CURRENT

Practice Guidelines in Inpatient Medicine

2018-2019

JACOB A. DAVID

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2018–2019

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New York Chicago San Francisco Athens London Madrid
Mexico City Milan New Delhi Singapore Sydney Toronto

ISBN: 978-1-26-001223-1
MHID: 1-26-001223-9

The material in this eBook also appears in the print version of this title: ISBN: 978-1-26-001222-4, MHID: 1-26-001222-0.

eBook conversion by codeMantra
Version 1.0

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This book is dedicated to the VCMC Family Medicine family, and to Ken and Karen, who helped with homework.

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Preface

CURRENT: Practice Guidelines in Inpatient Medicine, 2018–2019 digests evidence-based guidelines into salient point-of-care applications, enabling physicians, nurse practitioners, physician assistants, and medical students to incorporate the advice of major professional societies and government agencies into the care of hospitalized adults. Each section outlines the initial assessment, acute management, and subsequent care for conditions commonly encountered in the hospital, putting relevant information at the busy clinician's fingertips.

The author is grateful to the contributors, a select group of teaching faculty and resident physicians from the Ventura County Medical Center Family Medicine Residency Program, for conferring their expertise. Their knowledge of medicine and commitment to excellent care for all is inspiring, and will be the principal reason for any success the book enjoys.

Acutely ill patients deserve consistent, high-quality care informed by the guidelines summarized in *CURRENT: Practice Guidelines in Inpatient Medicine, 2018–2019*. However, no guideline encompasses every scenario, and no handbook obviates the need for clinical training and critical analysis of the available evidence. The clinician's experience and judgment and the patient's unique circumstances and preferences will at times supersede the recommendations found herein. Though painstaking efforts have been made to accurately represent these recommendations and to find and correct errors and omissions, inaccuracies may remain. If you care to suggest an improvement or correct an error, please e-mail at EditorialServices@mheducation.com.

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Cardiovascular

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ADULT LIFE SUPPORT

Adult Basic Life Support and Cardiopulmonary Resuscitation (CPR)

1. Unresponsive, no pulse, and not breathing
   a. Activate emergency response
   b. Obtain defibrillator; when available, attach and activate
   c. Begin CAB resuscitation (compressions, airway, breathing)
      i. Compressions: 100/min, 2 inches depth, allow recoil, minimize interruptions
      ii. Airway: Head tilt, chin lift; jaw thrust if trauma
      iii. Breathing: Compressions only; if second trained rescuer available, 30:2 ratio; with advanced airway, 8–10 breaths per minute
   d. Every 2 minutes, reassess, rotate compressors, and resume compressions promptly

Adult Advanced Cardiac Life Support

1. Cardiac arrest
   a. Activate emergency response
   b. Begin CPR while obtaining rhythm assessment
   c. Non-shockable rhythm (asystole, pulseless electrical activity)
      i. CPR 2-minute cycles
      ii. Give epinephrine every 3–5 minutes
      iii. Reassess for shockable rhythm at end of each CPR cycle
      iv. Treat reversible causes
   d. Shockable rhythm (ventricular fibrillation, pulseless ventricular tachycardia)
   e. Shock
   f. Resume CPR immediately, 2-minute cycles
   g. Reassess for shockable rhythm at end of each CPR cycle; shock if appropriate

h. Give epinephrine every 3–5 minutes
i. Consider amiodarone or lidocaine if no ROSC after epinephrine and shock
j. Treat reversible causes

2. ROSC: Begin postarrest care

Source:

1. Neumar RW, Shuster M, Callaway CW, et al. Part 1: Executive summary. 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation. 2015;132 (18 Suppl 2):S315–S367. [http://circ.ahajournals.org/content/132/18_suppl_2/S315]

ST-ELEVATION MYOCARDIAL INFARCTION

Initial Assessment (ESC 2012)

