Fever: Common Complications and Conditions

CCC: CCC-011 (ISC)
Link to Codes

MCG Health
Inpatient & Surgical Care
30th Edition

Prevention

- Prevention issues and possible preventive measures include(1)(2)(3)(4):
  - Prevention and early detection of hospital-associated infections; examples include:
    - General preventive measures, including(1)(2)(3)(4):
      - Hand hygiene before and after patient contact, before a clean or aseptic procedure, following body fluid exposure or risk of exposure, and following contact with patient surroundings or belongings
      - Regular environmental cleaning and disinfection(5)(6)
      - Use of personal protective equipment (PPE) when exposed to body fluids or potential infectious aerosols
      - Screening and isolation (eg, for suspected colonization with drug-resistant organisms, *Clostridioides difficile*, or infection spread by aerosol)
      - Antibiotic stewardship to reduce development of drug-resistant organisms
      - Decolonization strategies (eg, chlorhexidine bathing for ICU patients, preoperative skin antisepsis)(2)(7)
      - Ensure acuity-appropriate nurse to patient staffing(8)
    - Vascular catheter-related infections. See Intravenous Device Complications: Common Complications and Conditions ISC for further information.
    - Other vascular access infection (eg, arterial catheter, peripheral intravenous lines); examples include(7)(9):
      - Use of vascular access teams
      - Hand hygiene
      - Prepare insertion site with antiseptic solution.
      - Use ultrasound guidance for vascular access placement for arterial catheterization and difficult peripheral intravenous access.
      - Use sterile gel with ultrasound guidance if needle penetration through gel is anticipated.
      - Use sterile barrier precautions (mask, cap, sterile gloves, local fenestrated sterile drape) for arterial catheter placement.
      - Monitor to maintain clean and dry access site.
      - Daily assessment for removal (eg, continued need for device, signs of phlebitis, device malfunction)[A]
    - Pressure injury-related infections. See Wound and Skin Care: Common Complications and Conditions ISC for further information.

- Surgical site infections. See Wound and Skin Care: Common Complications and Conditions ISC for further information.
- Pneumonia. See Hospital-Acquired Pneumonia and Atelectasis: Common Complications and Conditions ISC for further information.
- Urinary catheter-related infections. See Urinary Complications: Common Complications and Conditions ISC for further information.
- Other implantable device infections (eg, cardiac implantable electronic devices, implanted prostheses)(10)
- Burn site infections[B](11)(12)
- Oral-related infections (eg, chemotherapy-injured mucosal infections, poor dentition-related infections)(13)
- Methicillin-resistant *Staphylococcus aureus* (MRSA) infections(14)
    - Adhere carefully to hand hygiene procedures.
    - Practice contact Isolation.
    - Perform equipment and environmental decontamination.
    - Maintain appropriate staffing ratios.
    - Implement immediate notification process from laboratory to infection control and clinical personnel identifying patients with newly diagnosed MRSA infection.
    - Cohort patient care[C]
    - If MRSA infection rate is inadequately controlled despite adherence to basic preventive practices, consider addition of **1 or more** of the following:
        - Active surveillance testing for MRSA
        - Decolonization therapy for MRSA-colonized patients, hemodialysis patients, and all adult ICU, burn unit, and neonatal ICU patients
        - Screen healthcare personnel only if they are linked to cluster of MRSA infections.
- *Clostridioides difficile* infections(16)(17)(18)(19)
    - Practice strict hand hygiene procedures with soap and water.
    - Practice contact Isolation (cohort patient care if private room unavailable).[C]
    - Practice prudent antibiotic use.[D](19)(20)
    - Implement immediate notification process from laboratory to infection control and clinical personnel identifying patients with newly diagnosed *Clostridioides difficile* infection.
    - Use disposable thermometers.
    - Use phenolic or hypochlorite solution disinfectants for environmental cleaning.
    - Perform active surveillance of patients with diarrhea.[E]
- *Candidozyma auris* (formerly *Candida auris*) infections(21)(22)
    - Maintain contact precautions including use of PPE.
    - Isolate or cohort patients colonized or infected with *Candidozyma auris*.[C]
    - Use single-use or disposable equipment when possible.
    - Use chlorine-based disinfectants or other effective agent for environmental cleaning.[F]
- Sinus infections(23)
    - Change nasotracheal intubations to oral.
    - Remove NG tubes as soon as possible.
- Viral infections(24)(25)
    - Monitor trends and outbreaks (eg, norovirus, rotavirus, influenza, coronavirus).
    - Monitor for herpes zoster if complaints of pain, rash, or recent exposure.
    - Monitor for herpes simplex if complaints of rash or recent exposure (eg, neonatal exposure, recurrent disease).
    - Isolation protocol appropriate for viral illness

