

# CAP CLINICAL PATHWAY

## INTENDED AUDIENCE:

Stewardship teams, including clinical infectious diseases physicians, pharmacists and any medical practitioners involved in treatment decision-making for patients with community-acquired pneumonia (CAP) are the intended audience of the guidance.

## HOW TO USE THIS CLINICAL PATHWAY:

The flowchart indicates actions to take and decision points in the clinical workflow for diagnosis and treatment of patients with suspected community-acquired pneumonia. Community-acquired pneumonia is pneumonia that is acquired outside of the hospital setting. The clinical pathway presented excludes immunocompromised patients defined as “inherited or acquired immune deficiency or drug-induced neutropenia, including patients actively receiving cancer chemotherapy, patients infected with HIV with suppressed CD4 counts, and solid organ or bone marrow transplant recipients”<sup>1</sup>. The pathway is based on the ATS/IDSA Community-acquired Pneumonia Clinical Guidelines (2019), however where appropriate, some clinical practice “enhancements” have been included to reflect current best practices in CAP care.

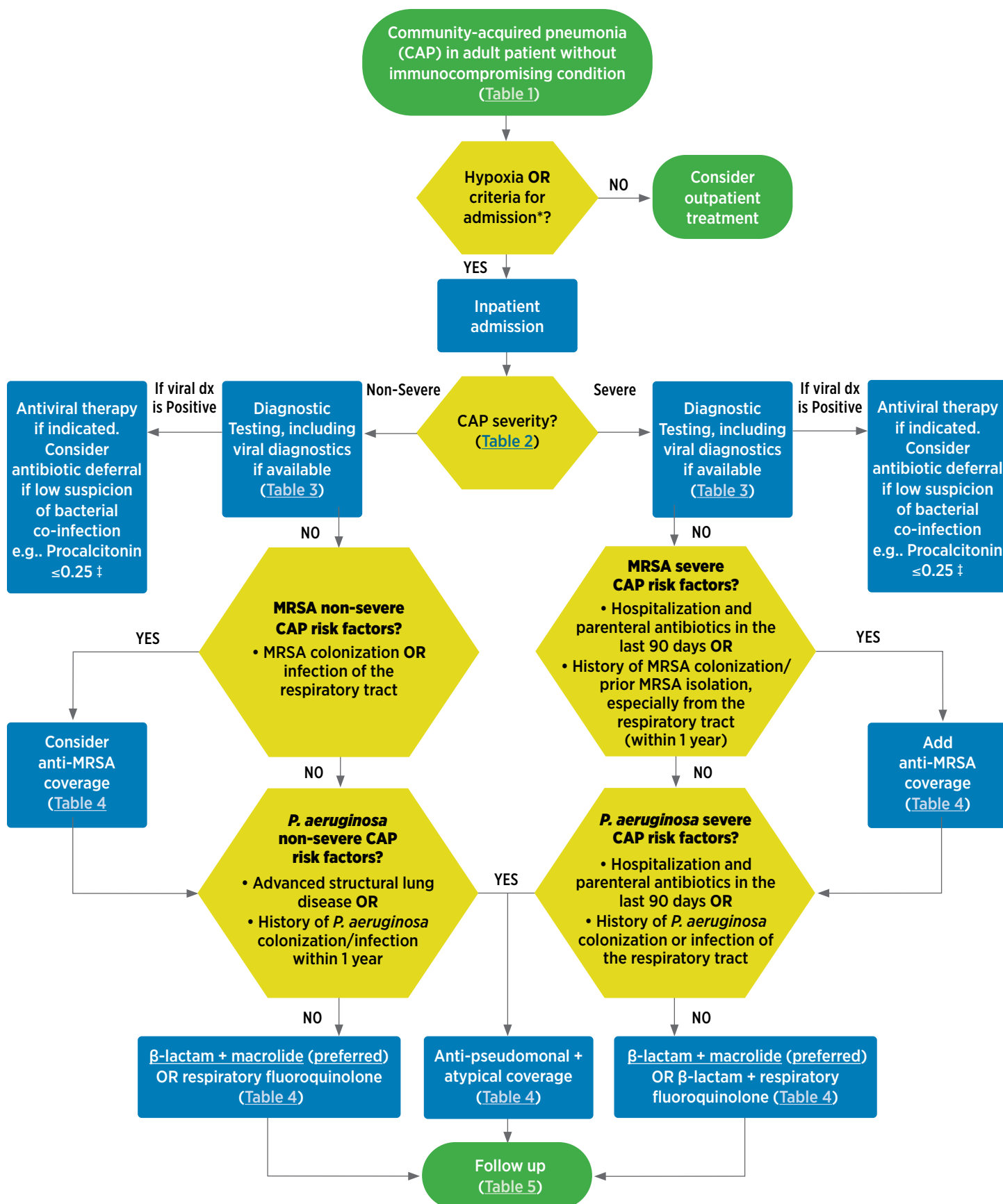
## IDSA DISCLAIMER:

This resource is intended to provide information on the management of patients with community-acquired pneumonia. It is not intended to be inclusive of all appropriate treatments or management approaches; to indicate the standard of care or mandate any particular course of care; or to supplant clinician judgment with respect to particular patients or clinical situations.

