Stroke: Ischemic

ORG: M-83 (ISC)
Link to Codes

MCG Health
Inpatient & Surgical Care
30th Edition

Care Planning - Inpatient Admission and Alternatives

Clinical Indications for Admission to Inpatient Care

Note: Some patients may be appropriate for Observation care. For consideration of observation care, see Stroke: Ischemic: Observation Care ISC.

Note: For patients with clinically active secondary conditions, see Stroke: Ischemic Multiple Condition Management Guidelines.

- Admission is indicated for **1 or more** of the following[A](2)(3)(4): N N N

- Acute ischemic stroke[A] with neurologic findings that warrant inpatient care, as indicated by **1 or more** of the following:
  - National Institutes of Health Stroke Scale (NIHSS) score greater than 2[B](2)(9)
  - Evidence of hemorrhagic transformation(4)(9)
  - Altered mental status (10)
  - Dysphagia that warrants evaluation (eg, aspiration risk suspected)(2)(9)
  - Significant arm or leg weakness (eg, limiting movement against gravity)(4)
  - Aphasia(4)
  - Gait impairment(4)
  - Finding on brain imaging that requires inpatient care (eg, edema, threatened herniation)(2)(9)
  - Clinical monitoring for neurologic worsening needed (eg, large infarct, posterior circulation infarct)[C](2)(9)(11)
  - Clinical stability unclear (eg, recurrent or worsening findings)
- Acute ischemic stroke[A] with clinical need for inpatient care or monitoring, as indicated by **1 or more** of the following:
  - Hemodynamic instability (2)(9)(12)
  - Cardiac arrhythmias of immediate concern (9)(13)(14)
  - Clinically significant cardiac or vascular disorder identified (eg, on echocardiogram, imaging) that requires inpatient care (eg, severe valvular disease, atrial myxoma, cervical artery dissection)(15)
  - Ischemic stroke due to cerebral venous thrombosis[D](1)(16)
  - Respiratory abnormalities (eg, Hypoxemia, impaired airway protection)(2)
  - Severe hypertension (SBP greater than 180 mm Hg or DBP greater than 120 mm Hg, or greater than the 95th percentile for age, sex, and height plus 30 mm Hg in pediatric patients[E][F])(2)(4)(17)(18)
  - Prolonged cardiac telemetry monitoring needed (eg, beyond observation care time frame) due to concern for Dangerous arrhythmia (ie, not in effort to detect atrial fibrillation)[G]
  - Suspected vasculitis(21)(22)
- Thrombolysis or thrombectomy performed or planned[H](2)(23)(24)

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(25):
  - 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 include(4)(26):
  - Outpatient evaluation and treatment in emergency department, rapid treatment site, urgent care center, or medical office

- History and physical examination
- Laboratory and diagnostic testing (eg, brain imaging, carotid imaging, echocardiogram)(28)
- Outpatient antithrombotic therapy and control of risk factors (eg, hypertension, hyperlipidemia)

- Observation. See Stroke: Ischemic: Observation Care ISC guideline as appropriate.

Hospitalization

Optimal Recovery Course

Day	Level of Care	Clinical Status	Activity	Routes	Interventions	Medications
1	• Stroke unit, ICU,[I] telemetry, or floor • Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Extended Stay Risk Assessment • Discharge planning	• **Clinical Indications met[J]** • Cerebral hemorrhage excluded	• Bed rest	• IV fluids • IV medications • Possible central line venous access	• Neurologic checks • Check lipid levels • Neurology consultation • Laboratory studies • Cardiac monitoring • Imaging studies (ie, brain, intracranial vascular) • Swallowing evaluation • Oxygen if needed to maintain saturation at 94% or greater[K] • Possible endovascular therapy	• Blood pressure control as indicated[L] • Possible antithrombotic therapy[M] • Possible thrombolytic therapy
2	• Stroke unit, ICU, telemetry, or floor • Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Extended Stay Risk Assessment	• **Hemodynamic stability** • **Mental status at baseline or stable** • **Neurologic deficits absent or stable** • **Unimpaired swallowing**	• **Up to chair** • Rehabilitation at bedside • Possible assisted ambulation	• **Oral hydration** • **Oral medications** • **Advance diet as tolerated**	• Neurologic checks • Rehabilitation assessment • Possible oxygen • Possible physical therapy • Possible occupational and speech therapy	• Antithrombotic therapy • Blood pressure control

3	• Social Determinants of Health Assessment • Pediatric Readmission Risk Assessment • Adult Readmission Risk Assessment • Extended Stay Risk Assessment • Stroke unit or floor to discharge • Complete discharge planning	• **Hemodynamic stability** • **Dangerous arrhythmia absent** • **Mental status at baseline or stable and appropriate for next level of care** • **Neurologic deficits absent or stable and appropriate for next level of care** • **Discharge plans and education understood**	• **Ambulatory or acceptable for next level of care**	• **Oral hydration[N]** • **Oral medications or regimen acceptable for next level of care** • **Oral diet or acceptable for next level of care** • Advance diet as tolerated	• **Supplemental oxygen absent or at baseline requirement** • Neurologic checks • Possible physical therapy • Possible occupational and speech therapy	• **Antithrombotic therapy appropriate for next level of care established[M]** • Statin • Blood pressure control

(1)(2)(6)(31)(34)(35)(39)(40)NN

Recovery Milestones are indicated in **bold**.

