Hematology GRG

GRG: MG-HEM (ISC GRG)

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

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

Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Admission to Inpatient Care

- Hospital admission is needed for appropriate care of the patient because of **1 or more** of the following:
  - High-risk thrombocytopenia (low platelet count) (1)
  - Febrile neutropenia not attributed to chemotherapy[A](2)(3)(4)(5)
  - Active hemolysis with high-risk findings, as indicated by **1 or more** of the following(1)(6)(7)(8)(9)(10):
    - Hematocrit less than 25% (0.25)(1)
    - Rapidly progressing anemia(1)

- Thrombocytopenia(1)
- Evidence of thrombosis or new renal insufficiency (eg, hemolytic uremic syndrome, paroxysmal nocturnal hemoglobinuria)(1)(11)(12)(13)

− IgA vasculitis (Henoch-Schonlein purpura) and **1 or more** of the following[B](14)(15)(16):

- GI bleeding(15)(16)(17)(18)
- Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury), or rapidly progressive glomerulonephritis(14)(15)(16)(17)(18)(19)
- Orchitis(14)(16)(18)
- CNS involvement (eg, meningeal signs, encephalopathy)(14)(15)(16)(17)(18)
- Abdominal pain refractory to emergency and observation care(15)(16)(18)
- Severe pain requiring acute inpatient management (14)(15)(16)(17)(18)
- Other condition requiring inpatient admission (eg, intestinal obstruction, small bowel intussusception, pulmonary vasculitis)(15)(18)

− Hemophilia[C] in adult and **1 or more** of the following(20)(21)(22)(23)(24):

- Hemodynamic instability (21)
- Severe bleeding (eg, bleeding that is life-threatening or limb-threatening, or leads to drop in hematocrit)(20)(21)
- CNS bleed(20)(21)
- Retroperitoneal bleed(20)(21)(25)
- Retropharyngeal space bleed(20)(21)
- GI bleeding(20)(21)(25)
- Pulmonary hemorrhage or significant hemoptysis(21)
- Intramuscular bleed(20)(21)
- Hemarthrosis(21)
- Ophthalmic hemorrhage(21)(25)
- Renal hemorrhage (gross hematuria)(21)(25)
- Bleeding threatening airway(20)(21)
- Need for any invasive procedure or surgery(21)
- Other bleeding requiring inpatient care (eg, posterior nasal packing, postpartum hemorrhage disorder, pericardial tamponade)(21)
- Bleeding that persists beyond observation care(21)
- Severe pain requiring acute inpatient management (22)(25)
- Severe electrolyte abnormalities requiring inpatient care [D](25)

− Bleeding disorder and high-risk features, as indicated by **1 or more** of the following(21)(26):

- Hemodynamic instability (21)(26)(27)
- Severe bleeding (eg, bleeding that is life-threatening or limb-threatening, or leads to drop in hematocrit)(21)(26)(27)
- CNS bleed(21)(26)
- Retroperitoneal bleed(21)
- Retropharyngeal space bleed(21)
- GI bleeding(21)(28)
- Pulmonary hemorrhage or significant hemoptysis(21)(26)
- Intramuscular bleed(21)(26)
- Hemarthrosis(21)(26)
- Ophthalmic hemorrhage(21)
- Renal hemorrhage (gross hematuria)(26)
- Bleeding threatening airway(21)
- Disseminated intravascular coagulation(29)

- Significant bleeding that persists beyond observation care(26)
- Other bleeding requiring inpatient care (eg, epistaxis requiring posterior nasal packing, postpartum hemorrhage disorder, pericardial tamponade)(21)(26)

− Severe over-anticoagulation or high-risk situation in anticoagulated patient, as indicated by **1 or more** of the following(30)(31)(32)(33):

- Ongoing bleeding with **1 or more** of the following:
  - Hemodynamic instability (21)
  - Bleeding in location that is dangerous or can compromise organ function (eg, intracranial, intraocular, spinal, retroperitoneal, intra-articular, hemothorax, hemorrhage involving airway, or pericardium)(21)
  - Acute significant blood loss (eg, hemoglobin decline of 2 g/dL (20 g/L) or greater from known or presumed baseline)(21)
  - Concomitant coagulopathy that is not readily reversible (eg, liver disease, thrombocytopenic disorder)(21)

− Anemia and **ALL** of the following:

- Presence of significant clinical finding, as indicated by **1 or more** of the following:
  - Altered mental status (34)(35)
  - Acute heart failure(34)(35)
  - Myocardial ischemia(34)(35)
  - Dyspnea at rest or with minimal exertion(34)(35)
  - Syncope(34)(35)
  - Other findings suggesting inadequate perfusion (eg, peripheral ischemia, Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury), intestinal ischemia)(34)(35)
- Findings persist despite treatment in observation care or are inappropriate for observation care (ie, too severe).