- Active surveillance of patients with known gaps in immunizations
- Active surveillance of patients with known immunodeficiency

- Prevention and early detection of drug fever(26)(27)(28)
  - Review history of drug reactions or relevant pharmacogenetic screening (eg, HLA-B 5701, HLA-B 1502).(27)
  - Minimize number of medications.
  - Systemic corticosteroids may be indicated for some drug-induced fever with rash syndromes (eg, drug-induced hypersensitivity syndrome (DISH, also known as drug reaction with eosinophilia and systemic symptoms (DRESS)), select patients with Stevens-Johnson syndrome)(28)
  - Review medication list if fever occurs.
- Prevention and early detection of febrile transfusion reaction(29)(30)
  - Restrict transfusions if possible.
  - Consider use of leukoreduced products.(31)
  - Premedicate with antipyretics for patients with history of febrile reactions to transfusions.
- Prevention and early detection of venous thromboembolism. See Venous Thrombosis and Pulmonary Embolism: Common Complications and Conditions ISC for further information.

Clinical Indications for Ongoing Inpatient Care

- Ongoing inpatient care for fever is indicated for **1 or more** of the following(24)(32)(33)(34)(35):
  - Hemodynamic instability (32)(33)(34)(36)
  - Bacteremia (if blood cultures performed)
  - Hypoxemia (34)(36)
  - Suspected cause requiring acute care (eg, endocarditis, meningitis, systemic fungal infection)
  - Evidence of infection of medical devices, such as implanted catheters or hardware(34)
  - Need for graded drug challenge or desensitization (eg, drug reaction to medication for which there is no substitute or concern for cross-reactivity)(27)
  - Altered mental status (33)(36)(37)
  - New coagulopathy (eg, reduced platelet count or new prolonged prothrombin time consistent with disseminated intravascular coagulation)(38)(39)
  - Dehydration that is severe or persistent (40)
  - Evidence of end organ dysfunction (eg, rising creatinine, myocardial ischemia, rising liver function tests) that is severe or persists despite initial treatment(33)(34)
  - Core (rectal) temperature lower than 95 degrees F (35 degrees C) (eg, thought to be due to infection)(41)
  - Parenteral antimicrobial regimen that must be implemented on inpatient basis (eg, infusion or monitoring needs beyond capabilities of outpatient parenteral therapy)(42)
  - Evidence of malignant hyperthermia (eg, unexplained tachycardia and muscle rigidity after depolarizing muscular blocking agent or inhaled anesthetic agent)(43)
  - Suspected neuroleptic malignant syndrome (eg, fever, muscle rigidity after recent use of neuroleptic medication)(44)
  - Severe immunosuppression (eg, neutropenic)[G](45)
  - Isolation indicated that cannot be performed outside hospital setting[H]

Alternatives to Inpatient Care

- Alternatives to inpatient stay extension include(16)(24)(32)(35)(45):
  - Outpatient care
    - Oral or IV antibiotics(42)(46)

        - Wound care
        - Supplemental oxygen
        - Catheter management
        - Antipyretics
        - Palliative or hospice care(47)
    - Recovery facility care
        - Repeat cultures
        - Pulmonary toilet
        - Wound care
        - Drain care
        - Oral or IV antibiotics
        - Catheter management

Discharge

- Extended stay beyond goal length of stay for primary condition may be needed until **ALL** of the following are present(24):
    - Hemodynamic stability
    - Hypoxemia absent
    - Tachypnea absent
    - Afebrile or temperature acceptable for next level of care
    - Cultures negative or infection identified and under adequate treatment
    - No condition, organ dysfunction (eg, renal failure), or laboratory finding (eg, acidosis) identified that requires inpatient care
    - Behavior or mental status abnormalities absent or manageable at lower level of care. See Mental Status Change: Common Complications and Conditions ISC for further information.
    - Adequate diet tolerated
    - Medical comorbidities absent or manageable at lower level of care
    - Oral medications or regimen acceptable for next level of care (eg, outpatient parenteral medications arranged)

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Footnotes

[A] A specialty nursing guideline recommends the removal of vascular access devices when they are no longer needed or for clinical indications (eg, signs of infection, complications, device dysfunction), and recommends against removal based solely on dwell time.(9) [A in Context Link 1]