Goal Length of Stay: 2 days

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

Extended Stay

Note: See Stroke: Ischemic Multiple Condition Management Benchmarking Table for more detailed information.

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

- Extended stay beyond goal length of stay may be needed for(2)(6)(29)(31)(34)(35):
  - Failure to meet discharge criteria (recovery milestones within final day in Optimal Recovery Course)
    - Expect brief stay extension.
  - Major deficit or clinical deterioration(42)
    - Patient presenting with severe manifestations (eg, hemiplegia, aphasia, progression in neurologic deficits, impaired cognitive or swallowing function) may require ongoing inpatient care.
    - Anticipate use of feeding tube, continuing physical therapy, and possible mechanical ventilation.
    - Anticipate permanent feeding tube placement and possible tracheostomy in patient with severe persistent dysphagia or impaired cognitive function.
    - Expect brief to moderate stay extension.
  - Seizures(3)(16)(43)
    - Patients with cerebral venous thrombosis and those undergoing thrombolytic or catheter-directed reperfusion therapy may be at higher risk of seizure. (16)(44)

- Anticipate parenteral and oral antiseizure therapy and possible continuous EEG monitoring.
- Expect brief stay extension.

- Bleeding (eg, cerebral or postprocedural)
  - Bleeding may occur after thrombolytic or antithrombotic therapy or following endovascular thrombectomy.
  - Factors that may increase the risk of hemorrhagic transformation of ischemic stroke include large infarct size, thrombocytopenia, more than 10 cerebral microbleeds on imaging, and renal impairment.(2)(45)(46)
  - Anticipate need for extended observation if bleeding occurs.
  - Expect brief to moderate stay extension.
- Increased intracranial pressure(31)
  - Anticipate hyperosmolar agents, diuretics, hyperventilation, intracranial pressure monitoring, and possible external ventricular drainage.
  - Decompressive surgical craniectomy may be needed for select patients (eg, refractory intracranial hypertension, neurologic deterioration, brainstem compression, or ventricular obstruction).(16)(35)
  - Expect moderate to prolonged stay extension.
- Surgical intervention(47)(48)
  - Ischemic stroke with brain edema and progressive neurologic compromise may prompt surgical decompression (eg, ventriculostomy or craniotomy).
  - Children or adults with focal cerebral arteriopathy (eg, moyamoya) may require surgical revascularization.(3)(49)
  - Expect moderate to prolonged stay extension.
  - See Craniotomy, Supratentorial ISC guideline as indicated.
- Hospital-acquired infection (eg, urinary tract infection, pneumonia)(50)(51)
  - Poststroke pneumonia is more common among patients older than 75 years with comorbid heart failure, dysarthria, and dysphagia.(52)
  - Anticipate parenteral antibiotics and supportive care.
  - Expect brief to moderate stay extension.
- Noninfectious poststroke fever(51)
  - Expect laboratory and radiologic evaluation for infectious and noninfectious etiologies.
  - Anticipate treatment with antipyretic medications and possible treatment of underlying cause (eg, withdrawal of possibly contributing drugs, chest physiotherapy for atelectasis).
  - Expect brief stay extension.
- Venous thromboembolism(29)(51)
  - Anticipate local external measures, anticoagulation, and possible vena cava filter.
  - See Venous Thrombosis and Pulmonary Embolism: Common Complications and Conditions ISC for further information.
  - Expect brief to moderate stay extension.
- Severe electrolyte abnormality (eg, hypernatremia, hyponatremia)
  - Anticipate careful fluid management and close monitoring of electrolytes and mental status.
  - Expect brief stay extension.
- Respiratory failure(35)(53)
  - Intubation and mechanical ventilation may be needed for obtundation, coma (eg, GCS Calculator less than 8), agitation or combativeness, loss of protective airway reflexes, significant elevation in intracranial pressure, brain herniation, or non-neurologic respiratory complications (eg, severe aspiration pneumonia, acute respiratory distress syndrome).
  - Tracheostomy may be needed for patient with Altered mental status that is severe or persistent, ongoing need for mechanical ventilation, or failure of extubation.
  - Anticipate brief stay extension.
- Myocardial ischemia(54)

