Clinicians continue to find the information in the *Pharmacotherapy Self-Assessment Program* (PSAP) modules not only a superb educational resource, but also a valuable patient care resource, replete with up-to-date information. The algorithms particularly can be used by clinicians as a quick reference to help guide patient care decisions. Although the format of PSAP is almost ideal as a teaching tool, it may not lend itself as readily to user-friendly practice applications. Thus, we have created this reference, a condensation of the pharmacotherapy algorithms from PSAP-VI, to provide a ready reference for a busy clinician.

The goal of this reference is to provide an affordable collection of clinically useful pharmacotherapy decision-making algorithms that are easy to find, understand, and apply. We have attempted to provide algorithms to help guide experienced clinicians in making optimal choices in concert with their patients without the need to consult additional references extensively. Thus, we have included algorithms leading to selection of type of therapy or selection between or among therapeutic options. Diagnostic algorithms have not been included. The material that is included is listed in the same general therapeutic categories as the PSAP modules. Please note that some algorithms may have been modified from their original PSAP version to reflect “current thinking.”

We hope you find this collection of algorithms a useful addition to your patient care armamentarium.

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American College of Clinical Pharmacy

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Algorithm for treatment of hypertension from JNC 7

Lifestyle Modifications

Not at Goal Blood Pressure (<140/90 mm Hg)
(<130/80 mm Hg for those with diabetes or chronic kidney disease)

Initial Drug Choices

Without Compelling Indications

Stage 1 Hypertension (SBP 140–159 or DBP 90–99 mm Hg)
Thiazide-type diuretics for most. May consider ACE inhibitor, ARB, β-blocker, CCB, or combination

Stage 2 Hypertension (SBP > 160 or DBP > 100 mm Hg)
Two-drug combination for most (usually thiazide-type diuretic and ACE inhibitor or ARB, or β-blocker, or CCB)

With Compelling Indications

Drug(s) for the compelling indications
Other antihypertensive drugs (diuretics, ACE inhibitor, ARB, β-blocker, CCB) as needed.

Not at Goal Blood Pressure
Optimize dosages or add additional drugs until goal blood pressure is achieved.
Consider consultation with hypertension specialist.
Compelling indications for specific pharmacotherapy

Recommendations are based on evidence demonstrating reduced morbidity and/or mortality related to the compelling indication with recommended pharmacotherapy and adapted from JNC 7 recommendations. Blood pressure should be managed concurrently with the compelling indication using these drugs when possible.

QTc interval monitoring algorithm

Starting class Ia or III antiarrhythmic drug

Baseline QTc interval > 440 ms?

No

Hypokalemia or hypomagnesemia?

No

Correct before starting

Yes

Start drug

Yes

Do not start drug

Baseline QTc interval > 460 ms?

No

Hypokalemia or hypomagnesemia?

Yes

Correct before starting

Yes

Start drug

Re-check QTc interval at steady state. If QTc interval > 500 ms, hold therapy until QTc interval below thresholds (either 440 ms for antiarrhythmics or 460 ms for non-antiarrhythmics) and re-start at lower dose or discontinue

Check QTc interval again when doses change, hypokalemia, hypomagnesemia, acute ischemia/infarction, first dialysis episode, bradycardia, new drug interaction introduced, new-onset kidney or hepatic dysfunction (depending on drug elimination route)

IKr = rapid component of the delayed rectifier potassium channel; ms = millisecond; QTc interval = corrected QT interval.
Evaluation of the acute coronary syndrome patient

- Ischemic chest discomfort symptoms, lasting at least 20 min; suspect acute coronary syndrome

- ST-segment Elevation
  - Obtain and interpret a 12-lead ECG within 10 min
  - ST-segment depression
  - T-wave inversion
  - No ECG changes

- No ST-segment Elevation

- Risk stratification*: multilead continuous ST-segment monitoring; obtain serial troponin and CK MB

- Low-risk
  - Stress test to evaluate likelihood of CAD
    - Negative stress test
      - Diagnosis of non-cardiac chest pain syndrome
    - Positive stress test
      - Angiography with revascularization (PCI or CABG)
  - High risk

- Moderate risk
  - Initiate pharmacotherapy for non-ST-segment elevation ACS based upon patient risk; evaluate moderate and high risk patients for early angiography and revascularization

*As described in table on p. 5.

ACS = acute coronary syndrome; CABG = coronary artery bypass graft surgery; CAD = coronary artery disease; CK, MB = creatine kinase, myocardial bound; ECG = electrocardiogram; PCI = percutaneous coronary intervention.

Risk stratification for non-ST-segment elevation acute coronary syndrome

Using the TIMI Risk Score

<table>
<thead>
<tr>
<th>Past Medical History</th>
<th>Clinical Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Age = 65 years</td>
<td>✓ ST-segment depression (≥ 0.5 mm)</td>
</tr>
<tr>
<td>✓ ≥ 3 Risk Factors for CAD</td>
<td>✓ ≥ 2 episodes of chest discomfort within the past 24 hours</td>
</tr>
</tbody>
</table>
| Hypercholesterolemia | ✓ Positive biochemical marker for infarction
| HTN                  |                              |
| DM                   |                              |
| Smoking              |                              |
| Family history of premature CHD
| Known CAD (= 50% stenosis of coronary artery) |
| Use of aspirin within the past 7 days |

One point is assigned for each of the seven medical history and clinical presentation findings. The score (point) total is calculated and the patient is assigned a risk for experiencing the composite end point of death, myocardial infarction or urgent need for revascularization as follows:

<table>
<thead>
<tr>
<th>High-Risk</th>
<th>Medium Risk</th>
<th>Low-Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMI Risk Score 5–7 points</td>
<td>TIMI Risk Score 3–4 points</td>
<td>TIMI Risk Score 0–2 points</td>
</tr>
</tbody>
</table>

Other Ways to Identify High-Risk Patients:
- Other findings which alone, or in combination, may identify a patient at high risk of death or MI:
  - ST-segment depression
  - Positive biochemical marker for infarction
  - Deep symmetric T-wave inversions (≥ 2 mm)
  - Acute heart failure
  - Diabetes mellitus
  - Chronic kidney disease
  - Recent myocardial infarction (within the past 2 weeks)

As defined by the National Cholesterol Education Program Adult Treatment Panel III Report (2001): the presence of coronary heart disease in a first degree male relative younger than age 55 or a first-degree female relative younger than age 65.