1. Draw serum markers routinely, but do not wait for results to initiate reperfusion therapy

Acute Medical Management

1. Antiplatelet therapy (ACC/AHA 2013, ESC 2012, NICE 2013)
   a. Give aspirin (162–325 mg) at presentation
   b. If treating with PCI, give a loading dose of an ADP-receptor inhibitor (clopidogrel 600 mg, prasugrel[1] 60 mg, or ticagrelor 180 mg)[2] as early as possible
   c. If treating with fibrinolytics, give a loading dose of clopidogrel (300 mg; 75 mg if >75 years of age) with aspirin
2. Beta blockers
   a. ACC/AHA: If hypertensive or having ongoing ischemia, give beta blocker at time of presentation, unless contraindicated
3. Oxygen
   a. ESC: Give supplemental oxygen to treat hypoxia (SaO_2 <95%), breathlessness, or acute heart failure
4. Analgesics
   a. ESC: Give IV opioids to relieve pain
5. Anticoagulation (ACC/AHA 2013, ESC 2012, NICE 2013)
   a. If patient will receive primary PCI, give anticoagulation with unfractionated heparin (UFH), enoxaparin, or bivalirudin[3]; a glycoprotein IIb/IIIa inhibitor (abciximab, eptifibatide, tirofiban) may be added to UFH

[1]Do not administer prasugrel to patients with a history of prior stroke or TIA.
[2]ESC guidelines favor prasugrel or ticagrelor over clopidogrel. ACC/AHA does not state a preference.
[3]ESC guidelines favor bivalirudin or enoxaparin to unfractionated heparin. ACC/AHA does not state a preference.

b. If patient will receive fibrinolytics, give anticoagulation until hospital discharge (minimum 48 hours, up to 8 days) or until revascularization is performed; options include UFH (titrated to a PTT of 1.5–2.0 times control), enoxaparin (IV bolus followed in 15 minutes by subcutaneous injection), or fondaparinux (initial IV dose followed in 24 hours by subcutaneous therapy)

Coronary Reperfusion Therapy

1. PCI (ACC/AHA 2013, ESC 2012, NICE 2013)
   a. Initiate reperfusion therapy (PCI, if experienced operators are available in a timely fashion) to all eligible patients within 12 hours of symptom onset; it remains beneficial up to at least 24 hours if there is evidence of ongoing ischemia
   b. Primary PCI is preferable to fibrinolysis if performed by an experienced team within 120 minutes of first medical contact
   c. Primary PCI is indicated in all patients with STEMI and cardiogenic shock or severe acute heart failure
   d. In PCI for STEMI, use either a bare-metal or drug-eluting stent; use a bare-metal stent in patients with high bleeding risk, inability to comply with 1 year of dual antiplatelet therapy, or upcoming invasive procedure
   e. In comatose patients, use therapeutic hypothermia
2. Fibrinolytic therapy (ACC/AHA 2013, ESC 2012, NICE 2013)
   a. If timely PCI is not available, give fibrinolytic therapy within 30 minutes of hospital arrival, unless contraindicated; it is most useful if ischemic symptoms started within the past 12 hours, and is a reasonable choice between 12 and 24 hours if there is evidence of ongoing ischemia or a large area of myocardium at risk
   b. Transfer to PCI-capable center
   c. ACC/AHA: Transfer for urgent PCI if fibrinolysis fails
   d. ESC: Transfer all patients after fibrinolysis; rescue PCI is indicated immediately when fibrinolysis has failed

Management After Stabilization

1. Antiplatelet therapy (ACC/AHA 2016, ESC 2012)
   a. Continue aspirin 81 mg indefinitely
   b. After PCI for ACS, give dual antiplatelet therapy[4] for 1 year
      i. ESC: "Up to 12 months," with strict minimum of 1 month for bare-metal stent and 6 months for drug-eluting stent
      ii. ACC/AHA: "Discontinuation after 6 months may be reasonable" if high bleeding risk; ">1 year may be reasonable" if low bleeding risk
   c. After fibrinolytic therapy, continue dual antiplatelet therapy for at least 14 days and up to 1 year

[4]ESC guidelines favor prasugrel or ticagrelor over clopidogrel for dual antiplatelet therapy. ACC/AHA lists three options: clopidogrel 75 mg daily, prasugrel 10 mg daily, or ticagrelor 90 mg BID.

