd-Elsayed A, editor. Sacroiliac Joint Techniques. Elsevier; 2024:71-87. [Context Link 1, 2, 3, 4, 5, 6, 7]
84. Abd-Elsayed A, Chiteneni A. Sacroiliac joint posterior fusion. In: Abd-Elsayed A, editor. Sacroiliac Joint Techniques. Elsevier; 2024:62-70. [Context Link 1, 2]
85. Polly DW, et al. Two-year outcomes from a randomized controlled trial of minimally invasive sacroiliac joint fusion vs. non-surgical management for sacroiliac joint dysfunction. International Journal of Spine Surgery 2016;10:28. DOI: 10.14444/3028. [Context Link 1] View abstract...
86. Dengler J, et al. Randomized trial of sacroiliac joint arthrodesis compared with conservative management for chronic low back pain attributed to the sacroiliac joint. Journal of Bone and Joint Surgery. American Volume 2019;101(5):400-411. DOI: 10.2106/JBJS.18.00022. [Context Link 1] View abstract...
87. Lee MC. The opaque sacroiliac joint: Commentary on an article by Julius Dengler, MD, et al.: "Randomized trial of sacroiliac joint arthrodesis compared with conservative management for chronic low back pain attributed to the sacroiliac joint". Journal of Bone and Joint Surgery. American Volume 2019;101(5):e19. DOI: 10.2106/JBJS.18.01254. [Context Link 1] View abstract...
88. Chang E, Rains C, Ali R, Wines RC, Kahwati LC. Minimally invasive sacroiliac joint fusion for chronic sacroiliac joint pain: a systematic review. Spine Journal 2022;22(8):1240-1253. DOI: 10.1016/j.spinee.2022.01.005. [Context Link 1] View abstract...

89. Hermans SMM, Droeghaag R, Schotanus MGM, Santbrink HV, van Hemert WLW, Curfs I. Minimally invasive sacroiliac joint fusion vs conservative management in patients with sacroiliac joint dysfunction: a systematic review and meta-analysis. International Journal of Spine Surgery 2022;16(3):472-480. DOI: 10.14444/8241. [Context Link 1] View abstract...
90. Abbas A, Du JT, Toor J, Versteeg A, Finkelstein JA. The efficacy of primary sacroiliac joint fusion for low back pain caused by sacroiliac joint pathology: a systematic review and meta-analysis. European Spine Journal 2022;31(10):2461-2472. DOI: 10.1007/s00586-022-07291-y. [Context Link 1] View abstract...
91. Mehkri Y, et al. Outcomes after minimally invasive sacroiliac joint fusion: a scoping review. World Neurosurgery 2022;168:120-132. DOI: 10.1016/j.wneu.2022.09.094. [Context Link 1] View abstract...
92. Lorio M, Kube R, Araghi A. International Society for the Advancement of Spine Surgery policy 2020 update-minimally invasive surgical sacroiliac joint Fusion (for chronic sacroiliac joint pain): coverage indications, limitations, and medical necessity. International Journal of Spine Surgery 2020;14(6):860-895. DOI: 10.14444/7156. [Context Link 1, 2, 3, 4, 5, 6, 7, 8] View abstract...
93. Thawrani DP, Agabegi SS, Asghar F. Diagnosing sacroiliac joint pain. Journal of the American Academy of Orthopedic Surgeons 2019;27(3):85-93. DOI: 10.5435/JAAOS-D-17-00132. [Context Link 1, 2, 3, 4, 5, 6, 7] View abstract...
94. Bovinet C, et al. Minimally invasive posterior SI joint fusion with a novel cortical allograft: real-world, long-term, outcomes from a large, multisite US cohort. Orthopedic Research and Reviews 2025;17:381-390. DOI: 10.2147/ORR.S538286. [Context Link 1, 2, 3] View abstract...
95. Horton I, et al. Sacroiliac joint: function, pathology, treatment, and contribution to outcomes in spine and hip surgery. Journal of Bone and Joint Surgery. American Volume 2024;DOI: 10.2106/JBJS.24.00380. [Context Link 1, 2, 3] View abstract...
96. Cannon DL. Flexor and extensor tendon injuries. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:3442-3496.e8. [Context Link 1, 2, 3]
97. Grear BJ. Disorders of tendons and fascia and adolescent and adult pes planus. In: Azar FM, Beaty JH, editors. Campbell's Operative Orthopaedics. 14th ed. Philadelphia, PA: Elsevier; 2021:4154-4226.e10. [Context Link 1, 2, 3, 4]
98. Moran J, et al. Open debridement alone versus open debridement with tendon repair for lateral epicondylitis: a comparison of complications and 5-year reoperation rates from a large insurance database. Orthopaedic Journal of Sports Medicine 2022;10(9):Online. DOI: 10.1177/23259671221120812. [Context Link 1] View abstract...
99. Geiderman JM, Torbati S. General principles of orthopedic injuries. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:438-457.e2. [Context Link 1, 2, 3]
100. Uson J, et al. EULAR recommendations for intra-articular therapies. Annals of the Rheumatic Diseases 2021;80(10):1299-1305. DOI: 10.1136/annrheumdis-2021-220266. (Reaffirmed 2025 Jun) [Context Link 1] View abstract...
101. Gibbs JC, et al. Exercise for improving outcomes after osteoporotic vertebral fracture. Cochrane Database of Systematic Reviews 2019, Issue 7. Art. No.: CD008618. DOI: 10.1002/14651858.CD008618.pub3. [Context Link 1] View abstract...
102. Smolen JS, et al. EULAR recommendations for the management of rheumatoid arthritis with synthetic and biological disease-modifying antirheumatic drugs: 2022 update. Annals of the Rheumatic Diseases 2023;82(1):3-18. DOI: 10.1136/ard-2022-223356. (Reaffirmed 2025 May) [Context Link 1] View abstract...
103. Carmichael SP, Mowery NT, Martin RS, Meredith JW. Management of acute trauma. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:386-428. [Context Link 1]
104. Padilla PL, Khoo KH, Ho T, Cole EL, Sirvent RZ, Phillips LG. Plastic surgery. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:1916-1944. [Context Link 1]
105. Schriger DL. Approach to the patient with abnormal vital signs. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:32-35. [Context Link 1]
106. Ramgopal S, Sepanski RJ, Martin-Gill C. Empirically derived age-based vital signs for children in the out-of-hospital setting. Annals of Emergency Medicine 2023;81(4):402-412. DOI: 10.1016/j.annemergmed.2022.09.019. [Context Link 1] View abstract...
107. Yepuri N, Pruekprasert N, Cooney RN. Surgical complications. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:238-283. [Context Link 1]
108. Nield LS, Kamat D. Fever. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:1640-1642. [Context Link 1]