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**FIGURE 1: Initial Evaluation and Treatment of Community-Acquired Pneumonia (CAP)**



\*e.g. CURB-65, PSI

‡ This is a clinical practice enhancement to the ATS/IDSA CAP clinical practice guideline

**TABLE 1: Diagnosis of Community-acquired Pneumonia in Adults ( $\geq 18$  years) Without Immunocompromising Conditions<sup>1\*</sup>**

Newly recognized pulmonary infiltrate(s) on chest imaging <sup>†</sup>
<b>AND</b> at least one respiratory symptom
<b>AND</b> at least one other symptom/sign or finding (see below)
<b>Respiratory Symptoms (at least one)</b>
New or increased cough
New or increased sputum production
Dyspnea
Pleuritic chest pain
<b>Other Signs or Findings (at least one)</b>
Abnormal lung sounds (rhonchi or rales)
Fever ( $\geq 100.4$ °F)
Leukocytosis or unexplained bandemia (above normal limits for laboratory)
Hypoxia ( $< 90\%$ )

\*Immunocompromising conditions include inherited or acquired immune deficiency or drug-induced neutropenia, including patients actively receiving cancer chemotherapy, patients infected with HIV with suppressed CD4 counts, and solid organ or bone marrow transplant recipients.

<sup>†</sup>If clinical suspicion for community-acquired pneumonia is high despite negative chest radiograph, consider a CT scan of the chest.<sup>2</sup>

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**TABLE 2: Criteria for Defining Severe Community-acquired Pneumonia<sup>1</sup>**

One major criterion <b>OR</b> three or more minor criteria	
<b>Major Criteria</b>	Septic shock with need for vasopressors
	Respiratory failure requiring mechanical ventilation
<b>Minor Criteria</b>	Respiratory rate $\geq 30$ breaths/min
	$\text{PaO}_2/\text{FiO}_2$ ratio $\leq 250$ <sup>*</sup>
	Multilobar (i.e., $\geq 2$ ) infiltrates
	Confusion/disorientation
	Uremia (blood urea nitrogen level $\geq 20$ mg/dl)
	Leukopenia (white blood cell count $< 4,000$ cells/ $\mu\text{l}$ ) <sup>†</sup>
	Thrombocytopenia (platelet count $< 100,000/\mu\text{l}$ )
	Hypothermia (core temperature $< 36^\circ\text{C}$ )
	Hypotension requiring aggressive fluid resuscitation

\*  $\text{PaO}_2/\text{FiO}_2$  ratio is the ratio of patient's oxygen in arterial blood ( $\text{PaO}_2$ ) to the fraction of the oxygen in the inspired air ( $\text{FiO}_2$ ).<sup>3</sup>

<sup>†</sup> Due to infection alone (i.e., not chemotherapy)

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**TABLE 3: Diagnostic Testing for Community-acquired Pneumonia (CAP) by Disease Severity<sup>1</sup>**