A positive biochemical marker for infarction is a value of troponin I, troponin T or creatinine kinase MB of greater than the myocardial infarction detection limit.

CAD = coronary artery disease; CHD = coronary heart disease; HTN = hypertension; TIMI = Thrombolysis in Myocardial Infarction.

Initial pharmacotherapy for ST-segment elevation acute coronary syndromes

ST-segment Elevation ACS

Oxygen (if O₂ saturation < 90%)
SL NTG, Aspirin
IV NTG

Symptoms ≤ 12 hours

Clopidogrel

Reperfusion Therapy

Primary PCI

Unfractionated heparin (preferred) or enoxaparin*, Abciximab preferred (or eptifibatide)

β-blocker (oral or IV), statin, ACE inhibitor (or ARB), eplerenone (or spironolactone)

Symptoms > 12 hours

Stress testing, PCI or CABG or fibrinolysis for selected patients; For PCI during hospitalization, administer abciximab or eptifibatide at time of PCI and clopidogrel

Fibrinolysis

IV UFH, SC fondaparinux or IV and SC enoxaparin* (for selected patients)

ACE = angiotensin enzyme; ACS = acute coronary syndrome; ARB = angiotensin receptor blocker; CABG = coronary artery bypass graft surgery; IV = intravenous; NTG = nitroglycerin; O₂ = oxygen; PCI = percutaneous coronary intervention; SC = subcutaneously; SL = sublingual; UFH = unfractionated heparin.
Initial pharmacotherapy for non-ST-segment elevation acute coronary syndrome

**Non-ST-segment Elevation ACS**

- **Oxygen** (if $O_2$ saturation < 95%)
- **SL** NTG, Aspirin
- **IV** Nitroglycerin
- IV UFH, SC enoxaparin or IV bivalirudin
- Clopidogrel in patients unlikely to undergo CABG

**Early PCI planned (≤12 hours from hospital presentation), high risk patient**

- Abciximab or eptifibatide started at time of PCI for patients receiving UFH or enoxaparin
- Bivalirudin IV bolus and increased infusion for patients receiving bivalirudin
- **β-blocker** (oral or IV), statin, ACE inhibitor (or ARB)
  - **High or moderate risk patient**
  - Initiate early eptifibatide or tirofiban before angiography/PCI;
    - Discontinue NTG, IV UFH, enoxaparin and bivalirudin post-PCI

**Delayed PCI planned (>12 hours from hospital presentation)**

- **β-blocker** (oral or IV), statin, ACE inhibitor (or ARB)
  - **Stress test**
  - Positive findings for ischemia

**No PCI planned (e.g., low risk patient)**

- **β-blocker** (oral or IV), statin, ACE inhibitor (or ARB); discontinue NTG, IV UFH and SC enoxaparin

**Recurrent ischemia**

- Abciximab, eptifibatide (with UFH or enoxaparin) or bivalirudin at time of PCI

---

*May require supplemental IV dose of enoxaparin.

*Fondaparinux may be used as anticoagulant if no PCI planned.

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ACS = acute coronary syndrome; CABG = coronary artery bypass graft surgery; IV = intravenous; NTG = nitroglycerin; $O_2$ = oxygen; PCI = percutaneous coronary intervention; SC = subcutaneous; SL = sublingual; UFH = unfractionated heparin.
Acute ischemic stroke management algorithm

Onset of stroke

Admission to the hospital

< 3 hours from onset of symptoms

Yes

Assess eligibility for intravenous rt-PA
- Noncontrast CT scan
- History and physical examination
- Chemistry and complete blood count panel; coagulation test
- Blood pressure management (if SBP > 185 mm Hg or DBP > 110 mm Hg)

Eligible

Airway; oxygenation
Initiate rt-PA 0.9 mg/kg maximum 90 mg
10% of the dose given bolus, then infuse the remaining 90% over 60 minutes
Monitor blood pressure (keep SBP < 180 mm Hg or DBP < 105 mm Hg)

Hold anticoagulation and antiplatelet therapy for 24 hours

Noneligible

No

Give ASA 160–325 mg within 48 hours
Supportive care
- Airway; oxygenation
- 12-lead ECG
- Blood pressure management (if SBP > 220 mm Hg or DBP > 140 mm Hg)

Prevention of medical complications:
- Maintain normal temperature
- DVT prophylaxis
- Glycemic control
- SUP if indicated
- Nutritional support
- Physical/speech/occupational therapy

Treatment of medical complications:
- ICP management
- AED if seizure present

- Initiate secondary prevention
- Patient education on signs and symptoms of stroke, medication adherence

Assess eligibility for intravenous rt-PA: onset within 3 hours; negative for hemorrhagic stroke or history; blood pressure < 185/110 mm Hg; no head trauma, prior stroke, or myocardial infarction in the past 3 months; no history or gastrointestinal or urinary tract hemorrhage in the past 21 days; no major surgery in the previous 14 days; not taking oral anticoagulant or INR ≤ 1.7; platelet count ≥ 100,000/mm³; blood glucose ≥ 50 mg/dL; no seizure with postictal residual neurologic impairments at onset of stroke.

All pharmacologic prophylaxis should be held for 24 hours post-thrombolytic therapy.

Hyperglycemic control should be managed judiciously. The consensus is to treat when glucose > 300 mg/dL. The role of tight glucose control is currently unknown in patients with stroke.

All patients should receive prompt swallow evaluation. If patients fail swallow evaluation, enteral or parenteral nutrition should be initiated.

AED = antiepileptic drug; ASA = aspirin; CT = computed tomography; DBP = diastolic blood pressure; DVT = deep vein thrombosis; ECG = electrocardiogram; ICP = intracranial pressure; INR = international normalized ratio; rt-PA = recombinant tissue plasminogen activator; SBP = systolic blood pressure; SUP = stress ulcer prophylaxis.
Algorithm for chronic management of atrial fibrillation

AA = antiarrhythmic; AC = anticoagulation; AF = atrial fibrillation; BP = blood pressure; CV = cardioversion; HF = heart failure; SR = sinus rhythm.