− Anticoagulant overdose and **ALL** of the following(32)(36):

- Patient at high risk of bleed that is serious or can compromise organ function (eg, intracranial, spinal, or retroperitoneal due to recent surgery)
- Coagulopathy persists beyond observation care.

− Hyperviscosity syndrome, as indicated by **1 or more** of the following(37)(38)(39):

- Polycythemia vera with hematocrit greater than 60% (0.60) and symptomatic or newly diagnosed(35)(39)
- Elevated platelet count associated with thrombosis, bleeding, or significant organ dysfunction(35)
- Leukostasis with white blood cell count greater than 100,000/mm^3 (100 x10^9/L) or more than 20% blast cells[E](37)(40)(41)(42)
- Severe signs or symptoms due to elevated red blood cell, white blood cell, or protein levels, as indicated by **1 or more** of the following(38)(39)(40)(43):
  - Neurologic findings (eg, Altered mental status, seizure, ataxia, neuromuscular symptoms)(37)(38)(39)
  - Visual disturbance (eg, bilateral retinal hemorrhage or thrombosis, papilledema, blurred vision)(37)(38)(39)(40)(44)
  - Mucosal hemorrhage (eg, bilateral epistaxis, gingival bleeding, gastrointestinal bleeding, retinal bleeding)(38)(44)
  - Cardiopulmonary symptoms (eg, congestive heart failure, myocardial infarction, dyspnea, diffuse alveolar hemorrhage)(37)(38)(39)
  - Other signs or symptoms of end organ dysfunction (eg, priapism, tissue ischemia)(37)(39)

− Thrombotic disorder requiring inpatient care (eg, heparin-induced thrombocytopenia, catastrophic antiphospholipid syndrome, thrombotic thrombocytopenia, immune thrombocytopenia, purpura fulminans) and **1 or more** of the following(21)(45)(46)(47)(48)(49)(50):

- Need for inpatient treatment (eg, Inpatient anticoagulation needed, IV immunosuppression, plasma exchange)(21)(40)(45)(49)(50)(51)
- Need for inpatient monitoring (eg, frequent laboratory testing, response to therapy)(21)(45)(49)(50)

− Cryoglobulinemia and **1 or more** of the following:

- Severe systemic effects (eg, glomerulonephritis, extensive skin necrosis, motor deficit, multiple mononeuropathy, other end organ damage due to vasculitis)(40)(52)
- Hyperviscosity (eg, acute thrombosis)(52)(53)

- Need for specified treatment that can only be managed in inpatient setting(52)

− Methemoglobinemia and **1 or more** of the following(54)(55):
- Hypotension
- Methemoglobinemia greater than 15% (0.15)(56)
- Cyanosis(56)(57)
- Seizure(57)
- Lactic acidosis
- Other severe symptoms due to tissue hypoxia(56)(57)

- Splenic infarct(58)

− Splenic trauma and **1 or more** of the following:
- High-grade splenic injury (eg, World Society of Emergency Surgery Classes II or greater, American Association for the Surgery of Trauma Grades III or greater)[F](59)(60)
- Vital sign abnormality (59)(61)(62)
- Serial hemoglobins are trending downward (eg, show a 10% decrease or more from highest value)[G](59)(61)(62)
- Need for blood transfusion[H](62)
- Known vascular injury (pseudoaneurysm, arteriovenous fistula, vessel truncation), contrast extravasation, or arterial blush detected on CT scan(59)(60)(63)
- Failure of trial of nonoperative management(59)(60)(61)

- Transfusion reaction requiring inpatient care (eg, anaphylaxis, hemolysis, transfusion-related lung injury, Hemodynamic instability)(64)(65)
- Bone marrow biopsy or aspiration requiring inpatient care (eg, complication of procedure)[I][J](66)
- **Hematology** condition, symptom, or finding for which observation care has failed or is not considered appropriate. See General Criteria: Observation Care ISC, General Admission Criteria GRG, or Pediatric General Admission Criteria GRG guideline as appropriate.

Supplemental Medicare Criteria

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

- Patient with Medicare coverage requires inpatient admission, as indicated by **1 or more** of the following(67):
  - Admitting clinician expects patient to require hospital care for less than 2 midnights but, based on complex medical factors documented in medical record, judges that inpatient care is necessary (case-by-case exception). The medical record must contain sufficient documentation to make clear the rationale for the exception.
  - Patient has need for intubation and mechanical ventilation that is new (ie, did not present to hospital already on mechanical ventilation).
  - Treatment plan for hospital admission includes procedure designated by CMS as inpatient only (ie, on Inpatient Only List).
  - Patient has already received medically necessary hospital care that meets 2-midnight benchmark (excluding activities such as triage/intake, delays in provision of care, or time added due to patient or family convenience). The medical record must contain sufficient documentation to make clear the medical necessity for hospital care across 2 or more midnights.