	Non-severe CAP*	Severe CAP*
<b>Blood</b>		
Blood culture	Not routinely recommended <sup>†</sup>	Yes
Procalcitonin <sup>‡</sup>	Consider if available and recommended by hospital guidelines	Yes, if available and recommended by hospital guidelines
<b>Respiratory</b>		
Respiratory culture	Not routinely recommended unless: <ul style="list-style-type: none"> <li>• hospitalization and parenteral antibiotics in the last 90 days</li> <li>OR</li> <li>• anti-MRSA or anti - <i>P. aeruginosa</i> coverage is initiated</li> <li>OR</li> <li>• advanced structural lung disease<sup>§</sup></li> </ul>	Yes
Molecular testing for bacterial pathogens <sup>‡</sup>	Not routinely recommended <sup>†</sup>	Yes, if available and recommended by hospital guidelines
MRSA nasal swab (marker of MRSA colonization)*	Yes, if: <ul style="list-style-type: none"> <li>• hospitalization and parenteral antibiotics in the last 90 days</li> <li>OR</li> <li>• anti-MRSA coverage is initiated</li> </ul>	Yes, if <ul style="list-style-type: none"> <li>• hospitalization and parenteral antibiotics in the last 90 days</li> <li>OR</li> <li>• history of MRSA colonization or infection at any site within 1 year</li> <li>OR</li> <li>• anti-MRSA coverage is initiated</li> </ul>
<b>Viruses</b>		
Influenza testing	Yes, if presence of virus in community, travel risk or potential exposure	Yes, if presence of virus in community, travel risk or potential exposure
COVID-19 testing <sup>‡</sup>	Yes, if presence of virus in community, travel risk or potential exposure	Yes, if presence of virus in community, travel risk or potential exposure
Expanded viral molecular panel (e.g., rhinovirus, enterovirus, RSV) <sup>‡</sup>	Consider if available <sup>†</sup>	Yes, if available <sup>†</sup>
<b>Urine</b>		
Legionella urine antigen test	Yes, if recent outbreak, travel or other epidemiological factors	Yes
Pneumococcus urine antigen test	Not routinely recommended <sup>†</sup>	Yes

\* See table 3 for criteria for defining severe CAP

<sup>†</sup> Can be considered in select cases where timely pathogen determination may allow a more directed therapy or discontinuation of unnecessary antibiotics

<sup>‡</sup> This is a clinical practice enhancement to the ATS/IDSA CAP clinical practice guideline

<sup>§</sup> Patients with advanced structural lung disease defined as “bronchiectasis, post-obstruction, advanced chronic obstructive pulmonary disease or cystic fibrosis”

\* See detailed note in Table 5<sup>4</sup>

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**TABLE 4: Initial Treatment for Hospitalized Patients with Community-Acquired Pneumonia (CAP) Stratified by Disease Severity and Risk for Antibiotic Resistant Pathogens<sup>1</sup>**  
(Note: Modify per hospital formulary and/or preferred antibiotics)

<b>Allergy Alert:</b> Use evidence-based validated risk strategies for evaluating $\beta$ -lactam allergy and cross-reactivity to other $\beta$ -lactams (add references). Patients with mild to moderate penicillin reactions <sup>5</sup> can typically tolerate non-penicillin $\beta$ -lactams. Obtain a detailed history as these patients may be de-labeled based on tolerated penicillin-class agents since the initial reaction <sup>6</sup> . Patients with immediate penicillin reactions (e.g., urticaria, angioedema, anaphylaxis) within 1 hour of $\beta$ -lactam penicillin exposure may tolerate 3rd/4th generation cephalosporins or carbapenems <sup>7</sup> . Avoid $\beta$ -lactams in patients with severe delayed cutaneous reactions (e.g., Stevens-Johnson syndrome, toxic epidermal necrolysis) <sup>8</sup> .							
Standard Regimen		Recent hospitalization and parenteral antibiotics in the last 90 days		History of MRSA colonization or infection at any site within 1 year OR MRSA nasal PCR positive		History of <i>P. aeruginosa</i> colonization or infection at any site within 1 year OR Advanced structural lung disease	
Non-severe CAP	<b><math>\beta</math>-lactam PLUS Atypical Coverage (Preferred)</b>	<b><math>\beta</math>-lactam PLUS Atypical Coverage (same as standard regimen)</b>		<b>MRSA Coverage</b>		<b><math>\beta</math>-lactam PLUS Atypical Coverage</b>	
	<b>Choose One:</b> Ampicillin/sulbactam 1.5-3g IV q6h Ceftriaxone 1-2g IV q24h (2g if >80kg) <sup>9,10</sup> Cefotaxime 1-2g IV q8h					<b>Choose One:</b> Piperacillin/tazobactam 4.5g IV q6h Cefepime 2g IV q8h Ceftazidime 2g IV q8h Imipenem 500mg IV q6h Meropenem 1000mg IV q8h	<b>Choose One:</b> Azithromycin 500mg IV/PO q24h* Clarithromycin 500mg IV/PO q12h Doxycycline 100mg IV/PO q12h**
	<b>Monotherapy (alternative if above regimen is not tolerated)</b>						
	<b>Choose One:</b> Levofloxacin 750mg IV/PO q24h Moxifloxacin 400mg IV/PO q24h						
Severe CAP	<b><math>\beta</math>-lactam PLUS Atypical Coverage</b>	<b>MRSA Coverage</b>	<b><math>\beta</math>-lactam PLUS Atypical Coverage</b>	<b>MRSA Coverage</b>	<b><math>\beta</math>-lactam PLUS Atypical Coverage</b>		
	<b>Choose One:</b> Ampicillin/sulbactam 1.5-3g IV q6h Ceftriaxone 2g IV q24h <sup>11,12</sup> † Cefotaxime 1-2g IV q8h	<b>Choose One:</b> Vancomycin per hospital guidelines Linezolid 600 mg IV/PO q12h	<b>Choose One:</b> Piperacillin/tazobactam 4.5g IV q6h Cefepime 2g IV q8h Ceftazidime 2g IV q8h Imipenem 500mg IV q6h Meropenem 1000mg IV q8h	<b>Choose One:</b> Vancomycin per hospital guidelines Linezolid 600 mg IV/PO q12h	<b>Choose One:</b> Piperacillin/tazobactam 4.5g IV q6h Cefepime 2g IV q8h Ceftazidime 2g IV q8h Imipenem 500mg IV q6h Meropenem 1000mg IV q8h	<b>Choose One:</b> Azithromycin 500mg IV/PO q24h* Clarithromycin 500mg IV/PO q12h Doxycycline 100mg IV/PO q12h**	<b>Choose One:</b> Levofloxacin 750mg IV/PO q24h Moxifloxacin 400mg IV/PO q24h

