Residents and Fellows Edition

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Featured Employer Profile

Residents and Fellows Edition

Geisinger
Hospitalist Update: For Hospital Medicine Physicians, Emerging Opportunities Plentiful in Clinical and Operational Realms

By Bonnie Darves

Hospital medicine has made a lot of headway for a relatively new physician specialty. In just over 25 years, hospitalists have integrated themselves into virtually every aspect of care delivery in hospitals and health systems. From their beginnings as in-hospital internists and family medicine physicians managing the inpatient care of community primary care physicians’ patients, a vital role that persists today, hospitalists are now serving in top leadership positions, commandeering quality improvement initiatives, and developing facility-wide protocols. They’re also comanaging specialists’ patients and delving deep into hospital operations and IT infrastructures to help facilitate systems improvements.

For young physicians contemplating where they’ll hang their stethoscopes, that broad swath of practice possibilities is a large part of the specialty’s appeal, according to Rohit Uppal, MD, MBA, chief clinical officer for TeamHealth Hospitalist Services in Orlando, Florida. “The lure of hospitalist practice is that physicians are exposed to aspects of medicine that they might not encounter elsewhere and also have the opportunity to learn leadership skills on the job,” Dr. Rohal said. “There’s really no other specialty that exposes you to the breadth of medicine.”
manage such patients. Hospitalists bring valuable experience to HAH pro-
grams because of their extensive expertise in triaging acutely ill patients,
working in multidisciplinary teams, and, recently, delivering telemedicine.
In a June 2019 article in the *Journal of Hospital Medicine*, Dr. Danielsson
predicted that HAH hospitalists might one day become a subspecialty
of their own.

In a field that continues to grow steadily, and at a time when hospitals
are amenable to placing talented hospitalists in just about any administra-
tive role they're interested in, there's no shortage of both traditional prac-
tice opportunities and jobs that combine clinical and administrative work.
Today, an estimated 50,000 hospitalists practice in the United States, and
the specialty experienced a 50 percent growth rate between 2012 and
2019, according to a study published in *Journal of Hospital Medicine*
in August 2022.

What early-career hospitalists are seeking

Even if the sky is the limit in terms of the myriad ways that hospitalists
might configure their clinical careers or combine clinical and administra-
tive work, young physicians considering — or newly entering — the field
choose the specialty for its schedule flexibility and its perceived ability to
deliver acceptable work/life balance. Ijeoma Carol Nwelue, MD, hospitalist
medical director for Baylor Scott & White Health in Fort Worth, Texas,
said that even early-career hospitalists aren't shy about articulating their
wish lists.

"Young physicians really want that work/life balance, so schedules are a
big issue for them," she said. "Hospitalists really want their work planned
around their life, and they're expecting not to have to grind it out every
day. They want specific fixed hours, but they also want some schedule
flexibility when they need it."

Most hospitalist organizations are attempting to deliver on both fronts.
Still, the predominante schedule in the specialty is seven on/seven off (often
called a “7/7”) — hospitalists work seven days or nights in a row, followed
by seven off — can be a bit of a grind when hospitalists are in the “on”
mode, several sources acknowledged. As such, some groups are exploring
ways to shorten shifts or otherwise reconfigure schedules. So far, no new
standard has emerged.
Young physicians are also looking for ways to serve the community at large. They're increasingly articulating that desire when they interview for positions, observed Dr. Nwelue, now a veteran of the field. "That's something we've been seeing a lot in recent years — young physicians wanting dedicated time for community outreach, for opportunities to care for or teach patients outside of the hospital setting," she said. "It's a common request of this new generation."

**Hospitalists want to teach, too**

Also high on the wish list for many young hospitalists are formal or informal teaching opportunities. Although hospitalists in academic medicine have such opportunities as a matter of course, many of those practicing in other settings such as community hospitals also want to spend some time teaching residents, or even other colleagues, several sources mentioned. Fortunately, some of the hybrid community hospital/academic institution partnerships that have emerged in the past decade are giving hospitalists a chance to do some teaching and research work in addition to their clinical duties.

In the academic realm, some programs are seeking more expedient pathways for early-career hospitalists move into medical education more quickly — with the objective of providing that career satisfaction sooner that it might occur traditionally in competitive academic environments. The University of Chicago, for instance, has pioneered an innovative Passport to Clinical Teaching program, which offers early-career hospitalists access to medical-education opportunities that they can pursue on their own time and coordinate with their clinical responsibilities.

"A lot of young hospitalists really want to teach and to learn how to become mentors, but it's challenging because their schedules are heavy clinically. And there is substantial competition for available teaching time in academic environments," said Elizabeth A. Murphy, MD, assistant professor and director of clinical service development in the University of Chicago's Section of Hospital Medicine. "What we've done is create structured content on becoming a better teacher that hospitalists can access on their own time."

More limited teaching opportunities are available as a series of Passport rotations in various domains, that cohort members complete within about a year, Dr. Murphy noted. Participants typically spend time at external community hospitals that operate smaller residency programs or host medical students and can use extra hands. Cohort members also learn how to develop continuing medical education (CME) offerings, work in community health clinics, and engage in scholarly activities, among other offerings.