Algorithm for selecting antiarrhythmic drug therapy for maintenance of sinus rhythm in patients with recurrent paroxysmal or recurrent persistent atrial fibrillation

Within each of the boxes, the drugs are listed alphabetically, not in order of suggested use. However, the sequence of the boxes does imply the order of suggested use.

CAD = coronary artery disease; HTN = hypertension; LVH = left ventricular hypertrophy.

Algorithm for treatment of pulseless ventricular tachycardia/ventricular fibrillation

- If arrest is witnessed and defibrillator is readily available, 2 rescue breaths can be given before defibrillation. If arrest is unwitnessed, 5 cycles of CPR should be administered before defibrillation.
- One cycle of CPR = 30 chest compressions, then 2 breaths; 5 cycles about 2 minutes.
- After advanced airway established, cycles of CPR no longer need to be given. Instead, continuous chest compressions should be given without pauses for breaths. Give 8–10 breaths/minute.

AED = automated external defibrillator; CPR = cardiopulmonary resuscitation; IO = introsseous; IV = intravenous; J = joules; PEA = pulseless electrical activity; VF = ventricular fibrillation; VT = ventricular tachycardia.

Algorithm for treatment of asystole and pulseless electrical activity

- Give CPR
- Give oxygen
- Check rhythm to determine if pulseless VT/VF vs. asystole or PEA

Asystole or PEA
DO NOT SHOCK!

Resume CPR immediately for 5 cycles.\textsuperscript{a,b}

Give vasopressor during CPR:
- Epinephrine 1 mg IV/IO every 3-5 minutes, OR
- Vasopressin 40 units (one dose only) IV/IO to replace first or second dose of epinephrine

For asystole or slow PEA:
- Consider atropine 1 mg IV/IO every 3-5 minutes (maximum total dose = 3 mg)

Check rhythm (after 5 cycles of CPR delivered)\textsuperscript{a}
Persistent asystole or PEA??

\textsuperscript{a}One cycle of CPR = 30 chest compressions; then, 2 breaths; 5 cycles about 2 minutes.
\textsuperscript{b}After advanced airway established, cycles of CPR no longer need to be given. Instead, continuous chest compressions should be given without pauses for breaths. Give 8–10 breaths/minute.

CPR = cardiopulmonary resuscitation; IO = intraosseous; IV = intravenous; PEA = pulseless electrical activity; VF = ventricular fibrillation; VT = ventricular tachycardia.

Algorithm for assessing kidney function

AKI = acute kidney injury; BSA = body surface area; CG = Cockcroft-Gault; CKD = chronic kidney disease; CrCl = creatinine clearance; CRRT = continuous renal replacement therapy; eGFR = estimated glomerular filtration rate; GFR = glomerular filtration rate; KDOQI = Kidney Disease Outcomes Quality Initiative; MDRD4 = 4-variable Modification of Diet in Renal Disease.
Anemia treatment algorithm

Hb testing in all patients with CKD, regardless of the cause or stage, at least annually

Hb < 13.5 g/dL, adult males
Hb < 12 g/dL, adult females

Diagnosis of anemia, further work-up

- CBC + RBC indices to assess anemia severity, adequacy of nutrients such as vitamin B₁₂, folate, iron
- Absolute reticulocyte count (corrected for Hb value) to assess erythropoietic activity

Normochromic, normocytic
CKD

Start/adjust ESA based on Hb, Hb target

ESA monitoring
- Monitor Hb weekly when initiating ESA until stable and then at least monthly
- Adjust ESA no more often than every 4 weeks unless clinically indicated (unstable Hb, bleeding, surgery, hospitalization)

Inadequate response
Assess for hyporespons

Macrocytic
Vitamin B₁₂ and/or folate deficiency
Start renal multivitamin

Microcytic
Iron deficiency, aluminum overload

Iron monitoring
- Monthly during initial ESA therapy
- At least every 3 months during stable ESA therapy
- After blood loss, surgery, hospitalization, or course of IV iron

Consider maintenance iron therapy in patients on HD
FG – 62.5–100 mg IV weekly or every other week or
IS – 50–100 mg IV weekly or every other week

Macrocytic

TSAT, ferritin, or CHr

HD
Ferritin ≤ 200 ng/mL and
TSAT ≤ 20% or
CHr < 29 pg/cell

PD or nondialysis CKD
Ferritin ≤ 100 ng/mL and
TSAT ≤ 20%

IV iron – 100 mg × 10 doses (ID or IS) or
125 mg × 8 doses (FG)

FG – 62.5–100 mg IV weekly or every other week
or
IS – 50–100 mg IV weekly or every other week

Waıt 1–2 weeks to evaluate iron status if intravenous doses greater than 200 mg are administered.

CBC = complete blood cell (count); CHr = reticulocyte hemoglobin; CKD = chronic kidney disease; ESA = erythropoiesis-stimulating agent; FG = ferric gluconate; Hb = hemoglobin; HD = hemodialysis; ID = iron dextran; IS = iron sucrose; IV = intravenous; PD = peritoneal dialysis; PO = by mouth; RBC = red blood cell; TSAT = transferrin saturation.