**Severe CAP with allergy to  $\beta$ -lactams:** Consider levofloxacin 750mg IV/PO q24h  $\pm$  aztreonam 2g IV q8h +/- MRSA coverage

\* Azithromycin 500mg q24 hours x 3 doses for 1500mg total to treat atypical pneumonia<sup>13,14</sup>

\*\* Macrolide intolerance or QTc prolongation.

† This is a clinical practice enhancement to the ATS/IDSA CAP clinical practice guideline

#### Notes:

- Antibiotic selections should be driven by local antibiograms
- Patients with septic shock should receive therapy per hospital sepsis guidelines
- Antibiotic dosing should be adjusted according to hospital guidelines and renal/liver insufficiency
- The following FDA-approved agents may be considered in non-severe CAP patients who are not candidates for  $\beta$ -lactams, macrolides or FQs: lefamulin 150 mg IV q 12 hours (600 mg orally q 12 h) or omadacycline 200 mg IV on day one followed by 100mg IV daily (300 mg orally q 12 h on day one, followed by 300 mg orally once daily)

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**TABLE 5: Daily Follow-up Stewardship Considerations for Hospitalized Patients with Community-acquired Pneumonia (CAP)†**

Assessment	Action
Confirm CAP diagnosis and assess clinical improvement	Review clinical progression to confirm CAP (viral or bacterial) diagnosis vs. non-infectious etiology
	Evaluate documented penicillin allergy as recommended by hospital guidelines. The evaluation may include history and physical examination, allergy consultation, challenge doses, or skin testing (refer to top of Table 4).
	Assess for clinical stability <sup>15</sup> , at least 5 clinical stability criteria (or return to baseline) below: <ul style="list-style-type: none"> <li>• Tmax ≤38°C</li> <li>• HR ≤100</li> <li>• RR ≤24</li> <li>• Arterial O<sub>2</sub> saturation ≥90% or pO<sub>2</sub> &gt;60mmHg</li> <li>• Baseline mental status</li> <li>• SBP ≥90 mmHg</li> </ul>
	Assess for CAP complications if no clinical improvement (secondary bacteremia, lung abscess, or empyema)
Diagnostic Testing	Determine pathogen-directed therapy based on sputum culture (if sputum can be readily produced) and other diagnostic testing
	Viral diagnostics: Consider discontinuing antibiotic therapy if, viral diagnostics are positive, Procalcitonin <0.25 (or 80% reduction on repeat testing in 72 hours), WBC < 10,000 cells/μl, and low suspicion for bacterial co-infection
	MRSA nasal swab: <ul style="list-style-type: none"> <li>• If negative, discontinue MRSA coverage (&gt;95% negative predictive value in CAP)</li> <li>• If positive, may not be indicative of MRSA pneumonia (&lt;40% positive predictive value); continue assessment of other MRSA risk factors and consider anti-MRSA therapy discontinuation if no risk factors</li> </ul>
Treatment Considerations	Try to minimize broad spectrum antibiotics when possible
	Assess for adverse drug events
Discharge Considerations	Assess for clinical stability; patient afebrile with at least 5 signs of CAP stability criteria listed above or return to baseline
	Assess for ability to tolerate oral therapy, oral de-escalation options: <ul style="list-style-type: none"> <li>• No MDRO risk factors (choose one): <ul style="list-style-type: none"> <li>» Amoxicillin (500mg) + clavulanate (125mg) PO TID, or Amoxicillin (875 mg or 2000mg) + clavulanate (125mg) PO BID</li> <li>» Cefpodoxime 200mg PO BID</li> <li>» Cefuroxime 500mg PO BID</li> </ul> </li> <li>• MDRO Risk Factors: <ul style="list-style-type: none"> <li>» Levofloxacin 750mg PO q24h</li> <li>» If Legionella-negative or alternative etiology identified, discontinue azithromycin after 1500mg total.</li> </ul> </li> </ul>
	Consider duration of antibiotics administered (no more than 3-5 days total in the ED and inpatient) if clinically stable by day 3. <sup>16†</sup>
	Ensure post-discharge follow-up including insurance coverage and availability at outpatient pharmacy
	Consider vaccination (pneumococcal, influenza, COVID-19, and RSV [in eligible populations]). If relevant, provide smoking cessation counselling/medications and ensure patient is on proper therapy to enhance control of chronic conditions (e.g., COPD, CHF) <sup>17</sup>
	Educate patients and caregivers <sup>17</sup> : <ul style="list-style-type: none"> <li>• Planned antibiotic course (if needed) and instructions for follow-up medical care</li> <li>• Signs and symptoms of worsening infection, and sepsis</li> <li>• Signs and symptoms of antibiotic-associated adverse events, including <i>Clostridioides difficile</i> infection</li> </ul>