109. Melia MT. Approach to fever or suspected infection in the normal host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1845-1851. [Context Link 1, 2]
110. Sifri CD. Approach to fever and suspected infection in the immunocompromised host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1851-1862. [Context Link 1, 2]
111. Hooper DC, Shenoy ES, Elshaboury RH. Treatment and prophylaxis of bacterial infections. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:1148-1163. [Context Link 1]
112. Blum FC, Biros MH. Fever in the adult patient. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:90-95.e1. [Context Link 1]
113. Mick NW. Pediatric fever. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:2067-2077.e2. [Context Link 1]
114. Singh M, Fernandez-Frackelton M. Bacteria. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1586-1609.e3. [Context Link 1]
115. Gaddy JD, Dupre AA. Disorders of hemostasis. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1486-1499.e2. [Context Link 1]
116. Dyke C, et al. Universal definition of perioperative bleeding in adult cardiac surgery. Journal of Thoracic and Cardiovascular Surgery 2014;147(5):1458-1463.e1. DOI: 10.1016/j.jtcvs.2013.10.070. [Context Link 1] View abstract...
117. Bartoszko J, et al. Comparison of two major perioperative bleeding scores for cardiac surgery trials: universal definition of perioperative bleeding in cardiac surgery and European coronary artery bypass grafting bleeding severity grade. Anesthesiology 2018;129(6):1092-1100. DOI: 10.1097/ALN.0000000000002179. [Context Link 1] View abstract...
118. Levy JH, et al. Consensus statement: hemostasis trial outcomes in cardiac surgery and mechanical support. Annals of Thoracic Surgery 2022;113(3):1026-1035. DOI: 10.1016/j.athoracsur.2021.09.080. [Context Link 1] View abstract...
119. Swarm RA, et al. Adult Cancer Pain. NCCN Clinical Practice Guidelines in Oncology [Internet] National Comprehensive Cancer Network (NCCN). v. 2.2025; 2025 May 21 Accessed at: https://www.nccn.org/. [accessed 2025 Jun 04] [Context Link 1]
120. Cohen SP. Pain. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:133-141.e1. [Context Link 1]
121. Peterson SJB, Weisman SJ. Pediatric pain management. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:677-700. [Context Link 1]
122. Berger MJ, et al. Antiemesis. NCCN Clinical Practice Guidelines in Oncology [Internet] National Comprehensive Cancer Network (NCCN). v. 2.2025; 2025 May 12 Accessed at: https://www.nccn.org/. [accessed 2025 May 19] [Context Link 1]
123. Fourth consensus guidelines for the management of postoperative nausea and vomiting: erratum. Anesthesia and Analgesia 2020;131(5):e241. DOI: 10.1213/ANE.0000000000005245. [Context Link 1] View abstract...
124. Creager MA, Loscalzo J. Arterial diseases of the extremities. 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; 2022:2107-2115. [Context Link 1]
125. Raja AS. Peripheral vascular trauma. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:429-437.e2. [Context Link 1]
126. Simon BC, Hern HG. Wound management principles. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:651-665.e2. [Context Link 1]
127. Divi SN, Okroj K, Patel AA. General complication in lumbar spine surgery. In: Patel VV, Kleck CJ, editors. Complications in Orthopaedics: Spine Surgery. Elsevier; 2025:160-166. [Context Link 1]
128. Barber J, Wick J, Klineberg EO. Complications in spine surgery: expected rates and classification. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:149-157.e1. [Context Link 1]
129. Kessler RA, Rasouli JJ, Shao J, Momim A, Steinmetz MP. Intraoperative crisis management in spine surgery: what to do when things go bad. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:785-794.e2. [Context Link 1]