Causes of ESA hyporesponse

**Chronic conditions**
- HIV, sickle cell anemia, thalassemia, pregnancy
- Cancer/malignancy
- Chronic blood loss
  - Frequent clotting of dialyzer, excessive postdialysis bleeding, frequent phlebotomy
- Hyperparathyroidism—long-standing
- Chronic infection/inflammation
  - HIV, osteomyelitis, vasculitis, systemic lupus erythematosus, failed kidney transplantation, catheter-associated inflammation
- Uremia/suboptimal dialysis
- Nonadherence

**Acute conditions**
- Infection/inflammation
  - Occult infection, catheter infection, dialysis graft infection, diabetic foot infection, periodontal infection, acute flare of chronic inflammatory state
- Hospitalization
  - Acute blood loss (e.g., surgery, vascular access interventions, gastrointestinal bleed)

**Drugs or vitamin/mineral deficiencies**
- Iron deficiency
  - Vitamin B₁₂ or folate deficiency
- Aluminum toxicity

**Effects on bone marrow**
- Effects on cofactors necessary for erythropoiesis (folic acid, vitamin B₁₂, iron)
- Drug-induced hemolysis

**Effects on cofactors necessary for erythropoiesis**
- Folic acid, vitamin B₁₂, iron

**ESA** = erythropoiesis-stimulating agent; **HIV** = human immunodeficiency virus.
Options for managing chronic kidney disease-mineral and bone disorder for patients with elevated iPTH and normal/low calcium concentrations

Ca 9.0–9.5

<table>
<thead>
<tr>
<th>Ca X P &lt;55</th>
<th>Ca X P &gt;55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease CCPB ± increase NCCB</td>
<td>DC CCPB</td>
</tr>
<tr>
<td>Use newer vitamin D agent</td>
<td>Increase NCCPB</td>
</tr>
<tr>
<td>Avoid calcitriol</td>
<td>Lower/DC vitamin D</td>
</tr>
<tr>
<td>Consider cinacalcet</td>
<td>Add/increase cinacalcet</td>
</tr>
</tbody>
</table>

Ca ≥9.5

<table>
<thead>
<tr>
<th>Ca X P &lt;55</th>
<th>Ca X P &gt;55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Ca dialysate</td>
<td>DC CCPB</td>
</tr>
<tr>
<td>Lower Ca dialysate</td>
<td>DC CCPB</td>
</tr>
<tr>
<td>Increase NCCPB</td>
<td>DC/low vitamin Da</td>
</tr>
<tr>
<td>Add/increase cinacalcet</td>
<td>Add/increase cinacalcet</td>
</tr>
</tbody>
</table>

*aLower/DC vitamin D = decrease dose or discontinue calcitriol/paricalcitol/doxercalciferol until Ca X P < 55 mg²/dL².
Ca = calcium mg/dL; Ca X P = calcium/phosphate product mg²/dL²; CCPB = calcium-containing phosphate binder; DC = discontinue; NCCPB = noncalcium containing phosphate binder; P = phosphorus in mg/dL.
Decision algorithm for prevention of CIN

Patient with CIN risk score ≥ 5

Can an alternative imaging procedure be performed that does not use contrast?

Yes

Use alternate imaging procedure

No

Is procedure emergent?

Yes

Use intravenous hydration at 3 mL/kg/hour for 1 h prior to procedure
- In absence of metabolic alkalosis: 5% dextrose in water with sodium bicarbonate 154 mEq/L
- In presence of metabolic alkalosis: 0.9% sodium chloride

Use the following in addition to hydration
- Oral ascorbic acid 3 g before procedure and 2 q BID x 2 doses after procedure
- Use lowest possible volume of nonionic low-osmolar or iso-osmolar contrast

Continue above intravenous hydration fluid at 1 mL/kg/h
- 6 h for sodium bicarbonate
- 12 h for 0.9% sodium chloride

No

Use intravenous hydration prior to procedure in order listed
- 5% dextrose in water with sodium bicarbonate 154 mEq/L at 3 mL/kg/h for 1 h prior to procedure (avoid if risk of fluid overload or in presence of metabolic alkalosis)
  OR
- 0.9% sodium chloride at 1 mL/kg/h for 6-12 h prior to procedure

Use the following in addition to hydration in order listed
- Acetylcysteine 600 to 1200 mg orally BID for 2 doses before and 2 doses after procedure
  OR
- Oral ascorbic acid 3 g at least 2 h before procedure and 2 g BID x 2 doses after procedure

---

Based on risk score calculated using table on p. 18.
BID = 2 times/day; CIN = contrast-induced nephropathy.
#### Approach to the risk assessment of CIN after percutaneous coronary intervention

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Definition</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypotension</td>
<td>SBP &lt; 80 mm Hg for at least 1 hour requiring inotropic support or IABP within 24 hours periprocedural</td>
<td>5</td>
</tr>
<tr>
<td>Use of IABP</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>CHF</td>
<td>NYHA class III/IV and/or history of pulmonary edema</td>
<td>5</td>
</tr>
<tr>
<td>Elderly</td>
<td>Age &gt; 75 years</td>
<td>4</td>
</tr>
<tr>
<td>Anemia</td>
<td>Hct &lt; 39% for men or Hct &lt; 36% for women</td>
<td>3</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Contrast volume</td>
<td>For every 100 mL</td>
<td>1</td>
</tr>
<tr>
<td>Kidney disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline SCr</td>
<td>SCr &gt; 1.5</td>
<td>4</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline GFR</td>
<td>40–59 mL/minute/1.73 m²</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>20–39 mL/minute/1.73 m²</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>&lt; 20 mL/minute/1.73 m²</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Risk Assessment

<table>
<thead>
<tr>
<th>Total Risk Score</th>
<th>Risk Group</th>
<th>Risk of CIN</th>
<th>Risk of Dialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 5</td>
<td>Low</td>
<td>7.5%</td>
<td>0.04%</td>
</tr>
<tr>
<td>6–10</td>
<td>Moderate</td>
<td>14%</td>
<td>0.12%</td>
</tr>
<tr>
<td>11–15</td>
<td>High</td>
<td>26.1%</td>
<td>1.09%</td>
</tr>
<tr>
<td>≥ 16</td>
<td>Very high</td>
<td>57.3%</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

*Estimated using the Modification of Diet in Renal Disease Equation.

CIN = contrast-induced nephropathy; CHF = congestive heart failure; GFR = glomerular filtration rate; Hct = hematocrit; IABP = intra-arterial balloon pump; NYHA = New York Heart Association; SBP = systolic blood pressure; SCr = serum creatinine.