[B] Up to 20% of patients with large burns (eg, greater than 20% total body surface area) can have a systemic inflammatory response syndrome (SIRS) response in the absence of infection.(11) The criteria to initiate treatment for sepsis are therefore more stringent in burn patients and include temperature greater than 102.2 degrees F (39 degrees C) or less than 97.7 degrees F (36.5 degrees C), progressive tachycardia greater than 110 beats per minute (adults), progressive tachypnea greater than 25 breaths per minute (adults), thrombocytopenia (platelet count less than 100,000/mm^3 (100 $x10^9$/L)), hyperglycemia in the absence of pre-existing diabetes, and enteral feeding intolerance; for purposes of defining sepsis, criteria also include documented infection (positive culture or pathology, or clinical response to antimicrobial agents).(11) [B in Context Link 1]

[C] Cohorting care means assigning staff and equipment such that they do not cross-cover patients with and without infection or colonization.(15) [C in Context Link 1, 2, 3]

[D] Prudent antibiotic use (antibiotic stewardship) entails the shortest duration of therapy possible, adherence to antibiotic prophylaxis guidelines, avoidance of high-risk agents (eg, clindamycin, cephalosporins), monitoring of patients on antibiotics, and ensuring optimal, effective, and targeted therapy (appropriate use of antibiotic for causative microorganism).(17)(19)(20) [D in Context Link 1]

[E] A specialty society guideline recommends against surveillance for *Clostridioides difficile* in pediatric patients younger than 2 years.(17) [E in Context Link 1]

[F] Many common hospital disinfectants are ineffective against *Candidozyma auris*. A list of effective agents is available at www.epa.gov/pesticide-registration/epas-registered-antimicrobial-products-effective-against-candida-auris-list. [F in Context Link 1]

[G] Low-risk patients (as defined by validated scoring systems) with neutropenic fever can be safely discharged and treated on an outpatient basis once they are clinically stable, symptomatically improved, and their fever has subsided.(45) [G in Context Link 1]

[H] Most patients who do not have clinical indications for inpatient care can continue their appropriate level of isolation at other levels of care (eg, home, recovery facility). Please consult the Centers for Disease Control and Prevention (CDC) website at www.cdc.gov/infection-control/hcp/isolation-precautions/ for updated recommendations on isolation. [H in Context Link 1]

Definitions

Acute kidney injury (stage 2)

- Acute kidney injury (stage 2) with significant clinical findings, as indicated by **ALL** of the following(1)(2)(3):
  - Acute[A] kidney injury (stage 2), as indicated by **1 or more** of the following[B]:
    - Acute[A] rise in serum creatinine between 2 and 2.9 times its baseline value[C] (increase of 3 times baseline would qualify as stage 3 acute kidney injury)

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

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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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Bacteremia

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

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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)

References

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Dehydration that is severe or persistent

- Dehydration and **1 or more** of the following(1)(2)(3)(4):
  - Clinical findings of severe dehydration, as indicated by **1 or more** of the following:
    - Hemodynamic instability
    - Acute renal failure (stage 3 acute kidney injury)
    - Acute kidney injury (stage 2)
    - Serum sodium greater than 150 mEq/L (mmol/L)
  - Dehydration that is persistent, as indicated by **ALL** of the following:
    - Oral rehydration therapy not tolerated or insufficient to adequately correct dehydration
    - Dehydration persists despite appropriate treatment (eg, IV fluids, observation care)

References

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Hemodynamic instability

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

- Systolic blood pressure less than 75 mm Hg in child 6 months to 5 years of age[A](14)
- Shock index greater than 0.9 in child 13 to 17 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- Shock index greater than 1.0 in child 7 to 12 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- Shock index greater than 1.2 in child 4 to 6 years of age (shock index is the heart rate divided by systolic blood pressure)[A](2)(15)
- IV inotropic or vasopressor medication required to maintain adequate blood pressure or perfusion(5)(6)
- Hypoperfusion due to hypotension, as indicated by **ALL** of the following:
  - Hypotension
  - Evidence of hypoperfusion, as indicated by **1 or more** of the following:
    - Lactate of 2.0 mmol/L (18 mg/dL) or more secondary to hypotension (ie, hypoperfusion)[C](6)(8)
    - Metabolic acidosis (arterial or venous pH less than 7.35) not otherwise explained[D](5)(6)(14)
    - Significant end organ dysfunction due to hypotension (eg, Altered mental status, myocardial ischemia, 2-fold or higher acute increase in serum creatinine)(5)(6)(14)

References

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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)