   d. ESC: If anticoagulation is otherwise indicated (i.e., for atrial fibrillation (AF)), give it in addition to antiplatelet therapy
2. Beta blockers (ACC/AHA 2013, ESC 2012)
   a. Initiate oral beta blockers in the first 24 hours, unless heart failure, evidence of a low output state, or other contraindications
3. Renin-angiotensin-aldosterone system inhibitors (ACC/AHA 2013, ESC 2012)
   a. Administer ACE inhibitor (or angiotensin receptor blocker, if intolerant of ACE) within the first 24 hours if anterior infarction, heart failure, or ejection fraction ≤40%
   b. Give an aldosterone antagonist to patients who are already receiving an ACE inhibitor and beta blocker, and whose ejection fraction is ≤40% and either have symptomatic heart failure or diabetes mellitus, unless contraindicated
4. Lipid-lowering agents (ACC/AHA 2013, ESC 2012)
   a. Start or continue high-intensity statin therapy, unless contraindicated
   b. Obtain a fasting lipid panel; ESC: Remeasure LDL after 1 month to ensure LDL <70 mg/dL
5. Implantable cardioverter-defibrillator therapy (ACC/AHA 2013, ESC 2012)
   a. ICD therapy is indicated before discharge in patients who develop sustained VT/VF more than 48 hours after STEMI, unless the arrhythmia is due to ischemia, reinfarction, or metabolic abnormalities
   b. If LVEF is initially reduced, reevaluate LVEF to assess candidacy for ICD therapy
6. Post-ACS risk assessments (ACC/AHA 2013, ESC 2012)
   a. If patient did not undergo coronary angiography, or in patients with multi-vessel disease, perform noninvasive testing for ischemia before discharge

Sources:

1. ACC/AHA 2013: O'Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction. J Am Coll Cardiol. 2013 Jan 29;61(4). [https://www.guideline.gov/summaries/summary/39429?]
2. ESC 2012: Steg PG, James SK, Atar D, et al. ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2012 Oct;33(20):2569–2619. [https://www.guideline.gov/summaries/summary/39353?]
3. NICE 2013: National Clinical Guideline Centre. Myocardial infarction with ST-segment elevation. The acute management of myocardial infarction with ST-segment elevation. National Institute for Health and Care Excellence (NICE); 2013 Jul. 28 p. [https://www.guideline.gov/summaries/summary/47019?]

   c. For adults >50 years old or immunocompromised, add ampicillin IV 2 g q4 hours[3]
   d. If allergic to beta-lactams
      i. Replace ceftriaxone with moxifloxacin IV 400 mg q24 hours
      ii. Replace ampicillin with trimethoprim-sulfamethoxazole 5 mg/kg (trimethoprim component) IV q6–12 hours
4. Give corticosteroids: 0.15 mg/kg dexamethasone q6 hours for 2–4 days; ideally, give 10–20 minutes before or at least concomitant with initiation of antibiotic therapy

Management After Stabilization (IDSA 2004)

1. Diagnose bacterial meningitis based on CSF profile
   a. Opening pressure: 200–500 mm H_2O
   b. WBC: 1000–5000 with 80%–95% neutrophils
   c. CSF glucose: <40 mg/dL
2. Tailor antibiotic therapy based on CSF Gram stain if possible
3. Follow blood and CSF cultures and tailor antibiotic/antiviral therapy to target isolated pathogens

Source:

1. IDSA 2004: Tunkel A R, Hartman BJ, Kaplan SL, et al. Practice guidelines for the management of bacterial meningitis. Clin Infect Dis. 2004;39(9):1267–1284. [https://academic.oup.com/cid/article-lookup/39/9/1267]

ENCEPHALITIS

Initial Assessment (IDSA 2008)

1. Suspect acute encephalitis in patients with fever, headache, altered level of consciousness, behavioral changes, focal neurologic signs, and seizures
2. Perform laboratory workup including:
   a. CBC
   b. Creatinine
   c. Transaminases
   d. PT/INR, PTT
   e. Chest X ray
   f. Neuroimaging (MRI preferred over CT, but do not delay imaging to obtain MRI)
3. Lumbar puncture with CSF culture (see Table 4-2 for interpretation parameters)

[3] Primarily to provide coverage for *Listeria* infection.

Acute Medical Management (IDSA 2008)

1. Start empiric acyclovir immediately if viral encephalitis suspected
   a. 10 mg/kg IV q8 hours in children and adults with normal renal function
   b. 20 mg/kg IV q8 hours in neonates
2. Give appropriate therapy for presumed bacterial meningitis if clinically indicated (see Figure 4-1 for initial management)
3. If there are clinical clues suggestive of rickettsial or ehrlichial infection during the appropriate season, add doxycycline to empiric regimen

Management After Stabilization (IDSA 2008)

1. Once pathogen has been identified, select a treatment specifically for that pathogen
2. Consider acute disseminated encephalomyelitis in all patients; if suspicion is high, treat with high-dose IV corticosteroids (i.e., methylprednisolone, 1 g IV daily for at least 3–5 days)