Algorithm for the management of Parkinson’s disease

**PSAP VI**

**Neurology/Psychiatry**

**Algorithm for the management of Parkinson's disease**

1. **Remove offending agent(s)**
   - **Drug-induced**
     - **Parkinson's Plus Syndrome(s)**
     - **Idiopathic**
2. **Assess Type**
   - **Nonpharmacological Therapy**
     - **Education**
     - **Nutrition**
     - **Exercise/Physical Therapy**
     - **Caregiver/Patient Psychosocial Support Services**
3. **Pharmacological Therapy**
   - **Functional Impairment**
     - **YES**
       - **Anticholinergics (Tremor Predominant)**
     - **NO**
       - **Monitor**
4. **Neuroprotection (Selegiline)**
5. **Younger (age < 65)**
   - **Dopamine Agonist**
     - **Add Levodopa/carbidopa**
       - **Add levodopa extender (e.g., COMT inhibitor, rasagiline)**
6. **Complications**
   - **Motor**
   - **Wearing-off**
   - **Dyskinesia**
   - **Suboptimal Control**
   - **Surgery**
7. **Older (age > 65)**
   - **Levodopa/carbidopa**
   - **Depression**
     - **SSRI**
     - **TCA**
   - **Hallucinations/psychosis**
     - **Quetiapine**
     - **Clozapine**

**COMT = catechol-O-methyl-transferase; SSRI = selective serotonin reuptake inhibitor; TCA = tricyclic antidepressant.**
Algorithm for use in guiding the treatment of generalized anxiety disorder and panic disorder

- If acute relief needed or increase in anxiety or insomnia on initiation, may overlap with a short term (2–4 weeks) BZD.
- Only for initial, nonrefractory treatment of GAD.
- After trial of 8–12 weeks at adequate dose, may try increasing dose if good tolerability.
- Try VFX if not yet tried, or try and alternate SSRI therapy if patient has not responded to an adequate trial of both an SSRI and VFX.
- BZD not recommended in patients with past or current comorbid substance abuse or dependence.
- Only for treatment of PD.

BSP = buspirone; BZD = benzodiazepine; GAD = generalized anxiety disorder; MAOI = monoamine oxidase inhibitor; PD = panic disorder; SSRI = selective serotonin reuptake inhibitor; TCA = tricyclic antidepressant; VFX = venlafaxine.
Management of suspected *Staphylococcus aureus* skin and soft tissue infections

### Clinical Presentation
- Looks like insect or spider bite
- Folliculitis, pustular lesions
- Furuncle, carbuncle (boils)
- Abscess (especially with tissue necrosis)
- Cellulitis
- Impetigo
- Infected wound

### History & Risk Factors Associated with MRSA
- History of MRSA infection, colonization
- History (within past 12 months) of: hospitalization; surgery; long-term care residence; indwelling catheter or medical device; dialysis; renal failure; diabetes; or other comorbidities
- Injection drug use, incarceration
- Close contact with someone known to be infected or colonized with MRSA
- High prevalence of MRSA in community or population
- Local risk factors: consult local public health department

### Incision & drainage (I&D) of abscesses
*If I&D not performed, consider culture of draining wounds, or aspirate or perform a biopsy of the central area of inflammation.*

#### Culture & antimicrobial sensitivity testing
*Include disk diffusion test for clindamycin resistance for those with MRSA.*

#### Patient education
*Educate patients and/or caregivers regarding infection control measures and wound care for those with *S. aureus* infections, especially those with MRSA.*

### Outpatient Management
- **Mild**
  - Otherwise afebrile, healthy
- **Moderate**
  - Febrile, appears ill, but no unstable comorbidities
- **Severe/Critically Ill**
  - Appears toxic, unstable comorbidity, sepsis syndrome, or limb- or life-threatening infection (e.g., necrotizing fasciitis)

#### Local care, I&D, ± topical antibiotics may be sufficient
- If oral antibiotics used - β-lactam preferred for MSSA
- If increased suspicion for MRSA based on presence of > 1 risk factor:
  - Consider empiric therapy active against MRSA
  - Adjust antibiotics based on results of culture & sensitivity testing
  - Monitor response to therapy

#### Outpatient Management
- **Low suspicion for MRSA:**
  - β-lactam antibiotics effective against *S. aureus* preferred for MSSA
- **If increased suspicion for MRSA based on presence of ≥ 1 risk factor:**
  - Empirc therapy active against MRSA
  - Adjust antibiotics based on results of culture & sensitivity testing
  - Monitor response to therapy

#### Outpatient Management (Hospital Management)
- **Empiric broad-spectrum IV antibiotics including vancomycin for activity against *S. aureus*, including MRSA
- Adjust antibiotics based on results of culture & sensitivity testing
- Monitor response to therapy
- Consult ID specialist if no improvement or considering alternative agents (e.g., linezolid, daptomycin)
- Switch to oral therapy based on sensitivity testing if:
  - Afebrile for 24 hours
  - Clinically improved
  - Able to take oral therapy
  - Close follow-up possible

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Adapted with permission from Interim guidelines for evaluation & management of community-associated methicillin-resistant *Staphylococcus aureus* skin and soft tissue infections in outpatient settings, which was developed collaboratively by the Infectious Diseases Society of Washington and Public Health—Seattle and King County, Tacoma-Pierce County Department of Health, and Washington State Department of Health.

ID = infectious diseases, IV = intravenous; MRSA = methicillin-resistant *S. aureus*; MSSA = methicillin-sensitive *S. aureus*. 
Classification of nosocomial pneumonia

Patient with pneumonia

Risk factors for multidrug-resistant pathogens?
- Antimicrobial therapy within 90 days
- Current hospitalization ≥ 5 days
- High frequency of antibiotic resistance in the community or specific hospital unit
- Immunosuppressive disease and/or therapy
- Presence of risk factors for HCAP:
  - Hospitalization of ≥ 2 days within 90 days
  - Residence in nursing home or extended care facility
  - Home infusion therapy (including antibiotics)
  - Chronic dialysis within 30 days
  - Home wound care
  - Family member with multidrug-resistant pathogen

NO

Pneumonia occurring > 48 hours of admission (NOT incubating at time of admission)

NO - CAP

Streptococcus pneumoniae
Haemophilus influenzae
Chlamydia pneumoniae
Mycoplasma pneumoniae
Legionella
Methicillin-sensitive Staphylococcus aureus
Moraxella catarrhalis