130. Casper DS, Maslak JP, Pelle D. Posterior cervical decompressions: cervical laminectomy and laminoforaminotomy. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:935-937.e1. [Context Link 1]

131. Hoffer LJ, Bistrian BR, Driscoll DF. Enteral and parenteral nutrition. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:2539-2546. [Context Link 1]

132. 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]

133. 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]

134. 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]

135. 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]

136. 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]

137. 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]

138. 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]

139. 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] Most osteoporotic vertebral fractures are successfully treated nonoperatively with analgesics, physical therapy, medical treatment of osteoporosis, and fall precautions.(1) [A in Context Link 1]

[B] Most type 1 and type 2 fractures can be treated nonoperatively with a rigid orthosis. Type 3 occipital condyle fractures are often associated with instability, particularly if displacement is present, which suggests avulsion of the alar ligament.(2) [B in Context Link 1]

[C] Most type 1 and type 3 C1 fractures can be treated nonoperatively with a collar or halo vest.(2) [C in Context Link 1]

[D] Most type 1 and type 3 odontoid fractures can be treated nonoperatively with rigid immobilization.(2)(3) [D in Context Link 1]

[E] This refers to a traumatic injury of the C2 vertebrae involving fractures through the neural arch, which may result in forward displacement of the C2 vertebrae over the C3 vertebrae. This fracture is also known as a hangman's fracture.(2)(11) [E in Context Link 1, 2]

[F] Type 3 hangman's fractures are fracture dislocation injuries and require surgical stabilization.(2)(11) [F in Context Link 1]

[G] The subaxial injury classification severity score is based on scoring injury morphology, neurologic involvement, and involvement of the disks and ligaments. A score less than 4 indicates nonoperative treatment is appropriate; a score of 4 may be treated operatively or nonoperatively depending on clinical factors and informed preference; and a score greater than 4 indicates operative treatment is needed. An online calculator is available at www.mdcalc.com/subaxial-injury-classification-severity-scale-slics.(13) [G in Context Link 1]

[H] Vertebral body tethering is a growth modulation technique used for pediatric idiopathic scoliosis as an alternative to spinal arthrodesis or fusion.(23)(24) Benefits include increased flexibility as compared with fusion.(23)(24) Risks associated with vertebral body tethering include overcorrection, progression of spinal curvature beyond the tethered segments, and cord breakage.(23) [H in Context Link 1, 2]