Alternatives to Admission

- Alternatives may include(26)(35)(68)(69)(70):
  - Outpatient care in emergency department, observation care (see General Criteria: Observation Care ISC guideline as appropriate), rapid treatment site, urgent care center, or medical office
    - Outpatient evaluation for nonemergent anemia, including:

- Initial evaluation and laboratory tests[K]
- Further outpatient evaluation, as indicated; examples include:
  - Colonoscopy or endoscopy
  - Double contrast barium enema
  - Angiography
  - Enteroscopy or wireless capsule endoscopy
  - Bone marrow aspiration and biopsy
- Transfusion in outpatient infusion center for chronic anemia

- Outpatient monitoring of platelet count(69)(71)
- Careful instructions on prevention of trauma (eg, no sports or playground activities, no intramuscular injections)
- Avoidance of medications known to affect platelet activity, such as aspirin and other NSAIDs
- Vitamin K
- Oral activated charcoal for overdose of direct-acting oral anticoagulant (within 4 hours of ingestion)(30)(31)
- Myeloid and erythroid growth factors (granulocyte colony-stimulating factor and granulocyte-macrophage colony-stimulating factor)(72)
- Outpatient transfusions
- Parenteral iron
- Outpatient apheresis or blood removal for hyperviscosity(40)
- Iron chelation
- Immunosuppressants

Hospitalization

General Recovery Course

Stage	Level of Care	Clinical Status	Interventions
1	• ICU or intermediate care[L] • Social Determinants of Health Assessment • Discharge planning. See Discharge Planning Tool SR.	• **Clinical Indications met[M]**	• 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** • **No significant hemolysis** • **No evidence of acute thrombosis** • **Platelet count normal or acceptable for next level of care** • **No blood loss, or problem resolved** • **No infection, or status acceptable** • **Coagulation parameters acceptable for next level of care**	• **Intake acceptable** • **No inpatient interventions needed**

- **Hyperviscosity absent or acceptable for next level of care**
- **No methemoglobinemia or stable and acceptable for next level of care**
- **General Discharge Criteria met**

(21)(34)(65)(73)(74)

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(21):
  - 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(75)(76):
        - Tachycardia absent
        - Hypotension absent
        - No evidence of inadequate perfusion (eg, no myocardial ischemia)
        - No other hemodynamic abnormalities (eg, no Orthostatic hypotension)
    - No significant hemolysis
    - No evidence of acute thrombosis
    - Platelet count normal or acceptable for next level of care(77)
    - No blood loss, or problem resolved, as indicated by **1 or more** of the following(21)(78)(79)(80):
      - No blood loss problem
      - Repeat evaluation shows blood loss resolved sufficiently (eg, hemoglobin at acceptable level and stable)
    - No infection, or status acceptable, as indicated by **1 or more** of the following(81)(82)(83)(84)(85):
      - No infection present
      - Infection status acceptable for next level of care, as indicated by **ALL** of the following(86):
        - 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
    - Coagulation parameters acceptable for next level of care
    - Hyperviscosity absent or acceptable for next level of care
    - No methemoglobinemia or stable and acceptable for next level of care
    - 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(87):

- Oral hydration, medications, and diet
- Enteral hydration, medications, and diet
- Administration routes performable at next level of care

No inpatient interventions needed; examples include:

- Urgent bone marrow aspiration or biopsy
- Cell pheresis or apheresis in unstable patient
- Urgent chemotherapy in unstable patient
- Urgent plasma or red blood cell transfusion
- Urgent clotting factor administration and follow-up monitoring

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

Case Management

See Medical Admission Case Management GRG GRG for further information.

Discharge Destination

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

Evidence Summary

Criteria

The evidence for the clinical indications found in this guideline includes 50 published peer reviewed articles, 3 specialty society or other evidence-based guidelines, and 12 book sections.

Rationale

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

Use of these evidence-based clinical criteria to support decision making around the need for inpatient treatment is of clinical benefit to the patient and is crucial for quality patient care. Use of evidence-based clinical criteria ensures patients receive the most appropriate care for their specific condition, reduces unnecessary

risks, promotes recovery, and provides a standard that can reduce disparities in care. Evidence-based clinical criteria not only help align treatment decisions with best practice, but they can also help reduce unwarranted variation in care by fostering consistency and equality in healthcare provision across regions and facilities. Appropriate use of the evidence-based clinical criteria in conjunction with the Supplemental Medicare Criteria ensures Medicare patients receive full access to Medicare benefits (eg, inpatient care), without risk of delay or decreased access, based on variables such as clinical severity of illness, length of provision of medically necessary hospital-level care, or satisfaction of specified Medicare criteria as directed by CMS. Use of these criteria will help ensure that the patient receives necessary care in the appropriate setting.