YES – Early nosocomial pneumonia

Pneumonia occurring > 48–72 hours after endotracheal intubation

NO - HAP

Streptococcus pneumoniae
Haemophilus influenzae
Methicillin-sensitive Staphylococcus aureus
Escherichia coli
Klebsiella pneumoniae
Enterobacter
Proteus

YES - VAP

Pseudomonas aeruginosa
Klebsiella pneumoniae (ESBL+)
Acinetobacter
Methicillin-resistant Staphylococcus aureus
Legionella pneumophilia

PLUS

Streptococcus pneumoniae
Haemophilus influenzae
Methicillin-sensitive S. aureus
Escherichia coli
Enterobacter
Proteus
Serratia marcescens

YES – Late nosocomial pneumonia or HCAP

Pneumonia occurring > 48–72 hours after endotracheal intubation

NO - HAP or HCAP

YES - VAP

Pneumonia occurring > 48–72 hours after endotracheal intubation

NO - CAP

Streptococcus pneumoniae
Haemophilus influenzae
Mycoplasma pneumoniae
Legionella
Methicillin-sensitive Staphylococcus aureus

CAP = community-acquired pneumonia; ESBL = extended-spectrum β-lactamase; HAP = hospital-acquired pneumonia; HCAP = health care–associated pneumonia; VAP = ventilator-associated pneumonia.

Management strategy recommended by the American Thoracic Society/Infectious Diseases Society of America guidelines

HAP, VAP, or HCAP suspected

Obtain LRT sample for culture (quantitative or semiquantitative) and microscopy

Unless there is both a low clinical suspicion for pneumonia and negative microscopy of LRT sample, begin empiric antimicrobial therapy (see text for details)

Days 2 and 3: Check cultures and assess clinical response (temperature, WBC, chest radiography, oxygenation, purulent sputum, hemodynamic changes, and organ function)

Clinical improvement at 48–72 hours

NO

Cultures (–)

Search for other pathogens, complications, other diagnoses, or other sites of infection

Cultures (+)

Adjust antibiotic therapy and search for other pathogens, complications, other diagnoses, or other sites of infection

YES

Cultures (–)

Consider discontinuing antibiotics

Cultures (+)

De-escalate antibiotics if possible. Treat selected patients for 7–8 days and reassess

HAP = hospital-acquired pneumonia; HCAP = health care–associated pneumonia; LRT = lower respiratory tract; VAP = ventilator-associated pneumonia; WBC = white blood cell count.

Treatment algorithm for HIV-associated dyslipidemia

HAART = highly active antiretroviral therapy; HDL-C = high-density lipoprotein cholesterol; HIV = human immunodeficiency virus; HMG-CoA = 3-hydroxy-3-methylglutaryl coenzyme A; LDL-C = low-density lipoprotein cholesterol.
Management of acute asthma exacerbations

**Initial Assessment:**
Brief history, physical examination (auscultation, use of accessory muscles, heart rate, respiratory rate), PEF or FEV₁, oxygen saturation, and other tests as indicated.

**FEV₁ or PEF ≥ 40% (Mild-to-Moderate):**
- Oxygen to achieve SaO₂ ≥ 90%
- Inhaled SABA by nebulizer or MDI with valved holding chamber, up to 3 doses in first hour
- Oral systemic corticosteroids if no immediate response or if patient recently took oral systemic corticosteroids

**FEV₁ or PEF < 40% (Severe):**
- Oxygen to achieve SaO₂ ≥ 90%
- High-dose inhaled SABA plus ipratropium by nebulizer or MDI plus valved holding chamber, every 20 minutes or continuously for 1 hour
- Oral systemic corticosteroids

**Impending or Actual Respiratory Arrest:**
- Intubation and mechanical ventilation with 100% oxygen
- Nebulized SABA and ipratropium
- Intravenous corticosteroids
- Consider adjunct therapies

**Repeat Assessment:**
Symptoms, physical examination, PEF, O₂ saturation, other tests as needed.

**Moderate Exacerbation:**
FEV₁ or PEF 40–69% predicted/personal best
Physical exam: moderate symptoms
- Inhaled SABA every 60 minutes
- Oral systemic corticosteroid
- Continue treatment 1–3 hours if there is improvement; make admit decision in < 4 hours

**Severe Exacerbation:**
FEV₁ or PEF < 40% predicted/personal best
Physical examination severe symptoms at rest, accessory muscle use, chest retraction
History: high-risk patient
No improvement after initial treatment
- Oxygen
- Nebulized SABA + ipratropium, hourly or continuous
- Oral systemic corticosteroids
- Consider adjunct therapies

**Impending or Actual Respiratory Arrest:**
- Intubation and mechanical ventilation with 100% oxygen
- Nebulized SABA and ipratropium
- Intravenous corticosteroids
- Consider adjunct therapies

**Recovery Assessment:**
Symptoms, physical examination, PEF, O₂ saturation, other tests as needed.

**Good Response:**
- FEV₁ or PEF ≥ 70%
- Response sustained 60 minutes after last treatment
- No distress
- Physical examination normal

**Incomplete Response:**
- FEV₁ or PEF 40–69%
- Mild-to-moderate symptoms

**Poor Response:**
- FEV₁ or PEF < 40%
- PCO₂ ≥ 42 mm Hg
- Physical examination symptoms severe, drowsiness, confusion

**Individualized decision re: hospitalization (see text):**

- **Admit to Hospital Intensive Care**
  - Oxygen
  - Inhaled SABA hourly or continuously
  - Intravenous corticosteroids
  - Consider adjunct therapies
  - Possible intubation and mechanical ventilation

- **Admit to Hospital Ward**
  - Oxygen
  - Inhaled SABA
  - Systemic (oral or intravenous) corticosteroid
  - Consider adjunct therapies
  - Monitor vital signs, FEV₁ or PEF, SaO₂

- **Discharge Home**
  - Continue treatment with inhaled SABA
  - Consider initiation of an ICS
  - Patient education
    - Review medicine use
    - Review/initiate action plan
    - Recommend close medical follow-up

**Discharge Home**
- Continue treatment with inhaled SABAs.
- Continue course of oral systemic corticosteroid.
- Continue on ICS. For those not on long-term control therapy, consider initiation of an ICS.
- Patient education (e.g., review medications, review/initiate action plan, recommend close medical follow-up).
- Before discharge, schedule follow-up appointment with primary care provider and/or asthma specialist in 1–4 weeks.