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

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

- Systolic blood pressure less than 90 mm Hg in child 1 or 2 years of age[A][D](3)
- Systolic blood pressure less than 80 mm Hg in infant 6 to 11 months of age[A][D](3)
- Systolic blood pressure less than 70 mm Hg in infant 3 to 5 months of age[A][D](3)
- Systolic blood pressure less than 65 mm Hg in infant 1 or 2 months of age[A][D](3)

References

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

Footnotes

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

Hypotension absent

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

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

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

Footnotes

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

Hypoxemia

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

Hypoxemia absent

- Hypoxemia absent, as indicated by **1 or more** of the following(1):
  - Arterial oxygen saturation (SpO_2) of 90% or greater or arterial partial pressure of oxygen (PaO_2) of 60 mm Hg (8.0 kPa) or greater on room air[A][B]
  - Oxygen requirements are stable and arranged for at next level of care.

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. Rojas-Camayo J, et al. Reference values for oxygen saturation from sea level to the highest human habitation in the Andes in acclimatised persons. Thorax 2018;73(8):776-778. DOI: 10.1136/thoraxjnl-2017-210598.

Footnotes

A. Specific target values (ie, 90% or 60 mm Hg (8.0 kPa)) may require adjustment when care is delivered at high altitude.(2)

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.

Isolation

- Isolation, as indicated by **1 or more** of the following[A][B](2):
  - Contact precautions, as indicated by **1 or more** of the following[C]:
    - Major draining abscess or decubitus ulcer, until drainage stops or can be contained by dressing
    - Acute viral conjunctivitis
    - Impetigo
    - Pediculosis (lice)
    - Known or suspected infection or colonization with multidrug-resistant organism
    - *Clostridioides difficile*
    - Child with bronchiolitis
    - For diapered or incontinent persons: gastroenteritis, hepatitis A or E
    - Severe primary, mucocutaneous, or disseminated *Herpesvirus hominis* (herpes simplex), until lesions are dry and crusted
    - Other infection or colonization with organism known to be transmitted via environmental contamination (eg, norovirus, rotavirus)
  - Droplet precautions (known or suspected infection with pathogen transmittable by large particle droplets from respiratory secretions), as indicated by **1 or more** of the following[D]:

- Pharyngeal diphtheria until 2 cultures are negative 24 hours apart
- Epiglottitis due to *Haemophilus influenzae*
- Seasonal influenza
- Meningitis due to *Haemophilus influenzae* or *Neisseria meningitidis* until 24 hours after effective therapy
- Mumps (infectious parotitis) until 5 days after swelling onset
- Group A *Streptococcus* skin, wound, or major burn (with contact isolation)
- Pneumonia adenovirus (with contact isolation)
- Pneumonia due to group A *Streptococcus*, *Mycoplasma pneumoniae*, child with type b *Haemophilus influenzae*
- *Bordetella pertussis* (whooping cough) until 5 days of effective antibiotic therapy
- Pneumonic plague (*Yersinia pestis*) until 48 hours of effective antibiotic therapy
- Rubella until 7 days after rash onset
- Other pathogenic agent transmittable by droplets

- Airborne precautions (known or suspected infection with pathogenic agent transmittable by aerosol that can remain suspended in the air), as indicated by **1 or more** of the following[E](3):
  - Severe acute respiratory syndrome (SARS) or severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection (with contact isolation)
  - *Mycobacterium tuberculosis*
  - Novel influenza A infection (eg, avian H5N1, H5N2, H7N9)
  - Measles until 4 days after rash onset, or for duration of illness if immunocompromised
  - Disseminated varicella zoster or infection in immunocompromised patient (with contact isolation)
  - Viral hemorrhagic fever (eg, *Ebolavirus*, Marburg; with contact isolation)
  - Other pathogenic agent transmittable by aerosol
- Protective environment required following allogeneic hematopoietic stem cell transplant[F]

References

1. Clinical Care Considerations. Clinical Considerations for Care of Children and Adults with Confirmed COVID-19 [Internet] Centers for Disease Control and Prevention. Accessed at: https://www.cdc.gov/covid/?CDC_AAref_Val=https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/clinical-considerations-index.html. Updated 2023 Aug [accessed 2024 Sep 23]
2. Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. [Internet] Centers for Disease Control and Prevention. 2024 Sep Accessed at: https://www.cdc.gov/infectioncontrol/. [accessed 2025 Sep 02]
3. Center for International Blood and Marrow Transplant Research (CIBMTR), et al. Guidelines for preventing infectious complications among hematopoietic cell transplant recipients: a global perspective. Bone Marrow Transplantation 2009;44(8):453-455.