Related CMS Coverage Guidance

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

Code of Federal Regulations (CFR): 42 CFR 412.3(67); 42 CFR 419.22(88); 42 CFR 422.101(89)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(90); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(91); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(92); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(93)

Medicare Coverage Determinations: Medicare Coverage Database(94)

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Footnotes

[A] This guideline pertains to patients who have neutropenia due to reasons other than chemotherapy, such as infection, congenital neutropenia (eg, severe combined immunodeficiency (SCID)), or bone marrow suppression from other medications (eg, antibiotics).(2)(3)(4) For chemotherapy-related neutropenia, please see Chemotherapy ISC or Chemotherapy, Pediatric ISC. [A in Context Link 1]

[B] Treatment of IgA vasculitis (Henoch-Schonlein purpura) is primarily supportive, and corticosteroids are not recommended for prophylactic prevention of complications.(14)(15)(16) [B in Context Link 1]

[C] Hemophilia is a bleeding disorder in which there is a deficiency in one or more of the proteins (called factors) in the coagulation pathway.(20) Hemophilia A (factor VIII deficiency) is much more common than hemophilia B (factor IX deficiency), representing 80% to 85% of hemophilia patients.(20) Severe hemophilia occurs when less than 1% of the factor is available for clotting, moderate 1% to 5%, and mild between 5% and 40%.(20) Clotting factor replacement is the mainstay of therapy whenever significant bleeding is present or suspected. Some patients develop autoimmune inhibitors to factor therapy complicating treatment.(20) [C in Context Link 1, 2]

[D] Electrolyte abnormalities may occur as a side effect of desmopressin treatment.(25) [D in Context Link 1]

[E] White blood cell count thresholds for leukostasis differ based on the underlying disease process.(40)(41) For example, leukostasis complications may occur in patients with acute myeloid leukemia or chronic myelomonocytic leukemia when the white blood cell count exceeds 100,000/mm^3 (100 $x10^9$/L), though patients with the myelomonocytic and monocytic subtypes of acute myeloid leukemia may become symptomatic when the white blood cell count exceeds 50,000/mm^3 (50 $x10^9$/L).(40) [E in Context Link 1]

[F] For lower-grade splenic injuries, a specialty society consensus and a narrative review recommend patients are observed for 24 hours. Higher-grade injuries require serial hemoglobin monitoring and at least 48 hours of observation in an acute care setting.(59)(60) [F in Context Link 1]

[G] A specialty society consensus states that a patient can be safely mobilized when 3 successive hemoglobin measurements, taken 8 hours apart, are within 10% of each other.(59) [G in Context Link 1]

[H] A specialty society guideline recommends that patients should receive packed red blood cell transfusion if they have clinical signs of shock after an initial fluid bolus of 20 mL/kg, if hemoglobin is less than 7 g/dL (70 g/L), or if a clinician has clinical suspicion of ongoing or recent bleeding.(62) [H in Context Link 1]

[I] Bone marrow biopsies are generally performed as an outpatient procedure.(66) [I in Context Link 1]

[J] Specialty society guidelines note that a bone marrow examination is not necessary when the presentation is typical of immune thrombocytopenia.(47) [J in Context Link 1]

[K] Evaluation may include CBC, peripheral smear, reticulocyte count, electrolytes, clotting studies, fecal occult blood testing, hemoglobin electrophoresis, iron studies, folate, and vitamin B12 levels.(35) [K in Context Link 1]

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

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

Definitions

Activity level acceptable

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

Acute kidney injury (stage 2)

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

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Footnotes

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

Acute renal failure (stage 3 acute kidney injury)

- Acute[A] kidney injury (stage 3),[B] as indicated by **1 or more** of the following[C](1)(2)(3):
  - Acute[A] rise in serum creatinine to 3 times its baseline value[D] or higher
  - Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%) and serum creatinine is greater than 4 mg/dL (354 micromoles/L)
  - In child younger than 18 years, estimated GFR less than 35 mL/min/1.73m^2 (0.58 mL/sec/1.73m^2) eGFR - Pediatric Calculator and **1 or more** of the following:
    - Acute[A] rise in serum creatinine to at least 1.5 times its baseline value[D] (increase of 50%)
    - Within past 48 hours, rise in serum creatinine greater than 0.3 mg/dL (26.5 micromoles/L)
  - Decreased urine output,[E] as indicated by **ALL** of the following:
    - Assessment of urine output appropriate (eg, adequate volume status, no urinary obstruction)
    - Oligoanuria, as indicated by **1 or more** of the following:
      - Urine output less than 0.3 mL/kg/hr for 24 hours
      - Anuria (urine output less than 0.1 mL/kg/hr) for 12 hours
  - Initiation of renal replacement therapy required(4)

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Footnotes

A. A specialty society practice guideline defines acute kidney injury as a change in renal function that is known or presumed to have occurred over the previous 7 days.(1)

B. For purposes of these criteria, the term acute renal failure can be viewed as stage 3 acute kidney injury in the KDIGO classification system.(1) Of note, in the ICD-10 diagnostic coding system (main coding scheme used in labeling diagnoses), the relevant codes covering the clinical entity of significant acute kidney injury use the term acute kidney failure (eg, code N17.9).