        - Anticipate pharmacologic treatment and possible cardiac catheterization and intervention.
        - Expect brief stay extension.
    - Dangerous arrhythmia (54)
        - Anticipate telemetry monitoring, possible electrophysiologic study, and antiarrhythmic medications or ablation procedure.
        - Expect brief stay extension.
        - See Arrhythmia: Common Complications and Conditions ISC guideline as appropriate.
    - Cerebral hyperperfusion syndrome[O](55)
        - Anticipate ICU monitoring, transcranial duplex ultrasound, and brain imaging studies.
        - Anticipate intensive blood pressure control, prophylactic antiseizure medications, and possible hyperosmolar agents for cerebral edema.
        - Intracranial hemorrhage may occur.
        - Stay extension varies.
    - Poststroke delirium(56)
        - Poststroke delirium is associated with worse poststroke function and higher mortality.
        - Expect brief stay extension.
    - Unstable comorbidities (heart failure, Acute kidney injury (stage 2), Acute renal failure (stage 3 acute kidney injury))(51)
        - Unstable comorbidities may require ongoing inpatient care.
        - Expect brief stay extension.

See Common Complications and Conditions ISC for further information.

Discharge

Discharge Planning

- Discharge planning includes[P]:
    - Assessment of needs and planning for care, including(58)(59):
        - Develop and modify treatment plan (involving multiple providers) as needed.
        - Evaluate and address preadmission functioning as needed.
        - Evaluate and address psychosocial status issues as indicated. See Psychosocial Assessment SR for further information.
        - Evaluate and address social determinants of health (eg, housing, food). See Social Determinants of Health Screening Tool SR for further information.
        - Evaluate and address patient or caregiver preferences as indicated.
        - Identify skilled services needed at next level of care, with specific attention to:
            - Home safety assessment(60)
            - Medication management, adherence instruction, and side effects assessment(61)(62)(63)
            - Neurologic status assessment
            - Nutrition and hydration management
            - Ongoing education required(64)
            - Rehabilitation therapy or equipment coordination
    - Early identification of anticipated discharge destination; options include(59)(65):
        - Home; considerations include:
            - Home safety assessment. See Home Safety Assessment SR for further information.

- Patient safe to go home; examples include(66)(67)(68):
  - Medical status stable for patient's condition
  - Functional care can safely be provided with available resources.
  - Mental status stable for patient's condition
  - Medication availability confirmed and reconciliation complete
  - Patient/caregiver education completed with written discharge instructions provided
  - Community resources identified and referrals made, as needed
  - Home care arranged, if indicated
  - Necessary medical equipment delivery arranged or available in home, if indicated
  - Necessary medical supplies ordered, or patient/caregiver can obtain, if indicated
- Access to follow-up care
- Self-management ability if appropriate. See Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) Assessment SR for further information.
- Caregiver need, ability, and availability

- Post-acute skilled care or custodial care as indicated. See Discharge Planning Tool SR for further information.

- Transitions of care plan complete, including(59)(65)(69):
  - Patient and caregiver education complete.
    - See Teach-Back Tool SR for further information.
    - See Stroke: Ischemic: Patient Education for Clinicians SR for further information.
  - Medication reconciliation completion includes(63)(70):
    - Compare patient's discharge list of medications (prescribed and over-the-counter) against provider's admission or transfer orders.
    - Assess each medication for correlation to disease state or medical condition.
    - Report medication discrepancies to prescribing provider, attending physician, and primary care provider, and ensure accurate medication order is identified.
    - Provide reconciled medication list to all treating providers.
    - Confirm that patient or caregiver can acquire medication.
    - Educate patient and caregiver.
      - Provide complete medication list to patient and caregiver.
      - Importance of presenting personal medication list to all providers at each care transition, including all provider appointments
      - Reason, dosage, and timing of medication (eg, use "teach-back" techniques)(71)
    - Encourage communication between patient, caregiver, and pharmacy for obtaining prescriptions, setting up home medication delivery, and reviewing for drug-drug interactions.
    - See Medication Reconciliation Tool SR for further information.
  - Plan communicated to patient, caregiver, and all members of care team, including(72):
    - Inpatient care and service providers
    - Primary care provider
    - All post-discharge care and service providers
  - Appointments planned or scheduled, which may include:
    - Primary care provider(73)
    - Cardiologist
    - Follow-up evaluation call. See Post-Acute Care Follow-Up Call Tool SR for further information.(74)

- Neurologist(64)
- Physiatrist or rehabilitation physician(64)
- Rehabilitation therapy services(75)
- Specialists for management of comorbidities as needed
- Other