Overview of BTF guidelines for the management of patients with TBI

Initial Assessment/Goals
1. Avoid pre- and in-hospital hypotension (systolic blood pressure < 90 mm Hg) (Class II)
2. Avoid hypoxia (partial pressure oxygen < 60 mm Hg, arterial oxygen saturation < 90 mm Hg) (Class III)
3. Early evaluation of mass lesions for potential surgical decompression
4. ICP monitoring if:
   a. GCS scores 3–8 and abnormal CT scan (Class II)
   b. GCS scores 3–8 and normal CT scan if two present: older than 40 years, posturing, systolic blood pressure < 90 mm Hg (Class I)
5. Maintain ICP < 20 mm Hg (Class II)
6. Maintain CPP > 60 mm Hg; no aggressive attempts for CPP > 70 mm Hg (Class II)
7. Jugular venous oxygen saturation < 50% or brain tissue oxygen tension < 15 mm Hg are treatment thresholds (when available) (Class III)
8. No high-dose corticosteroids (Class I)
9. Arterial line for blood pressure monitoring
10. Central line for central venous pressure monitoring
11. Elevate head of bed 30 degrees and keep head straight to avoid venous outflow obstruction
12. Early intubation in most patients with severe TBI
   a. No prophylactic hyperventilation (partial pressure of carbon dioxide 25–38 mm Hg); monitor brain tissue oxygen tension or jugular venous oxygen saturation if partial pressure of carbon dioxide < 35 mm Hg (Class III)

Management of Intracranial Hypertension
1. Maintain CPP with fluids and vasopressors
2. Tier 1 Therapies:
   a. Drain cerebrospinal fluid by external ventricular drain
   b. Mild hyperventilation if > 24 hours postinjury (partial pressure of carbon dioxide 35–38 mm Hg); monitor brain tissue oxygen tension or jugular venous oxygen saturation if partial pressure of carbon dioxide < 35 mm Hg (Class III)
3. Tier 2 Therapies:
   a. Hyperosmolar therapy
      i. Mannitol if serum osmolality < 320 mOsm/kg water (avoid hypotension) (Class II)
      ii. hypertonic saline (caution use with chronic hyponatremia)
4. Tier 3 Therapies:
   a. Heavy sedation with propofol (Class II)
   b. Consider paralysis if sedation inadequate
5. Tier 4 Therapy:
   a. Hypothermia (target 33°C for > 48 hours) (Class III)
6. Tier 5 Therapy:
   a. Consider surgery for decompressive craniectomy
7. Tier 6 Therapy:
   a. Barbiturate coma (if refractory to maximum medical and surgical therapies) (Class II)

Supportive Care
1. Adequate control of pain and agitation
2. Phenytoin for prevention of early seizures (Class II)
3. Full nutrition goal by day 7 postinjury (Class II)
4. Deep vein thrombosis prophylaxis (Class III)
5. Blood glucose goal 80–150 mg/dL
6. Stress ulcer prophylaxis if mechanically ventilated or coagulopathic
7. Maintain normothermia
Treatment algorithm for chronic prostatitis/chronic pelvic pain syndrome

- Antibiotic trial for 4 weeks (possible)
- What is the dominant symptom index?
  - Pain: use anti-inflammatory drug ≥ 6 weeks
  - Urinary symptoms: use α-blockers ≥ 12 weeks
  - No symptom relief? Try:
    1. Phytotherapy for 6 weeks
    2. Pentosan polysulfate for 6 months
    3. Finasteride for 6 months
Decision algorithm for evaluation of dietary supplement use

Supplement safety issues present:
- Anticoagulant/procoagulant
- Antioxidant
- Hormonal properties
- Immunomodulator
- Known safety issues

Yes → Discourage use

No →

Risk factors present:
- Cancer
- Chemotherapy
- Concurrent disease states
- Concurrent drugs or therapies
- Hematologic dyscrasias
- Immunocompromised
- Radiation therapy
- Surgery, invasive procedures

Yes → Discourage use

No →

Efficacy considerations

Conclusive evidence supports efficacy
Yes → Recommend use

Conclusive evidence supports inefficacy
Yes → Discourage use

Inconclusive evidence
Yes → Review risk versus benefit
Proposed algorithm for metastatic renal cell cancer therapy based on patient presentation

Status of patient with metastatic renal cell cancer

Treatment naïve

- Good or intermediate risk
  - Sunitinib
  - Optional therapy: high-dose IL-2 temsirolimus

- Poor risk
  - Temsirolimus OR sunitinib
  - Prior cytokine therapy
  - Prior VEGF inhibitor therapy
  - Prior mTOR inhibitor therapy

- Brain metastasis
  - Clinical trial

- Non-clear cell
  - Clinical trial

Optional therapy:
- Temsirolimus
- Sunitinib OR bevacizumab + IFN
- High-dose IL-2

*May consider, although limited clinical evidence.

IFN = interferon alfa; IL-2 = interleukin-2 (aldesleukin); mTOR = mammalian target of rapamycin; VEGF = vascular endothelial growth factor.
Algorithm for management of a basal/bolus insulin regimen in children and adolescents

1. **Estimate TDD**
   - Calculate starting basal dose (typically 50% of TDD)
   - Calculate starting I:CHO (various methods may be used)
   - Calculate starting insulin correction ratio/ISF (various methods may be used)

2. **Initiate insulin regimen**
   - Monitor blood glucose concentrations closely for at least 24–72 hours after a regimen change and before re-evaluation

3. **Account for or eliminate noninsulin dose variables affecting control**
   - Basal control of glucose concentrations overnight and fasting periods without short-acting insulin; glucose within target range
     - Yes
     - No
     - Adjust basal insulin dose by +/- 10% to 20%
   - Control of postprandial glucose concentrations with short-acting insulin; glucose within target range
     - Yes
     - No
     - Adjust I:CHO by +/- 25% to 50%
   - Control of hyperglycemic excursions with short-acting insulin; glucose within target range
     - Yes
     - No
     - Adjust ISF by +/- 25% to 50%
   - Continue with plan of care until next visit with patient continuing to perform appropriate self-monitoring of blood glucose concentrations