† This is a clinical practice enhancement to the ATS/IDSA CAP clinical practice guideline

## References

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- <sup>17</sup> Adapted from [BAA-Hospital-Discharge-Flowchart-P.pdf \(cdc.gov\)](#)

## Development and Conflict of Interest

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### **CAP CLINICAL PATHWAY DEVELOPMENT GROUP:**

Fritzie Albarillo, MD, Loyola University Medical Center; Edward Hines VA Center

Steve Burdette, MD, Wright State University

Shira Doron, MD, Tufts Medical Center

Thomas File, MD, Summa Health Medical Group

Kevin Hseuh, MD, Washington University School of Medicine

Maryrose Laguio-Vila, MD, Rochester Regional Hospital

Monica Mahoney, PharmD, Beth Israel Deaconess Medical Center

Jerod Nagel, PharmD, Michigan Medicine

Michael Pulia, MD, University of Wisconsin – Madison

Valerie Vaughn, MD, University of Utah; Salt Lake City VA

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**CONFLICT OF INTEREST SUMMARY:** The following list includes what has been reported to IDSA. To provide thorough transparency, IDSA requires full disclosure of all relationships, regardless of relevancy to the guidance topic. Evaluation of such relationships as potential conflicts of interest is determined by a review process which includes assessment by the Board of Directors liaison to the Standards and Practice Guidelines Committee and, if necessary, the Conflicts of Interest and Ethics Committee. The assessment of disclosed relationships for possible conflicts of interests is based on the relative weight of the financial relationship (i.e., monetary amount) and the relevance of the relationship (i.e., the degree to which an association might reasonably be interpreted by an independent observer as related to the topic or recommendation of consideration). IDSA requests panel members to disclose activities and financial relationships/investments related to consultant/advisory roles, promotional speakers bureau, stocks/bonds, honoraria, expert testimony, ownership interest, research grants, organizational benefits, intellectual property, other remuneration, activities with other organizations, and relevant financial interest of family members. Readers of this clinical pathway should be mindful of this when the list of disclosures is reviewed.

**S.B.** serves as a speaker for GlaxoSmithKline. **F.A.** has no disclosures. **S.D.** served as a speaker for Vertex; served as an advisor for Sunovion. **T.F.** served as an advisor for Nabriva therapeutics; serves on an Advisory Committee for ThermoFisher; serves as an advisor for HealthTrackRx; serves as an editor-in-chief for Wolters Kluwer; serves as an author for Wolters Kluwer. **K.H.** serves as a fellowship program director for IDSA; received a grant from CDC on behalf of their institution. **M.L.** has no disclosures. **J.N.** has no disclosures. **M.M.** serves as an advisor and speaker for BD Biosciences; serves as an advisor for Cidara; serves as an advisor for GlaxoSmithKline; received remuneration for research conducted for Merck; served as an advisor for Pfizer; receives honoraria from ASHP; served as immediate past president of MSHP; serves on the editorial boards for ASHE, Contagion Live and OFID. **M.P.** received a grant from AHRQ on behalf of their institution; received a grant from CDC on behalf of their institution. **V.V.** received grants from CDC, GBMF, AHRQ, NAM on behalf of their institution; received an individual grant from NHLBI.