- Outpatient testing and procedure plans made, which may include:
  - Laboratory testing(76)
  - Other
- Referrals made for assistance or support, which may include:
  - Alcohol and other drug abuse or dependence treatment
  - Community services(64)
  - Educational program (eg, chronic condition management, self-management)(73)(77)
  - End-stage disease planning
  - Financial, for follow-up care, medication, and transportation
  - Home architectural modifications
  - Self-help or support groups(64)
  - Social services (eg, social programs, advance directives)(64)
  - Tobacco use treatment(78)(79)
  - Vocational rehabilitation(80)
  - Other
- Medical equipment and supplies coordinated (ie, delivered or delivery confirmed), which may include(81):
  - Adaptive devices (eg, feeding tools, reachers)(75)
  - Ambulation devices (eg, cane, crutches, walker)
  - Antiembolic or compression stockings
  - Bath and toilet aids
  - Blood pressure cuff
  - Chair lift
  - Lift equipment
  - Pressure injury prevention equipment(64)
  - Wheelchairs and accessories
  - Other

Discharge Destination

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

Evidence Summary

Criteria

The evidence for the clinical indications found in this guideline includes 10 published peer reviewed articles, 6 specialty society or other evidence-based guidelines, and 6 book sections.

Analysis of national hospital discharge data for a commercially insured population shows 78.1% of patients seen in an emergency department with a principal diagnosis of ischemic stroke were admitted to inpatient care.(5) **(EG 3)** Analysis of hospital discharge data for a Medicare-insured population shows 85.3% of patients seen in an emergency department with a principal diagnosis of ischemic stroke were admitted to inpatient care.(5) **(EG 3)** Analysis of an all-payer database shows a mean length of stay of 5.0 days for patients admitted to inpatient care.(6) **(EG 3)**

A consensus guideline states that all patients with acute ischemic stroke who are candidates for thrombolysis or mechanical thrombectomy require admission to inpatient care, often to the neuro-intensive care unit. The same consensus guideline notes that patients with acute ischemic stroke who have severe hypertension or hypotension must be admitted for inpatient care for monitoring and treatment.(2) **(EG 2)** A narrative review states that patients with ischemic stroke who have motor or sensory deficits, such as weakness, visual disturbance, dysphagia, or gait impairment, should be admitted for inpatient care.(4) **(EG 2)** A clinical guideline recommends at least 24 hours of ICU monitoring for children with acute stroke.(3) **(EG 2)**

Adjusted analysis of 13,335 Medicare patients with acute ischemic stroke undergoing endovascular thrombectomy found that having the procedure performed by a high-volume proceduralist (15 cases or more over 2 years) was independently associated with lower mortality and better outcomes, with further benefits seen at higher volumes.(7) **(EG 2)** In the same study, a hospital volume of 53 procedures over 2 years was independently associated with reduced mortality, with a further decrease in odds of mortality at higher volumes.(7) **(EG 2)**

Alternatives

Patients with ischemic stroke that is known or presumed to be new (this guideline applies to patients diagnosed with acute ischemic stroke), but who have minimal signs and symptoms, may not require inpatient care. Specifically, if there is no need for monitoring beyond the observation care time frame and there is no other need for inpatient level of treatment (eg, thrombolysis, rehabilitation that requires inpatient setting), there may not be a need for inpatient care. For example, if the clinical situation is such that there are no rehabilitative needs appropriate for an inpatient setting and treatment will consist of risk factor modifications such as cholesterol reduction (eg, statin), blood pressure control, and initiation of antiplatelet agents or an anticoagulant, absent other indications, inpatient care may not be necessary.(1)(4)(26)(27) **(EG 2)**

Hospitalization

A systematic review and meta-analysis of 17 randomized controlled trials (2422 adult patients) found that, compared with conventional care, hospitalized stroke patients given early supported discharge services had lower rates of long-term disability or institutionalization and shorter lengths of stay.(41) **(EG 1)** A systematic review and meta-analysis including 29 randomized controlled trials (5902 patients) concluded that providing inpatient care in a multidisciplinary stroke unit vs a general ward resulted in fewer deaths, less disability, and less need for institutionalization in nursing facilities.(30) **(EG 1)**

Length of Stay

Analysis of 1,541,685 patients (mean age 70 years) admitted with acute ischemic stroke reported that 38% were discharged in 2 days or less.(39) **(EG 2)** Analysis of the Nationwide Inpatient Sample database including 47,795 young adult patients (age range 18 to 44 years, median age 35 years) admitted with acute ischemic stroke reported that 25% were discharged within 2 days.(40) **(EG 2)** Analysis of national hospital discharge data for a pediatric population shows 29% of hospitalized patients with the principal diagnosis of stroke (without intracerebral hemorrhage) were discharged in 2 days or less.(6) **(EG 3)** Analysis of national hospital discharge data shows 36% of hospitalized adult patients with the principal diagnosis of stroke (without intracerebral hemorrhage) were discharged in 2 days or less.(6) **(EG 3)**

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(25); 42 CFR 419.22(82); 42 CFR 422.101(83)

Internet-Only Manual (IOM) Citations: CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 1 - Inpatient Hospital Services Covered Under Part A(84); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 6 - Hospital Services Covered Under Part B(85); CMS IOM Publication 100-02, Medicare Benefit Policy Manual, Chapter 15 - Covered Medical and Other Health Services(86); CMS IOM Publication 100-08, Medicare Program Integrity Manual, Chapter 6, Section 6.5 - Medical Review of Inpatient Hospital Claims for Part A Payment(87)