TABLE 4-2

TYPICAL CSF PARAMETERS FOR VARIOUS INFECTIONS

	Bacterial	Viral	Fungal/TB
Color	Turbid	Clear	Clear
Opening pressure	High	Normal or mildly increased	High
Glucose	Low	Low	Normal
Serum: CSF glucose ratio	<0.4	>0.6	<0.4
Protein	High	Normal	Normal to elevated
WBC count	>500	<1000	100–500
WBC differential	Predominantly PMNs	Increased lymphocytes	Increased lymphocytes

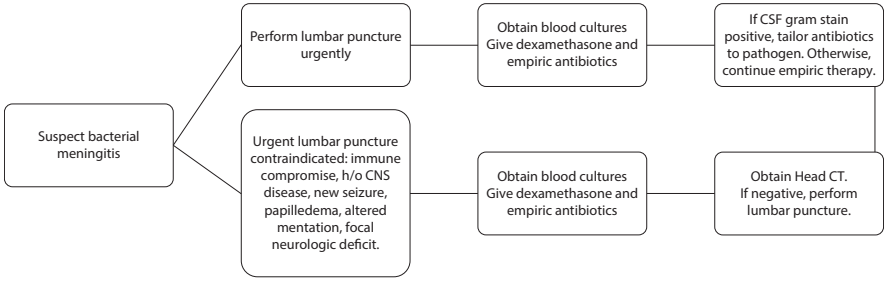

FIGURE 4-1. Initial management of bacterial meningitis. (From IDSA 2004; with permission.)

3. Perform plasma exchange in individuals who respond poorly to corticosteroids

Source:

1. IDSA 2008: Tunkel AR, Glaser CA, Bloch KC, et al. The management of encephalitis: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis. 2008;47(3):303–327. [https://academic.oup.com/cid/article/47/3/303/313455]

TRANSVERSE MYELITIS

Initial Assessment

1. Determine underlying etiology (AAN 2011)
   a. Idiopathic
      i. Usually there is a preceding GI, respiratory, or systemic illness (Curr Neurol Neurosci Rep. 2006)
   b. Secondary
      i. MS, para-infectious myelitis, lupus, Guillain-Barré syndrome, other systemic diseases
      ii. Often the initiating complaint of a new MS diagnosis
      iii. If it involves three or more vertebral segments, often due to neuromyelitis optica
2. Workup: Exclude compressive cord lesion
   a. Lumbar puncture
      i. Elevated CSF WBC of >10 cells/mm^3
      ii. Get oligoclonal bands, DRL, IgG index, cytology, and routine spinal studies
   b. MRI with and without gadolinium of the entire spine and brain
   c. Serum: NMO-IgG
   d. Diagnosis requires either pleocytosis of CSF or elevated IgG index or gadolinium enhancement on MRI
   e. Other workup
      i. TSH, auto-immune labs such as ANA/RF, ESR, CRP, rule out vascular myelopathies, metabolic and nutritional myelopathies, neoplasm, and radiation myelitis
3. Type
   a. Acute complete (ACTM)
   b. Acute partial (APTM)
      i. Higher risk of transition to MS; may be up to 90% in those with abnormal brain MRI

Acute Medical Management (AAN 2011)

1. Give high-dose burst steroids for 3–5 days

a. Methylprednisolone 1000 mg daily
b. Dexamethasone 200 mg daily
2. Longer steroid treatment may be needed, tailored to the patient's disease activity and guided by expert consultation
3. If motor impairment is present, consider plasma exchange: Five treatments of 1.1–1.5 plasma volumes every other day for 10 days
4. If severe TM, consider cyclophosphamide 800–1200 mg/m^2 once

Chronic Medical Management

1. Consider chronic immunomodulatory therapy for patients with recurrent disease
   a. Azathioprine: 150–200 mg/daily
   b. Methotrexate: 15–20 mg/week
   c. Mycophenolate: 2–3 g/day

Management After Stabilization

1. Relapse higher with APTM
2. Idiopathic TM usually has at least a partial recovery but may take 1–6 months (J Child Neurol. 2003); ensure good PT/OT
3. Rapid onset or infectious causes tend to yield a prolonged (over years) recovery or permanent disability

Sources:

1. Scott TF, Frohman EM, De Seze J, et al. Evidence-based guideline: clinical evaluation and treatment of transverse myelitis. Neurology. 2011;77(24): 2128–2134. [http://www.neurology.org/content/77/24/2128.full.html]
2. Krishnan C, Kaplin AI, Pardo CA, et al. Demyelinating disorders: update on transverse myelitis. Curr Neurol Neurosci Rep. 2006;6(3):236–243. [https://www.ncbi.nlm.nih.gov/pubmed?term=16635433]
3. Defrense P, Hollenberg H, Husson B, et al. Acute transverse myelitis in children: clinical course and prognostic factors. J Child Neurol. 2003;18(6):401–406. [https://www.ncbi.nlm.nih.gov/pubmed/12886975]

ICU DELIRIUM

Identification (SCCM 2013)

1. Risk factors for delirium (SCCM 2013)
   a. Preexisting dementia
   b. History of hypertension
   c. History of alcoholism
   d. High severity of illness at admission
   e. Comatose
2. Monitor all ICU patients routinely for delirium using a validated tool such as CAM-ICU or ICDSC

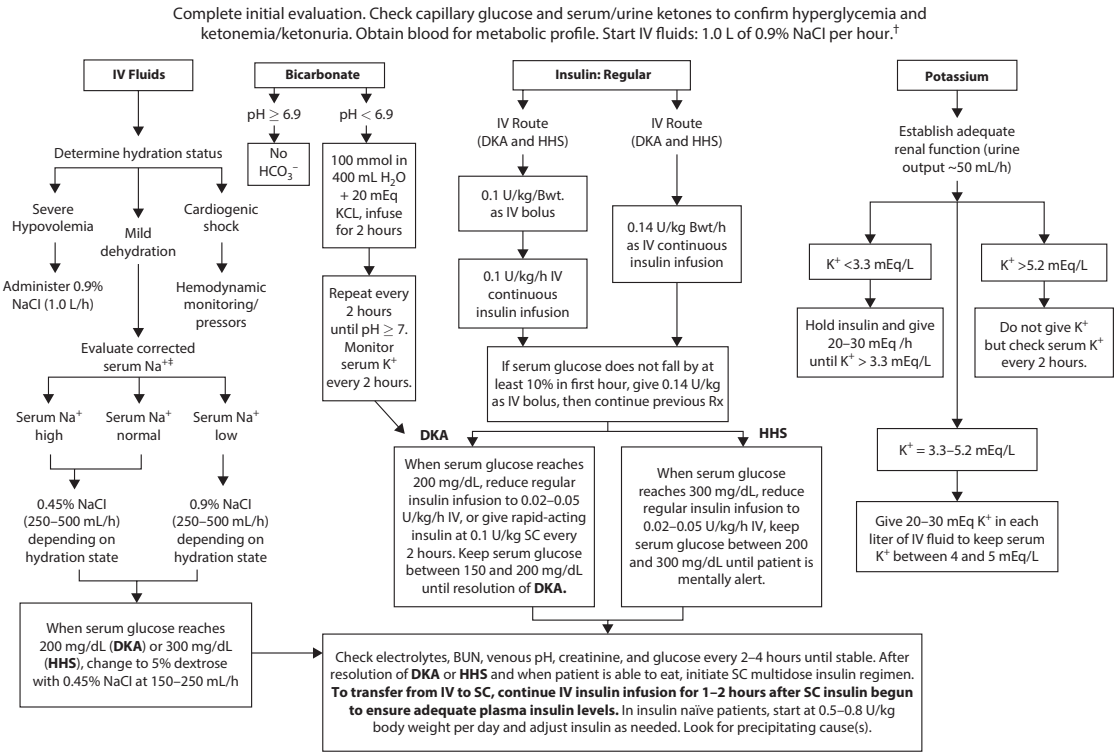

FIGURE 9-1. Protocol for management of adult patients with DKA or HHS. DKA diagnostic criteria: blood glucose 250 mg/dl, arterial pH 7.3, bicarbonate 15 mEq/l, and moderate ketonuria or ketonemia. HHS diagnostic criteria: serum glucose >600 mg/dl, arterial pH >7.3, serum bicarbonate >15 mEq/l, and minimal ketonuria and ketonemia.

†15–20 ml/kg/h;

‡Serum Na should be corrected for hyperglycemia (for each 100 mg/dl glucose 100 mg/dl, add 1.6 mEq to sodium value for corrected serum value).

Abbreviations: Bwt, body weight; IV, intravenous; SC, subcutaneous.