[I] Open reduction of some common fractures and dislocations have dedicated guidelines in Inpatient & Surgical Care (ISC) and, when available, should be used rather than this General Recovery Guideline. Those with individual guidelines include ankle dislocation, ankle fracture, elbow fracture, femur fracture, foot fracture, hip fracture, hip dislocation, humerus fracture, knee dislocation, tibial plateau fracture, radius-ulna fracture, tibia-fibula fracture, and wrist fracture. [I in Context Link 1, 2]

[J] Two lower extremity amputations have their own dedicated guideline in Inpatient & Surgical Care (ISC) and should be used rather than this General Recovery Guideline. The ISC amputation guidelines are Foot: Transmetatarsal Amputation ISC and Leg Amputation, Above or Below Knee ISC. [J in Context Link 1]

[K] A narrative review states that patellofemoral arthroplasty is typically indicated in patients younger than 65 years, as total knee arthroplasty is usually more appropriate for older patients, but there is no absolute age restriction.(65) Relative contraindications include BMI greater than 35 or history of ligamentous reconstruction or meniscectomy. Case-by-case shared decision-making is the recommended approach for these patients.(65) [K in Context Link 1, 2]

[L] There is no clear clinical consensus concerning which patients are appropriate for ankle arthroplasty as opposed to ankle arthrodesis, a longtime standard treatment of severe ankle arthritis.(67)(69)(71) A randomized controlled trial including 281 patients with end-stage arthritis undergoing either total ankle replacement or arthrodesis and fusion found essentially equivalent clinical outcomes at 52-week follow-up; ankle replacement had more wound healing problems, while arthrodesis had higher rates of nonunion and thromboembolic events.(71) [L in Context Link 1]

[M] It is not clear whether revision arthroplasty is preferable to arthrodesis, as high complication rates have been noted in revision arthroplasty.(67) Absolute contraindications to revision ankle arthroplasty include deep infection, neuropathic joint, insufficient bone stock, and soft tissue breakdown.(67) Relative contraindications include absence of the distal part of the fibula, instability resulting from incompetent ligaments, severe malalignment, peripheral vascular disease, significant bone loss, and morbid obesity.(67) [M in Context Link 1]

[N] Evidence of the efficacy of sacroiliac joint fusion is largely based on observational studies, which have shown improvement in properly selected patients compared with patient cohorts treated nonsurgically.(81)(82)(83)(84) [N in Context Link 1, 2]

[O] Sacroiliac joint fusion may be done via an open or minimally invasive approach.(81)(82) Comparisons of open vs minimally invasive approaches have been limited to retrospective cohort analyses.(81)(82) [O in Context Link 1, 2]

[P] Two randomized controlled trials of minimally invasive sacroiliac joint fusion have shown efficacy, but both trials were small (total of 251 patients combined), were industry funded, had a large amount of crossover from nonoperative to operative treatment, and were unblinded.(85)(86) Editorial commentary suggested that patients should be selected with great care, as the ability to reliably identify sacroiliac joint pain is limited.(87) Several systematic reviews on minimally invasive sacroiliac joint fusion reported on the same 2 randomized controlled trials and a varying number of observational studies.(88)(89)(90)(91) [P in Context Link 1, 2]

[Q] A specialty society review and a narrative review state that, because individual tests aimed at identifying the sacroiliac joint as the source of pain are neither sensitive nor specific, a pain response from at least 3 provocative examination maneuvers is required in order to reach a provisional conclusion that the sacroiliac joint is the source of pain.(92)(93) These reviews go on to state that an image-guided (eg, fluoroscopy) intra-articular injection of local anesthetic into the sacroiliac joint is needed to confirm a conclusion that the sacroiliac joint is the source of pain. Specifically, at least a 50% reduction in pain constitutes a confirmatory response.(92)(93) One review and a specialty textbook state that a response of at least 75% is a more reliable indicator.(83)(93) The specialty society review specifically states that minimally invasive sacroiliac joint fusion is not indicated if symptoms have been present for less than 6 months, a trial of nonoperative therapy is lacking, or a diagnostic intra-articular injection is not performed or is not confirmatory.(92) [Q in Context Link 1, 2]

[R] See Intensive, Intermediate, and Telemetry Care Guidelines ISC. [R in Context Link 1]

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

Definitions

Activity level acceptable

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

Bacteremia

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

References

1. Lowy FD. Staphylococcal infections. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:1178-1188.
2. Rice LB. Principles of anti-infective therapy. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1840-1845.