Medicare Coverage Determinations: Medicare Coverage Database(88)

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Footnotes

[A] An ischemic stroke is defined as an episode of neurologic dysfunction caused by focal cerebral, spinal, or retinal infarction. Central nervous system infarction is defined as brain, spinal cord, or retinal cell death attributable to ischemia based on either (a) pathologic, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or (b) clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting for 24 or more hours, and other etiologies have been excluded.(1) [A in Context Link 1, 2, 3, 4, 5]

[B] The National Institutes of Health Stroke Scale (NIHSS) is a validated tool to measure neurologic function in stroke patients. The NIHSS includes 15 individual elements that measure motor and sensory function, language and speech production, vision, level of consciousness, and attention. The elements are summed to provide an overall assessment of stroke severity, with the score ranging from 0 to 42.(8) A calculator is available online at www.mdcalc.com/nih-stroke-scale-score-nihss. [B in Context Link 1]

[C] Patients with large territorial infarctions and those with posterior circulation strokes are at high risk for developing brain swelling and herniation.(2)(11) Measures to lessen the risk of swelling and close monitoring of the patient for signs of neurologic worsening during the first days after stroke are recommended.(2) [C in Context Link 1]

[D] Cerebral venous thrombosis causes occlusion of venous structures in the brain that may include intracranial venous sinuses, the deep venous system of the cerebral cortex, or cortical veins.(1) This venous occlusion may present with ischemic cerebral infarction, cerebral hemorrhage, vasogenic edema, or intracranial hypertension.(1) [D in Context Link 1]

[E] 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. [E in Context Link 1]

[F] The reference supporting this content on pediatric hypertension has age-adjusted, sex-adjusted, and height-adjusted blood pressure reference tables to identify the 95th percentile (tables 4 and 5).(17) The full article with the tables (https://pediatrics.aappublications.org/content/pediatrics/140/3/e20171904.full.pdf/) is publicly available. [F in Context Link 1]

[G] Telemetry monitoring beyond observation care so as to detect atrial fibrillation is not recommended.(19) Specialty society guidelines state that, in patients with TIA or stroke in whom a cardioembolic source is suspected, longer-term ambulatory rhythm monitoring (eg, wearable external monitor, or implantable monitor for those at high risk for atrial fibrillation) is appropriate to detect previously undiagnosed atrial fibrillation.(2)(19)(20) In stroke patients, a specialty society guideline recommends that, even if atrial fibrillation is detected, anticoagulation should not be initiated within 4 days of stroke onset and that initiation 4 to 14 days after stroke onset is appropriate.(2) [G in Context Link 1]

[H] An evidence-based guideline recommends that if urgent carotid revascularization is indicated, it should not be performed within 48 hours of stroke onset and that any time within the window of 48 hours to 7 days after stroke onset is appropriate.(2) Thus, absent other indications for inpatient care, outpatient care and follow-up may be appropriate for patients with acute ischemic stroke requiring carotid stenting or endarterectomy. [H in Context Link 1]

[I] ICU admission is indicated after thrombolysis or endovascular treatment, or for altered mental status, arterial dissection, mechanical ventilation, elevated intracranial pressure, large hemispheric or cerebellar infarcts, hypertensive emergency, hemorrhagic transformation, or high risk of progressive infarction, infarction complicated by new seizures, or deterioration. Patients receiving thrombolytic agents may be transferred out of the ICU after 24 hours if there is no evidence of

hemorrhagic conversion on examination and 24-hour post-thrombolysis brain imaging study and no other indications for ICU monitoring. If available, a neurocritical care or stroke unit that incorporates rehabilitation is preferred.(2)(29)(30)(31) A clinical guideline recommends at least 24 hours of ICU monitoring for children admitted with acute stroke.(3) See Intensive, Intermediate, and Telemetry Care Guidelines ISC for further information. [I in Context Link 1]

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

[K] 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.(32) 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.(32) Specific target values (ie, 90% or 60 mm Hg (8.0 kPa)) may require adjustment when care is delivered at high altitude.(33) Oxygen saturation goals for ischemic stroke may also require adjustment in patients with cyanotic heart disease.(34) [K in Context Link 1]

[L] Patients with hypotension and ischemic stroke may require fluids or vasoactive agents to maintain organ perfusion.(34)(35) [L in Context Link 1]

[M] The term "antithrombotics" refers to either anticoagulants or antiplatelet medications.(2)(36)(37)(38) [M in Context Link 1, 2]