I:CHO = insulin-to-carbohydrate ratio; ISF = insulin sensitivity factor; TDD = total daily insulin dosage or requirement.
Treatment algorithm for type 2 diabetes mellitus in adolescents

Lifestyle modifications (~ 3 months); thorough patient and family DM education; psychosocial support

- FPG < 126 mg/dL; A1C < 7.0%
  - No
  - Yes
  - FPG < 250 mg/dL; A1C < 8.5%; no significant acute complications
    - No
    - Yes
    - Continue lifestyle modifications
  - Yes
    - Initiate insulin therapy (0.3–0.5 units/kg/day, basal/bolus regimen)
      - FPG < 250 mg/dL; A1C < 8.5%
        - No
        - Yes
          - Intensify insulin regimen if glucose significantly above goal or add metformin 500 mg twice daily if mildly elevated
            - FPG and A1C at goal
              - No
              - Yes
                - Intensify insulin regimen and/or maximize metformin regimen (up to 2000 mg daily)
      - Maximize metformin regimen if needed (up to 2000 mg daily)
        - No change in therapy required; continue routine follow-up
  - FPG < 200 mg/dL; A1C < 8.0%
    - No
    - Yes
      - Add metformin (500 mg once or twice daily or 850 mg daily); reduce insulin regimen by 20% to 25% if already near glycemic goal
        - No change in oral medications; continue to reduce or discontinue insulin therapy when possible
        - FPG and A1C at goal
          - No
          - Yes
            - Maximize second oral medication or intensify insulin regimen
  - Initiate metformin (500 mg once or twice daily or 850 mg daily)
    - FPG and A1C at goal
      - No
      - Yes

A1C = hemoglobin A1C; DM = diabetes mellitus; FPG = fasting plasma glucose.
Recommendations on indications for the use of nonbiologic disease-modifying antirheumatic drugs (DMARDs) in rheumatoid arthritis (RA) patients who have never received DMARDs

These recommendations do not specifically include the potential role of glucocorticoids or nonsteroidal anti-inflammatory drugs in the treatment of patients with RA. Therapies are listed alphabetically. A, disease duration of less than 6 months; B, disease duration of 6–24 months; C, disease duration of greater than 24 months.

*Includes functional limitation (defined using standard measurement scales such as Health Assessment Questionnaire score or variations of this scale), extra-articular disease (e.g., presence of rheumatoid nodules, secondary Sjögren’s syndrome, RA vasculitis, Felty’s syndrome, RA lung disease), rheumatoid factor positivity, positive anticyclic citrullinated peptide antibodies, or bony erosions by radiography.

*Recommended only for patients with high disease activity with features of poor prognosis.

*Recommended only for patients with moderate disease activity irrespective of prognostic features and patients with high disease activity without features of poor prognosis.

*Only recommended for patients with high disease activity without features of poor prognosis.

HCQ = hydroxychloroquine; LEF = leflunomide; MIN = minocycline; MTX = methotrexate; SSZ = sulfasalazine.

Recommendations on indications for the use of biologic disease-modifying antirheumatic drugs (DMARDs) in patients with rheumatoid arthritis (RA)

These recommendations do not specifically include the potential role of glucocorticoids or nonsteroidal anti-inflammatory drugs in the treatment of patients with RA. Therapies are listed alphabetically. A, patients with RA less than 6 months; B, patients with RA for 6 months or longer whose prior MTX monotherapy failed; C, patients with RA disease 6 months or longer whose prior MTX combination therapy failed or after sequential administration of other nonbiologic DMARDs.

*Includes functional limitation (defined using standard measurement scales such as Health Assessment Questionnaire score or variations of this scale), extra-articular disease (e.g., presence of rheumatoid nodules, secondary Sjögren’s syndrome, RA vasculitis, Felty’s syndrome, RA lung disease), rheumatoid factor positivity, positive anticyclic citrullinated peptide antibodies, or bony erosions by radiography.

*Recommended only for patients with high disease activity with features of poor prognosis.

MTX = methotrexate, TNF = tumor necrosis factor.

Algorithm for the management of metabolic syndrome

Individual components:
- Central abdominal obesity
- Elevated triglycerides
- Low HDL-C
- Impaired fasting glucose
- Hypertension

Diagnosis of metabolic syndrome
(3 of 5 individual components per AHA/NHLBI criteria or abdominal obesity plus 2 additional components per IDF criteria)

All patients should be encouraged to lose weight, increase physical activity, and improve diet

Existing type 2 diabetes or ASCVD?

Treat diabetes or ASCVD according to current guideline recommendations

Initiate low-dose aspirin, consider clopidogrel in those with ASCVD when aspirin contraindicated

Hypertension
Elevated fasting glucose
Atherogenic dyslipidemia
Prothrombotic state

Determine 10-year Framingham risk

Treat individual components considering Framingham risk

No

Yes

Refr to Table 1-2.
AHA/NHLBI = American Heart Association/National Heart, Lung and Blood Institute; ASCVD = atherosclerotic cardiovascular disease; HDL-C = high-density lipoprotein cholesterol; IDF = International Diabetes Federation.
An algorithm for improving drug therapy in disabled or frail elderly patients

An evidence-based consensus exists for using the drug for the indication given in its current dosing rate, in this patient's age group and disability level, and the benefits outweigh all possible known adverse effects

Yes

No/not sure

Indication seems valid and relevant in this patient's age group and disability level

No

Stop drug

Yes

Do the known possible adverse reactions of the drug outweigh possible benefit in older, disabled patients?

Yes

No

Any adverse symptoms or signs that may be related to the drug?

Yes

No

Another drug that may be superior to the one in question?

Yes

No

Shift to another drug

Can the dosing rate be reduced with no significant risk?

Yes

No

Reduce Dose

Continue with the same dosing rate

Yes

No

No/not sure

No

Stop drug