Fracture or injury absent or status acceptable

- Fracture or injury absent or status acceptable, as indicated by **1 or more** of the following:
  - No injuries
  - Injury stable, as indicated by **ALL** of the following(1):
    - Fractures, joints, and injuries stabilized as needed (eg, cast, orthoses)
    - Neurologic deficit absent, at baseline, stable, or improving
    - Treatment at next level of care appropriate

References

1. Geiderman JM, Torbati S. General principles of orthopedic injuries. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:438-457.e2.

General Discharge Criteria met

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

Hemodynamic stability

- Hemodynamic stability, as indicated by **1 or more** of the following:
  - Hemodynamic abnormalities at baseline or acceptable for next level of care
  - Patient hemodynamically stable, as indicated by **ALL** of the following(1)(2):
    - Tachycardia absent

- Hypotension absent
- No evidence of inadequate perfusion (eg, no myocardial ischemia)
- No other hemodynamic abnormalities (eg, no Orthostatic hypotension)

References

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

Hypotension absent

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

References

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

Footnotes

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

Intake acceptable

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

References

1. Hoffer LJ, Bistrian BR, Driscoll DF. Enteral and parenteral nutrition. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:2539-2546.

No blood loss, or problem resolved

- No blood loss, or problem resolved, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - No blood loss problem
  - Repeat evaluation shows blood loss resolved sufficiently (eg, hemoglobin at acceptable level and stable)

References

1. Gaddy JD, Dupre AA. Disorders of hemostasis. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1486-1499.e2.
2. Dyke C, et al. Universal definition of perioperative bleeding in adult cardiac surgery. Journal of Thoracic and Cardiovascular Surgery 2014;147(5):1458-1463.e1. DOI: 10.1016/j.jtcvs.2013.10.070.
3. Bartoszko J, et al. Comparison of two major perioperative bleeding scores for cardiac surgery trials: universal definition of perioperative bleeding in cardiac surgery and European coronary artery bypass grafting bleeding severity grade. Anesthesiology 2018;129(6):1092-1100. DOI: 10.1097/ALN.0000000000002179.
4. Levy JH, et al. Consensus statement: hemostasis trial outcomes in cardiac surgery and mechanical support. Annals of Thoracic Surgery 2022;113(3):1026-1035. DOI: 10.1016/j.athoracsur.2021.09.080.

No infection, or status acceptable

- No infection, or status acceptable, as indicated by **1 or more** of the following(1)(2)(3)(4)(5):
  - No infection present
  - Infection status acceptable for next level of care, as indicated by **ALL** of the following(6):
    - WBC count normal, stable, or declining with treatment
    - Adequate treatment performable at next level of care
    - Organism and sensitivities identified, or adequate clinical response to empiric therapy
    - Repeat cultures negative or not needed

References

1. Hooper DC, Shenoy ES, Elshaboury RH. Treatment and prophylaxis of bacterial infections. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:1148-1163.

2. Blum FC, Biros MH. Fever in the adult patient. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:90-95.e1.
3. Mick NW. Pediatric fever. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:2067-2077.e2.
4. Melia MT. Approach to fever or suspected infection in the normal host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1845-1851.
5. Sifri CD. Approach to fever and suspected infection in the immunocompromised host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1851-1862.
6. Singh M, Fernandez-Frackelton M. Bacteria. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:1586-1609.e3.

No inpatient interventions needed

- No inpatient interventions needed; examples include:
  - Compartment syndrome monitoring
  - Monitoring for gangrene or tissue viability
  - Vital signs, neurologic signs, or vascular checks more often than feasible at next level of care
  - Large areas of debridement or skin grafting planned within 24 hours
  - Open fracture, dislocation, or other wound requiring imminent delayed closure
  - Urgent or emergent repeat operation for complex fractures (eg, secondary bone grafting) or complications (eg, dural laceration)
  - Epidural analgesia

No spinal surgery, or status acceptable

- No spinal surgery, or status acceptable, as indicated by **1 or more** of the following:
  - No spinal surgery performed
  - Status acceptable, as indicated by **ALL** of the following(1)(2)(3)(4):
    - No cerebrospinal fluid leak
    - No active bleeding at site
    - No severe respiratory abnormalities
    - Baseline voiding, or urinary catheter with management plan in place
    - Neurologic function at baseline or stable postoperatively