C. In determining the stage of acute kidney injury (eg, stage 2 vs stage 3), patients should be staged according to the criteria that give them the highest stage.(1)

D. If the baseline serum creatinine is not known, absent known or suspected chronic kidney disease, a baseline serum creatinine can be approximated by assuming an estimated GFR of 75 mL/min/1.73m^2 (1.25 mL/sec/1.73m^2).(1) eGFR - Adult Calculator eGFR - Pediatric Calculator

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

Altered mental status

- Altered mental status (ie, different from baseline), as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Confusional state (eg, disorientation, difficulty following commands, deficit in attention)
  - Lethargy (eg, awake or arousable, but with drowsiness; reduced awareness of self and environment)
  - Obtundation (ie, arousable only with strong stimuli, lessened interest in environment, slowed responses to stimulation)
  - Stupor (ie, may be arousable but patient does not return to normal baseline level of awareness)
  - Coma (ie, not arousable)

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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)

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Febrile neutropenia

- Febrile neutropenia[A] and **1 or more** of the following(1)(2)(3):
  - Profound neutropenia (neutrophil count of 100/mm^3 (0.1 x10^9/L) or less) anticipated to extend for 7 days or longer
  - Hemodynamic instability
  - Hypoxemia
  - Tachypnea
  - Altered mental status
  - New-onset abdominal pain
  - New-onset vomiting or diarrhea
  - Oral or gastrointestinal mucositis that interferes with swallowing or causes severe diarrhea
  - Focal infection (eg, cellulitis, pneumonia, central line or catheter infection, perirectal abscess)
  - Known or suspected infection with drug resistant organism
  - Renal insufficiency (eg, GFR of less than 30 mL/min/1.73m^2 (0.5 mL/sec/1.73m^2)) eGFR - Adult Calculator eGFR - Pediatric Calculator
  - Severe liver dysfunction (transaminase levels greater than 5 times normal)
  - Platelet count less than 50,000/mm^3 (50 x10^9/L)(4)
  - Leukemia or lymphoma induction therapy
  - Leukemia not in complete remission or with evidence of disease progression
  - Hematopoietic stem cell transplant patient
  - Alemtuzumab being used for therapy
  - Multinational Association for Supportive Care in Cancer (MASCC) Risk Index score of 20 or less, or Clinical Index of Stable Febrile Neutropenia (CISNE) score of 3 or more[B](1)(2)(5) MASCC Calculator
  - Outpatient treatment not feasible or not appropriate (eg, caregiver unavailable, distance to emergency care too great)

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Footnotes

A. A fever is defined as an oral equivalent temperature greater than or equal to 101 degrees F (38.4 degrees C), or greater than or equal to 100.4 degrees F (38 degrees C) sustained over a 1-hour period. Neutropenia is defined as an absolute neutrophil count less than 500/mm^3 (0.5 x10^9/L), or a neutrophil count that is expected to decrease to this level during the next 48 hours.(1)
B. The MASCC Risk Index and the CISNE score are validated prediction tools used to stratify febrile neutropenic adult patients into low-risk or high-risk categories. (1)(2)(5)

General Discharge Criteria met

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

Hemodynamic instability

- Hemodynamic instability, as indicated by **1 or more** of the following:
  - Vital sign abnormality not corrected by appropriate treatment, as indicated by **1 or more** of the following[A]:
    - Tachycardia that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
    - Hypotension that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
    - Orthostatic hypotension that persists despite appropriate treatment (eg, treatment of underlying cause, despite observation care)[A]
  - Severe hypotension in adult patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure less than 80 mm Hg(1)[A]
    - Shock index greater than 1.0 (shock index is the heart rate divided by systolic blood pressure)[A](2)(3)(4)
    - Mean arterial pressure[B] less than 65 mm Hg MAP Calculator[A](1)(6)
    - IV inotropic or vasopressor medication required to maintain adequate blood pressure or perfusion(3)(6)
    - Hypoperfusion due to hypotension, as indicated by **ALL** of the following:
      - Hypotension
      - Evidence of hypoperfusion, as indicated by **1 or more** of the following:
        - Lactate of 2.0 mmol/L (18 mg/dL) or more secondary to hypotension (ie, hypoperfusion)[C](3)(6)(8)
        - Metabolic acidosis (arterial or venous[D] pH less than 7.35) not otherwise explained(3)(6)(8)
        - Significant end organ dysfunction due to hypotension (eg, Altered mental status, myocardial ischemia, 2-fold or higher acute increase in serum creatinine)(3)(6)
  - Severe hypotension in pediatric patient, as indicated by **1 or more** of the following:
    - Systolic blood pressure less than 80 mm Hg in child 6 to 17 years of age[A](14)
    - Systolic blood pressure less than 75 mm Hg in child 6 months to 5 years of age[A](14)