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

[O] Cerebral hyperperfusion syndrome manifests as an increase in cerebral blood flow following a revascularization procedure such as carotid stenting, endarterectomy, or thrombectomy. Symptoms may include new-onset headache, facial and eye pain, and lethargy; severe cases may present with seizure, neurologic deficits, intracerebral hemorrhage, cerebral edema, or coma. Patients are usually hypertensive. The diagnosis is made by evidence of increased cerebral blood flow on transcranial duplex scan and lack of evidence for postoperative carotid occlusion or new ischemic event on brain imaging studies.(55) [O in Context Link 1]

[P] Discharge instructions should be given in the patient's and caregiver's native language using trained language interpreters whenever possible.(57) [P 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)

Adult Readmission Risk Assessment

- Risk of readmission is increased by presence (upon admission or during hospital stay) of **1 or more** of the following(1):
  - Clinically significant comorbid illness that necessitates (during current hospital stay) new or intensified treatment, prolongs length of stay, or impacts discharge level of care (eg, heart failure, COPD, active malignancy, cirrhosis, dementia, psychosis)(1)(2)(3)
  - End-stage renal disease or new need for dialysis(1)
  - Malnutrition[A](1)
  - Need for parenteral nutrition or supplemental enteral tube feeding (eg, via gastrostomy tube or jejunostomy tube)(1)
  - Need for transfusion of platelets or red blood cells(1)
  - Need for supplemental oxygen after discharge (new or pre-existing)(1)
  - Potential barriers to postdischarge clinical care (eg, homelessness, lack of transportation, impaired access to care or medication, active substance abuse)(1)
  - Frailty (ie, as indicated by a frailty measurement tool)[B][C](1)(5)(6)(7)
  - Two or more emergency department visits and/or inpatient admissions within previous 6 months(1)(8)

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Footnotes

A. There are many tools used to assess for malnutrition in adults. Near universal elements include recent weight loss and low muscle mass. Most tools include criteria based on BMI. Some include criteria around etiology such as low food intake vs disease burden or inflammation.(4) The Malnutrition Universal Screening Tool (MUST) is available at www.mdcalc.com/calc/10190/malnutrition-universal-screening-tool-must. The Nutrition Risk Screening 2002 (NRS-2002) tool is available at www.mdcalc.com/calc/4012/nutrition-risk-screening-2002-nrs-2002. A document that outlines the elements and scoring of several tools can be downloaded from https://aspenjournals.onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1002%2Fjpen.1440&file=jpen1440-sup-0001-Appendix.docx.

B. There are numerous measurement tools used to assess for frailty. Some of the more commonly used scales (with score indicating frailty in parentheses) include the following: Frailty Phenotype (3 or higher), 40-item Frailty Index (0.25 or higher), Study of Osteoporotic Fracture Index (2 or higher), Edmonton Frail Scale (8 or higher), FRAIL Scale (3 or higher), Clinical Frailty Scale (5 or higher), and Tilburg Frailty Indicator (5 or higher).(5)

C. Frailty may be described as a phenotype or as an accumulation of health deficits. The Fried phenotype delineates a clinical syndrome resulting from altered metabolism coupled with abnormal stress responses.(6) This model includes 5 characteristic features: exhaustion (energy level), weakness (hand grip strength), slowness (gait speed), physical inactivity (falls), and weight loss.(6)(7) The presence of 3 or more of these deficits indicates the presence of frailty.(6)(7) Frailty as deficit accumulation considers findings in multiple domains (eg, cognitive, physical, nutritional, laboratory) and high-risk comorbidities.(6)(7) In this model, the degree of frailty is quantified by the number of indicative items present.(6)

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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Altered mental status that is severe or persistent

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

References

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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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Clinically active atrial fibrillation

- Clinically active atrial fibrillation refers to atrial fibrillation necessitating electrical cardioversion or treatment with parenteral (IV) medication, while hospitalized, to control heart rate (eg, digoxin, diltiazem, metoprolol) or to cardiovert (eg, amiodarone, procainamide).

Clinically significant dementia

- Clinically significant dementia refers to dementia necessitating treatment with antipsychotic medication (eg, haloperidol, risperidone) or dementia-specific medication (eg, donepezil, memantine) while hospitalized.

Clinically significant malnutrition

- Clinically significant malnutrition refers to patients presenting with findings indicative of poor nutritional status; examples include unintentional weight loss, BMI less than 18.5, inadequate nutritional intake, loss of subcutaneous fat (eg, orbital, triceps, over ribs), or loss of muscle mass (eg, temples, clavicles, hands).