Footnotes

A. Most patients who do not have clinical indications for inpatient care can continue their appropriate level of isolation at other levels of care (eg, home, recovery facility).(1)
B. The indications and specifics for various infection control measures vary by diagnosis and can change over time. Detailed and up-to-date recommendations from the Centers for Disease Control and Prevention are available at www.cdc.gov/infectioncontrol/guidelines/isolation/updates.html, www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html, www.cdc.gov/flu/professionals/infectioncontrol/healthcaresettings.htm, www.cdc.gov/flu/avianflu/novel-flu-infection-control.htm, and www.cdc.gov/vhf/ebola/clinicians/index.html.
C. Contact precautions include hand hygiene, single-patient rooms (preferred) or cohorting of patients colonized with the same pathogen, use of personal protective equipment for patient contact (gloves and gowns), coverage and containment of infected or colonized areas of the patient's body during transport, use of

disposable patient care equipment where applicable, use of patient-dedicated nondisposable equipment where applicable, cleaning and disinfecting nondisposable equipment prior to reuse on another patient, and daily or more frequent cleaning and disinfection of patient rooms and room equipment.

D. Droplet precautions include hand hygiene, single-patient rooms (preferred) or cohorting of patients colonized with the same pathogen, use of masks for patient exposure, and masking of patient during transport.

E. Airborne precautions include hand hygiene, single-patient airborne infection isolation (negative pressure) room exhausted to the outside or through HEPA filtration, and use of personal protective equipment for patient contact (fit-tested N95 or higher level mask, gloves, and gowns). In the event of a large outbreak, patients known or presumed to have the same infection may be cohorted.

F. Protective environment precautions include hand hygiene, HEPA filtration for incoming air, positive pressure relative to the corridor, daily surface cleaning and disinfection, and N95 mask for patient during transport.

Orthostatic hypotension

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

References

1. Shibao C, Lipsitz LA, Biaggioni I, American Society of Hypertension Writing Group. Evaluation and treatment of orthostatic hypotension. Journal of the American Society of Hypertension 2013 Jul-Aug;7(4):317-324. DOI: 10.1016/j.jash.2013.04.006.
2. Dalal AS, Van Hare GF. Syncope. In: Kliegman RM, et al., editors. Nelson Textbook of Pediatrics. 22nd ed. Elsevier; 2025:592-599.
3. Fang JC, O'Gara PT. History and physical examination: an evidence-based approach. In: Libby P, Bonow RO, Mann DL, Tomaselli GF, Bhatt DL, Solomon SD, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine. 12th ed. Elsevier; 2022:123-140.

Footnotes

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

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

Respiratory distress

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

- Hypoxemia
- Altered mental status
- Other evidence of respiratory compromise (eg, respiratory acidosis)

References

1. Braithwaite SA, Wessel AL. Dyspnea. In: Walls RM, editor. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023:194-201.e2.
2. Naureckas ET, Solway J. Disturbances of respiratory function. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson JL, editors. Harrison's Principles of Internal Medicine. 21st ed. McGraw Hill Education; 2022:2133-2139.
3. Matthay MA, Ware LB. Acute respiratory failure. In: Goldman L, Cooney KA, editors. Goldman-Cecil Medicine. 27th ed. Elsevier; 2024:642-652.
4. Rakoczy K. Acute respiratory failure. In: Gershel JC, Rauch DA, editors. Caring for the Hospitalized Child: A Handbook of Inpatient Pediatrics. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2023:749-754.

Tachycardia

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

References

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

Footnotes

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

C. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. A patient who is upset, in pain, or nervous in the emergency department with an elevated heart rate may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as hypotension) may not be clinically important. The numeric values included in this definition

are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Tachycardia absent

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

References

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Tachypnea

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

- Respiratory rate greater than 55 breaths per minute in infant 1 or 2 months of age[A][B](2)

References

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

Tachypnea absent

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

References

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Codes

ICD-10 Diagnosis: A02.1, A20.7, A21.7, A22.7, A24.1, A26.7, A31.2, A32.7, A39.1, A39.2, A39.3, A39.4, A40.0, A40.1, A40.3, A40.8, A40.9, A41.01, A41.02, A41.1, A41.2, A41.3, A41.4, A41.50, A41.51, A41.52, A41.53, A41.54, A41.59, A41.81, A41.89, A41.9, A42.7, A54.86, A78, B00.7, B37.7, O03.37, O03.87, O04.87, O07.37, O08.82, O23.00, O23.519, O23.529, R50.2, R50.81, R50.82, R50.83, R50.9, R65.20, R65.21, R68.0, R78.81, T81.44XA, T88.0XXA [Hide]

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