- Shock index greater than 0.9 in child 13 to 17 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- Shock index greater than 1.0 in child 7 to 12 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- Shock index greater than 1.2 in child 4 to 6 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- IV inotropic or vasopressor medication required to maintain adequate blood pressure or perfusion(5)(6)
- Hypoperfusion due to hypotension, as indicated by **ALL** of the following:
  - Hypotension
  - Evidence of hypoperfusion, as indicated by **1 or more** of the following:
    - Lactate of 2.0 mmol/L (18 mg/dL) or more secondary to hypotension (ie, hypoperfusion)[C](6)(8)
    - Metabolic acidosis (arterial or venous pH less than 7.35) not otherwise explained[D](5)(6)(14)
    - Significant end organ dysfunction due to hypotension (eg, Altered mental status, myocardial ischemia, 2-fold or higher acute increase in serum creatinine)(5)(6)(14)

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Footnotes

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

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High-risk thrombocytopenia (low platelet count)

- Thrombocytopenia (low platelet count) and **1 or more** of the following(1)(2)(3):
  - Severe or life-threatening bleeding (eg, intracranial, major gastrointestinal, or extensive mucosal bleeding), with any reduced platelet count
  - Platelet count less than 20,000/mm^3 (20 $x10^9$/L) with any active bleeding
  - Platelet count less than 10,000/mm^3 (10 $x10^9$/L) with minor purpura or petechiae
  - Platelet count less than 5000/mm^3 (5 $x10^9$/L)
  - Low platelet count with hemolytic anemia

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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)

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

A. 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)

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3. Anderson CC, Kapoor S, Mark TE. Pediatric parameters and equipment. In: Anderson CC, Kapoor S, Mark TE, editors. The Harriet Lane Handbook: A Manual for Pediatric House Officers. 23rd ed. Elsevier; 2024:i-iii.

Footnotes

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

Hypoxemia

- Hypoxemia, as indicated by **1 or more** of the following(1):
  - Patient without baseline need for supplemental oxygen with oxygen saturation (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

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Footnotes

A. Pulse oximetry (SpO_2) may underestimate arterial saturation (SaO_2), especially in people with dark skin pigmentation, thick skin, cold body temperature, or who are wearing colored nail polish, and thus may not accurately detect hypoxemia.(2) Where appropriate, pulse oximetry should be measured after warming fingers or removing nail polish. Pulse oximetry results should be assessed within the context of the patient's clinical presentation, and performance of an arterial blood gas considered for a more accurate assessment of oxygenation if indicated.(2) Specific target values may require adjustment when care is delivered at high altitude.(3)

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

Inpatient anticoagulation needed

- Contraindication to outpatient use of medication with rapid anticoagulation effect (eg, IV unfractionated heparin and warfarin indicated),[A] as indicated by **ALL** of the following(1)(2)(4)(5):
  - Contraindication to use of low-molecular-weight heparin, as indicated by **1 or more** of the following:
    - Current or history of heparin-induced thrombocytopenia
    - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 $x10^9$/L))
    - Allergy to heparin, low-molecular-weight heparin, or product components
    - Need for neuraxial anesthesia or spinal puncture anticipated
    - Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)
  - Contraindication to use of fondaparinux, as indicated by **1 or more** of the following:
    - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 $x10^9$/L))
    - Allergy to fondaparinux, related drugs, or product components
    - Renal failure (creatinine clearance less than 30 mL/min/1.73m^2 (0.50 mL/sec/1.73m^2) or on dialysis)  eGFR - Adult Calculator  eGFR - Pediatric Calculator
    - Pregnancy(4)
    - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)

- Mechanical heart valve
- Need for neuraxial anesthesia or spinal puncture anticipated
- Inability to manage self-injection (eg, by patient, caregiver, or visiting nurse)
- BMI greater than or equal to 50[B]

- Contraindication to use of oral direct thrombin inhibitor (eg, dabigatran) or oral factor Xa inhibitor (eg, apixaban, edoxaban, rivaroxaban), as indicated by **1 or more** of the following[C][D](11):
  - Severe thrombocytopenia (eg, platelet count less than 50,000/mm^3 (50 $x10^9$/L))
  - Allergy to medication or product components
  - Pregnancy or breast-feeding[D](4)(11)
  - Severe liver disease (eg, Child-Pugh class C or coagulopathy (eg, elevated INR) due to liver disease)(12)
  - Renal failure (creatinine clearance less than 15 mL/min/1.73m^2 (0.25 mL/sec/1.73m^2) or on dialysis)[D](11) eGFR - Adult Calculator eGFR - Pediatric Calculator
  - Mechanical heart valve[D](11)(13)
  - Atrial fibrillation with rheumatic mitral stenosis[D](11)
  - Thrombotic antiphospholipid syndrome[D](11)
  - Left ventricular thrombus[D](11)
  - Catheter-associated deep venous thrombosis[D](11)
  - Cerebral venous sinus thrombosis[D](11)
  - Need for neuraxial anesthesia or spinal puncture anticipated
  - BMI greater than or equal to 50[B]