 BMI Calculator

Dangerous arrhythmia

- Dangerous arrhythmia, as indicated by **1 or more** of the following(1)(2)(3)(4):
  - Heart rhythms that are inherently dangerous or unstable, as indicated by **1 or more** of the following(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:
      - Acute myocarditis
      - Myocardial ischemia
  - Unstable cardiac conduction defects, as indicated by **1 or more** of the following(7):
    - Type II second-degree atrioventricular block
    - Third-degree atrioventricular block
    - New-onset left bundle branch block with suspected myocardial ischemia
  - Heart rhythms of concern due to **1 or more** of the following(8):
    - Hypotension
    - Respiratory distress
    - Association with other significant symptoms (eg, syncope)(7)(9)(10)(11)

References

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Dangerous arrhythmia absent

- Dangerous arrhythmia absent, as indicated by absence of **ALL** of the following(1)(2)(3)(4)(5)(6)(7)(8)(9)(10):
  - 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 with myocarditis or ischemia
  - Type II second-degree atrioventricular block
  - Third-degree atrioventricular block
  - New-onset left bundle branch block with suspected myocardial ischemia
  - Heart rhythms of concern due to association with Hypotension, Respiratory distress, or other significant symptoms (eg, syncope)

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Extended Stay Risk Assessment

- Risk of extended length of stay is increased by presence of **1 or more** of the following(1):
  - Acute renal failure (stage 3 acute kidney injury)

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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)

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

Footnotes

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

Hypotension absent

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

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

References

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

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B. The mean arterial pressure (MAP) takes into account both SBP and DBP readings.

Hypoxemia

- Hypoxemia, as indicated by **1 or more** of the following(1):
  - Patient without baseline need for supplemental oxygen with oxygen saturation (SpO_2) of less than 90% or arterial blood gas partial pressure of oxygen (PaO_2) of less than 60 mm Hg (8.0 kPa) on room air[A][B]
  - Patient without baseline need for supplemental oxygen who now requires supplemental oxygen to keep SpO_2 greater than 89% or PaO_2 greater than 59 mm Hg (7.9 kPa)[A]
  - Patient with baseline need for supplemental oxygen who now requires increased supplemental oxygen to maintain oxygenation at baseline or acceptable level

References

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

Observation care

- When a Clinical Indication says "…despite (or beyond) observation care," the intent is to signify that, despite an attempt to address a sign, symptom, finding, or treatment need in observation care, a continued need for hospital-based care persists beyond the observation care time frame (ie, Observation Care Discharge Criteria are not met). The time frame of observation care is determined by regulation (eg, CMS's Two-Midnight Rule) or payer-provider contractual agreement. MCG's understanding of observation care is that it must be finite and of short duration. The Two-Midnight Rule for Medicare patients (inpatient is defined as medical necessity for hospital-based care across 2 or more midnights) provides a good example of what is meant by a short duration (ie, observation care should not continue beyond the second midnight).

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.

Pediatric Readmission Risk Assessment

- Risk of readmission is increased by presence (upon admission or during hospital stay) of **1 or more** of the following(1):
  - Immunodeficiency (eg, neutropenia)(1)

- Malnutrition[A](1)
- Need for parenteral nutrition or supplemental enteral tube feeding (eg, via gastrostomy tube or jejunostomy tube)(1)
- Need for transfusion of platelets or red blood cells(1)
- Parenteral antineoplastic (eg, chemotherapy) administered(1)
- Presence of complex chronic condition (eg, cerebral palsy, congenital malformations, muscular dystrophy, cystic fibrosis, autoimmune disease, malignancy, genetic disorder)[B](1)(4)(5)(6)
- Potential barriers to postdischarge clinical care (eg, unstable home environment, ability of caregivers to adhere to treatment plan unclear, impaired access to care or medication, active substance abuse in patient or caregiver)(1)(6)
- Inpatient admission within previous 6 months(7)
- Two or more emergency department visits within previous 6 months(1)(6)(8)

References

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Footnotes

A. In children, malnutrition can be assessed by inadequate weight for corrected age, failure to gain adequate weight over time (weight gain velocity), height velocity, weight-for-length or BMI depending on age, and developmental outcomes.(2) These growth and anthropometric parameters are measured longitudinally and plotted on growth charts appropriate for the child's sex and age (corrected if premature).(2) The Centers for Disease Control and Prevention (CDC) recommends that tables developed by the World Health Organization be used in children up to 2 years of age and that CDC-developed tables be used for children age 2 years or older.(2) Both sets can be obtained and downloaded from www.cdc.gov/growthcharts/who_charts.htm#The%20WHO%20Growth%20Charts.

B. A complex chronic condition is any medical condition that is expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or one organ system severely enough to require specialty pediatric care.(3)

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.
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Social Determinants of Health Assessment