References

1. Divi SN, Okroj K, Patel AA. General complication in lumbar spine surgery. In: Patel VV, Kleck CJ, editors. Complications in Orthopaedics: Spine Surgery. Elsevier; 2025:160-166.
2. Barber J, Wick J, Klineberg EO. Complications in spine surgery: expected rates and classification. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:149-157.e1.
3. Kessler RA, Rasouli JJ, Shao J, Momim A, Steinmetz MP. Intraoperative crisis management in spine surgery: what to do when things go bad. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:785-794.e2.
4. Casper DS, Maslak JP, Pelle D. Posterior cervical decompressions: cervical laminectomy and laminoforaminotomy. In: Steinmetz MP, Berven SH, Benzel EC, editors. Benzel's Spine Surgery. 5th ed. Elsevier; 2022:935-937.e1.

Operative site and other wounds acceptable

- Operative site and other wounds acceptable, as indicated by **1 or more** of the following(1):
  - Wounds absent
  - Wound site clean and intact, with minimal to no drainage and without signs of infection
  - Current wound care performable at next level of care

References

1. Yepuri N, Pruekprasert N, Cooney RN. Surgical complications. In: Townsend CM, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston Textbook of Surgery. 21st ed. Elsevier; 2022:238-283.

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.

Pain and nausea absent or adequately managed

- Pain and nausea absent or adequately managed, as indicated by **1 or more** of the following(1)(2)(3)(4)(5):
  - No pain or nausea
  - Minimal discomfort on oral medications
  - Pain and nausea managed on regimen performable at next level of care

References

1. Swarm RA, et al. Adult Cancer Pain. NCCN Clinical Practice Guidelines in Oncology [Internet] National Comprehensive Cancer Network (NCCN). v. 2.2025; 2025 May 21 Accessed at: https://www.nccn.org/. [accessed 2025 Jun 04]
2. Cohen SP. Pain. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:133-141.e1.
3. Peterson SJB, Weisman SJ. Pediatric pain management. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:677-700.
4. Berger MJ, et al. Antiemesis. NCCN Clinical Practice Guidelines in Oncology [Internet] National Comprehensive Cancer Network (NCCN). v. 2.2025; 2025 May 12 Accessed at: https://www.nccn.org/. [accessed 2025 May 19]
5. Fourth consensus guidelines for the management of postoperative nausea and vomiting: erratum. Anesthesia and Analgesia 2020;131(5):e241. DOI: 10.1213/ANE.0000000000005245.

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 absent

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

References

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

Footnotes

A. Criteria based upon clinician acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no

or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.

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

Temperature status acceptable

- Temperature status acceptable, as indicated by **1 or more** of the following(1)(2)(3):
  - Temperature less than 100.5 degrees F (38.1 degrees C) (oral) and greater than 96.8 degrees F (36 degrees C) (rectal)
  - Temperature as expected for disease process and appropriate for management at next level of care

References

1. Nield LS, Kamat D. Fever. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:1640-1642.
2. Melia MT. Approach to fever or suspected infection in the normal host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1845-1851.
3. Sifri CD. Approach to fever and suspected infection in the immunocompromised host. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:1851-1862.

Vascular, soft tissue, and wound status acceptable

- Vascular, soft tissue, and wound status acceptable, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - No vascular, soft tissue, or wound problems
  - Status acceptable, as indicated by **ALL** of the following:
    - No significant ischemia
    - No Bacteremia
    - No evidence of compartment syndrome
    - Neuromotor function at baseline or expected level of recovery and appropriate for management at next level of care
    - No new wound dehiscence or hematoma that cannot be managed at next level of care
    - Tissue necrosis absent, or treatment plan appropriate for next level of care
    - Vascular, soft tissue, and wound management appropriate for next level of care

References

1. Creager MA, Loscalzo J. Arterial diseases of the extremities. 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; 2022:2107-2115.
2. Raja AS. Peripheral vascular trauma. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:429-437.e2.
3. Simon BC, Hern HG. Wound management principles. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:651-665.e2.

4. Osborn PM, Schmidt AH. Diagnosis and management of acute compartment syndrome. Journal of the American Academy of Orthopedic Surgeons 2021;29(5):183-188. DOI: 10.5435/JAAOS-D-19-00858.

Last Update: 1/25/2026 12:54:06 AM
Build Number: 30.0.2026012500524.025256