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Footnotes

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

Intake acceptable

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

References

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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

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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

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No inpatient interventions needed

- No inpatient interventions needed; examples include:
  - Urgent bone marrow aspiration or biopsy
  - Cell pheresis or apheresis in unstable patient

- Urgent chemotherapy in unstable patient
- Urgent plasma or red blood cell transfusion
- Urgent clotting factor administration and follow-up monitoring

Orthostatic hypotension

- Orthostatic hypotension,[A][B] as indicated by **1 or more** of the following(1)(2)(3):
  - Fall in SBP of 20 mm Hg or more 1 to 3 minutes after patient sits or stands from recumbent position
  - Fall in DBP of 10 mm Hg or more 1 to 3 minutes after patient sits or stands from recumbent position

References

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

A. Concomitant measurements of the heart rate are important to measure to help diagnose subtypes of orthostatic hypotension (eg, the lack of a compensatory increase in heart rate is typical of autonomic failure and an exaggerated tachycardia may be reflective of volume depletion). However, the heart rate is not a component of the definition of orthostatic hypotension, which relies upon blood pressure alone.(1)(2)(3)

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

Respiratory distress

- Respiratory distress, as indicated by **ALL** of the following(1)(2)(3)(4):
  - Patient with **1 or more** of the following:
    - Dyspnea (difficulty breathing)
    - Tachypnea
    - Abnormal breathing pattern (eg, chest retractions)
    - Other evidence of difficulty breathing
  - Evidence of respiratory compromise, as indicated by **1 or more** of the following:
    - Hypoxemia
    - Altered mental status
    - Other evidence of respiratory compromise (eg, respiratory acidosis)

References

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Severe electrolyte abnormalities requiring inpatient care

- Severe electrolyte abnormalities requiring inpatient care, as indicated by **ALL** of the following(1)(2)(3):
  - Electrolyte abnormality is not at acceptable patient baseline (eg, treatment effect).
  - Severe abnormality, as indicated by **1 or more** of the following:
    - Sodium[A] less than 130 mEq/L (mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(4)(5)
    - Sodium[A] less than 135 mEq/L (mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, seizures)(4)(5)
    - Sodium greater than 150 mEq/L (mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(4)
    - Sodium greater than 145 mEq/L (mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, seizures)(4)
    - Potassium less than 2.5 mEq/L (mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(6)
    - Potassium less than 3 mEq/L (mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, ECG findings,[B] paresis, paralysis)(6)(7)
    - Potassium greater than 6.5 mEq/L (mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(6)
    - Potassium greater than 5 mEq/L (mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, ECG findings,[C] paresis, paralysis)(6)(7)(8)
    - Calcium[D] less than 7 mg/dL (1.75 mmol/L) or ionized calcium less than 3.2 mg/dL (0.8 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(9)(11)
    - Calcium[D] less than 8.6 mg/dL (2.15 mmol/L) or ionized calcium less than 4.65 mg/dL (1.16 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, seizures, arrhythmia, cardiac conduction disturbance)(9)(11)
    - Calcium[D] greater than 14 mg/dL (3.5 mmol/L) or ionized calcium greater than 10.0 mg/dL (2.50 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(10)(11)
    - Calcium[D] greater than 12 mg/dL (3 mmol/L) or ionized calcium greater than 8.0 mg/dL (2.0 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, arrhythmia, cardiac conduction disturbance)(10)(11)
    - Phosphorus less than 1 mg/dL (0.32 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(12)
    - Phosphorus less than 1.5 mg/dL (0.48 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, seizures)(12)
    - Phosphorus greater than 10 mg/dL (3.2 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(12)
    - Phosphorus greater than 4.5 mg/dL (1.45 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, crush injury, Altered mental status, seizures, arrhythmia, cardiac conduction disturbance)(12)
    - Magnesium less than 1 mg/dL (0.41 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(12)
    - Magnesium less than 1.5 mg/dL (0.62 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, seizures, arrhythmia, cardiac conduction disturbance)(12)
    - Magnesium greater than 4.9 mg/dL (2 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(12)

- Magnesium greater than 3.0 mg/dL (1.23 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, Altered mental status, arrhythmia, cardiac conduction disturbance)(12)
- Uric acid greater than 20 mg/dL (1.19 mmol/L) not corrected to near normal or near chronic baseline despite observation care treatment(13)
- Uric acid greater than 8 mg/dL (0.48 mmol/L) with new (or presumed new) severe finding requiring inpatient management (eg, arrhythmia, cardiac conduction disturbance, seizure)(13)

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Footnotes

A. In patients with hyperglycemia, a corrected serum sodium should inform decision making.(4)

B. ECG manifestations of hypokalemia include ST-segment depression, flattened T-waves, and increased U-wave prominence.(7)