- Risk of poor health outcomes may be increased by the presence of **1 or more** of the following social determinants of health(1)(2)(3):
  - Housing insecurity, as indicated by **1 or more** of the following:
    - Individual or caregiver's current living situation is **1 or more** of the following(4):
      - Does not have own housing (eg, staying in a hotel, shelter, or with others)
      - Has own housing (eg, house, apartment), but at risk of losing it in the future (ie, behind on rent or mortgage)
      - Has own housing (eg, house, apartment), but has lived in 3 or more places in past year
    - Current housing has **1 or more** of the following:
      - Electrical appliances (eg, stove, refrigerator) not working or unavailable
      - Insufficient heating or cooling
      - Insufficient ventilation
      - Lead paint or pipes
      - Mold
      - Pests (eg, bugs) or rodents
      - Smoke detectors not working or unavailable
  - Food insecurity, as indicated by **1 or more** of the following(5):
    - In the past year, individual or caregiver ran out of food and did not have money to buy more food.
    - In the past year, individual or caregiver worried that they would run out of food before they received money to buy more food.
  - Insufficient transportation, as indicated by **1 or more** of the following(6):
    - In the past year, individual or caregiver missed medical appointments or could not get medications due to lack of transportation.
    - In the past year, individual or caregiver missed nonmedical activities, work, or could not get things needed for daily living due to lack of transportation.
  - Insufficient utilities, as indicated by **1 or more** of the following(7):
    - Utilities (eg, electricity, water, gas, or oil) are currently shut off or unavailable.
    - In the past year, electric, water, gas, or oil company threatened to shut off services.
  - Personal safety risk, as indicated by **2 or more** of the following(5):

- Individual is sometimes or frequently physically hurt by another person (including family member).
- Individual is sometimes or frequently insulted or talked down to by another person (including family member).
- Individual is sometimes or frequently threatened with physical harm by another person (including family member).
- Individual is sometimes or frequently screamed or cursed at by another person (including family member).

- Insufficient dependent care, as indicated by **1 or more** of the following:
  - In the past year, individual or caregiver was unable to work due to lack of dependent care.
  - In the past year, individual or caregiver was unable to work more (additional) hours due to lack of dependent care.
  - In the past year, individual or caregiver missed medical appointments or could not get medications due to lack of dependent care.
  - In the past year, individual or caregiver missed nonmedical activities (eg, school, church, social activity) due to lack of dependent care.
- Depression risk, as indicated by **ALL** of the following(8):
  - In the past 2 weeks, individual had little interest or pleasure in normal activities on at least several days.
  - In the past 2 weeks, individual felt down, depressed, or hopeless on at least several days.

References

1. Scanlon A, Reinisch C. Social determinants of health. In: Harding MM, Kwong J, Hagler D, Reinisch C, editors. Lewis's Medical-Surgical Nursing: Assessment and Management of Clinical Problems. 12th ed. St. Louis, MO: Mosby; 2023:18-20.
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Stroke: Ischemic Multiple Condition Management Guidelines

- For patients who also have:
  - Clinically active atrial fibrillation, see Stroke: Ischemic with Clinically Active Atrial Fibrillation MCM
  - Clinically significant dementia, see Stroke: Ischemic with Clinically Significant Dementia MCM
  - Clinically significant malnutrition, see Stroke: Ischemic with Clinically Significant Malnutrition MCM

Tachycardia

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

- Heart rate greater than 110 beats per minute in child 1 to 5 years of age[A][C](2)
- Heart rate greater than 120 beats per minute in infant 3 to 11 months of age[A][C](2)
- Heart rate greater than 150 beats per minute in infant 1 or 2 months of age[A][C](2)

References

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

Footnotes

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

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

C. Interpretation of heart rate requires clinical judgment and consideration of several patient-specific factors, such as the patient's baseline heart rate, medications, and clinical impact. A patient who is upset, in pain, or nervous in the emergency department with an elevated heart rate may meet the technical definition of tachycardia, but this tachycardia (absent associated findings such as hypotension) may not be clinically important. The numeric values included in this definition are provided to allow for consistency in terms of a technical definition of the term tachycardia. Whether a heart rate above or below the technical threshold is clinically meaningful is a matter of persistence, context, and clinical judgment.

Tachycardia absent

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

References

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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.

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)

Codes

ICD-10 Diagnosis: I63.00, I63.011, I63.012, I63.013, I63.019, I63.02, I63.031, I63.032, I63.033, I63.039, I63.09, I63.10, I63.111, I63.112, I63.113, I63.119, I63.12, I63.131, I63.132, I63.133, I63.139, I63.19, I63.20, I63.211, I63.212, I63.213, I63.219, I63.22, I63.231, I63.232, I63.233, I63.239, I63.29, I63.30, I63.311, I63.312, I63.313, I63.319, I63.321, I63.322, I63.323, I63.329, I63.331, I63.332, I63.333, I63.339, I63.341, I63.342, I63.343, I63.349, I63.39, I63.40, I63.411, I63.412, I63.413, I63.419, I63.421, I63.422, I63.423, I63.429, I63.431, I63.432, I63.433, I63.439, I63.441, I63.442, I63.443, I63.449, I63.49, I63.50, I63.511, I63.512, I63.513, I63.519, I63.521, I63.522, I63.523, I63.529, I63.531, I63.532, I63.533, I63.539, I63.541, I63.542, I63.543, I63.549, I63.59, I63.6, I63.81, I63.89, I63.9 [Hide]

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