C. ECG changes associated with hyperkalemia include peaked T-waves, prolonged PR interval, loss of P-waves, prolonged QRS interval, or sinus bradycardia. Other manifestations include second-degree or third-degree atrioventricular block or a junctional escape rhythm. The ultimate result of hyperkalemia can be ventricular fibrillation, pulseless electrical activity, or asystole. ECG changes are not a sensitive indicator of severe hyperkalemia; patients with severe hyperkalemia may have minimal or nondiagnostic abnormalities. While a normal ECG does not exclude hyperkalemia, it does confer a much lower risk of dangerous arrhythmia. Hyperkalemic patients with isolated T-wave abnormalities are at low risk of a serious adverse event overall, while patients with conduction abnormalities and other more severe ECG findings are at higher risk.(6)(7)(8)

D. An ionized calcium level may be more accurate than a total serum calcium level, especially in the setting of acidosis, renal failure, multiple transfusions, hypoalbuminemia, or the presence of a paraprotein.(9)(10)

Severe pain requiring acute inpatient management

- Severe pain requiring inpatient management, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Inpatient parenteral analgesic agent treatment required,[A] as indicated by **ALL** of the following:
    - Pain insufficiently responsive to nonpharmacologic and oral pharmacologic analgesia (eg, NSAID, oral opioid)
    - Need for parenteral treatment persists despite observation care (eg, adjustments in dosage, frequency, medication, route).
  - Pain control regimen for next level of care not established, as indicated by **ALL** of the following:
    - Regimen used to achieve sufficient pain control is not readily performable at next level of care.
    - Unable to convert patient to regimen performable at next level of care despite observation care (eg, adjustments in dosage, frequency, medication, route)
  - Suspected new or deteriorating disease process as etiology (eg, new site of metastatic disease) requiring inpatient evaluation and treatment (eg, urgent radiation therapy)(7)
  - Palliative procedure planned that necessitates inpatient care for assessment and monitoring needs (eg, celiac block, stent to relieve obstruction)

References

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Footnotes

A. Many validated instruments are available to quantify pain.(4)(5) A visual analog or numerical rating scale graded from 0 to 10 is often used; moderate pain correlates with a score of 4 to 6 and severe pain is 7 to 10.(4) Different scales may be more appropriate for different disease processes or patient populations.(5)(6)

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.

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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

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Footnotes

A. Criteria based upon clinician acquired numeric values (eg, vital signs, oxygen saturation) should be used if they are accurate reflections of the patient's condition. Transitory findings (eg, abnormal only upon initial emergency department intake or only one time out of multiple readings) that rapidly improve with no or minimal treatment usually do not reflect disease severity or risk for deterioration. This does not imply that an initial or one-time reading cannot ever be applicable. The goal is to separate erroneous or incidental findings from those that truly represent the patient's clinical picture.
B. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. For example, an elderly patient on a beta-blocker medication with a baseline resting heart rate of 60 beats per minute may be clinically tachycardic at a heart rate of 94 beats per minute. Likewise, a patient who is upset, in pain, or nervous in the emergency department with a heart rate of 106 beats per minute may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as chest pain or hypotension) may not be clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.
C. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. A patient who is upset, in pain, or nervous in the emergency department with an elevated heart rate may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as hypotension) may not be clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Tachycardia absent

- Tachycardia[A][B] absent, as indicated by **1 or more** of the following:

- Heart rate less than or equal to 100 beats per minute in adult[A][B](1)
- Heart rate less than or equal to 85 beats per minute in child 13 to 17 years of age[A][B](2)
- Heart rate less than or equal to 95 beats per minute in child 6 to 12 years of age[A][B](2)
- Heart rate less than or equal to 110 beats per minute in child 1 to 5 years of age[A][B](2)
- Heart rate less than or equal to 120 beats per minute in infant 3 to 11 months of age[A][B](2)
- Heart rate less than or equal to 150 beats per minute in infant 1 or 2 months of age[A][B](2)

References

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

Footnotes

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

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

Tachypnea

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

References

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

Footnotes

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

B. Interpretation of respiratory rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline respiratory rate and whether the respiratory rate is indicative of significant underlying respiratory or other pathology. A mildly increased respiratory rate (eg, 20 to 22 breaths per minute in an adult), absent other indications of serious illness (eg, hypoxemia, metabolic acidosis, decreased tidal volume, pain), may be transitory and not clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachypnea. Whether a respiratory rate above the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment. In addition, the measurement of the respiratory rate is subject to error. A medical textbook states that because there can be significant breath-to-breath variation in respiratory rate, the rate should be assessed for at least 30 seconds, preferably for a full minute.(1) This same textbook also states that new technologies designed to measure the respiratory rate have not proved to be clinically useful.(1)

Vital sign abnormality

- Vital sign abnormality, as indicated by **ALL** of the following(1)(2):
  - Vital sign findings not as expected for chronic patient condition or baseline (eg, intentionally low blood pressure in heart failure)
  - Vital sign abnormality, as indicated by **1 or more** of the following:
    - Tachycardia
    - Hypotension
    - 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. 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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