J.P. "John" Murray, MD, a young University of Chicago hospitalist who now directs the hospitalist consult service, maintains that his Passport program participation effectively jumpstarted his career. "I really appreciated the fact that the Passport program is geared toward young hospitalists. It provides lots of opportunities to get involved with residents and medical students, that you might not have otherwise," Dr. Murray said. "It provides a framework and exposure. It keeps you sharp, and it provides a way to show leadership that you're very interested in teaching."

The program started in 2020 and has been well received, Dr. Murphy said. Some of the learners in the initial cohort have received teaching awards or moved into formal teaching roles. "Many hospitalists come into academic medicine because of their favorable training experiences and because they want to be part of what academic medicine does," Dr. Murphy said. "This offers early-career hospitalists a way to do that, and it gives us a way to harness the mentoring talent we have."

**Telehealth and other practice options**

Not surprisingly, because of their varied exposure to many aspects of care delivery and the skills they gained navigating the pandemic, hospitalists have been pivotal in helping hospitals develop and expand telehealth services, to reach both home-bound patients and those in underserved areas. Dr. Siy noted that hospitalists at his organization provide telehealth services at night to outlying hospitals and some reserve a portion of their clinical time to work in rural hospitals.

Dr. Nwelue reported that her organization is piloting a hospitalist-managed telehealth service aimed at managing lower-acuity patients — such as those with infections that require IV antibiotics — who can be safely cared for at home with nursing intervention and hospitalist management. Likewise, in pediatrics, a field that has struggled with capacity as dedicated pediatrics units have shrunk or disappeared, pediatric hospitalists are using telemedicine to expand their reach into rural and smaller hospitals. In particular, pediatric hospitalists are helping such facilities care for lower-acuity young patients that present to their emergency departments.
In recent years, another brand of hospitalist has emerged — transitionalists. These hospitalists focus on the intersection of inpatient care and so-called step-down units. Transitionalists practice either part-time or full-time in post-acute settings such as inpatient rehabilitation facilities, long-term acute-care hospitals, or skilled nursing facilities. In such roles, hospitalists often serve as medical directors.

In another recent development, hospitalists are being tapped as in-house consultants. They’re helping hospitals reduce unnecessary services utilization, assess medical-necessity issues, and streamline post-discharge care continuity. Because hospitalists develop in-depth familiarity with specialists’ practice patterns, test ordering, and patient lengths of stay, hospitals are discovering that hospitalist input pays dividends in both reducing costs and improving care.

Inside hospitals and health systems, organizations are realizing that young tech-savvy hospitalists can also be instrumental in helping them vexing issues. Hospitalists are being tapped to help resolve workflow, IT, and EHR issues that cause inefficiencies — or clinician frustration. “This is an ideal role for early-career hospitalists who have an interest and some expertise in healthcare technology,” said Dr. Siy. “There’s a real demand for such skills.”

One of the big draws in the early years of hospital medicine was that hospitalists working “7/7” schedules could use some of the off-week time to moonlight at local hospitals, perhaps to pay off education debt more rapidly. Although moonlighting isn’t as common as it once was in the field, some hospitalists recognize that they can use their off time to learn new clinical or business skills or even start new ventures.

Mitchell Durante, DO, and Anthony King, DO, hospitalists at BJC Healthcare Christian Hospital in St. Louis, Missouri, recently decided to take advantage of their “7/7” schedule flexibility to start a manipulative medicine clinic that’s open during their off weeks. “It took us a few years to get this up and running, but we’re excited about starting our own business,” Dr. Durante said. “That’s one of the good things about hospital medicine — it gives you the flexibility to do something like this.”

Some hospitalists are also utilizing their newly developed telemedicine skills with their flexibility to carve out opportunities to provide remote care and consultations from home. Others are developing new products or apps, launching podcasts, or serving an independent medical reviewers.

The other ‘ists’ — growth of specialty hospitalists is slow, but steady

In the past 15 years, several specialties have made strides in developing inpatient-only services based on the hospitalist model as specialists wrestle with the growing challenges of simultaneously managing a combined outpatient/inpatient practice.

The mainstays of the specialty hospitalist movement remain orthopedics, trauma, anesthesiology, OB/GYN, general surgery, and gastroenterology. But psychiatry and neurology are both increasingly embracing the hospitalist model. In a pioneering venture, the University of California, San Francisco has started a Neurohospitalist Division that utilizes a structure similar to the traditional medicine hospitalist model.

Leadership roles

Although it’s not uncommon now to see hospitalists as medical directors, chief medical officers, and health-system committee chairs, young hospitalists should understand that both a learning curve and a willingness to devote extra time to small-scale initiatives are prerequisites for obtaining leadership roles, Dr. Siy noted. “As an early-career hospitalist, you have to invest in growing your knowledge base and carving out time to do committee work if you want to pursue a leadership role. There are new skill sets to learn, and that takes time,” he said.

Organizations are trying to accommodate hospitalists’ desires to move into leadership roles without waiting a decade or longer. TeamHealth, for example, operates a designated leadership track for interested hospitalists. And it’s a popular option, according to Dr. Uppal. In addition, the Society of Hospital Medicine’s Leadership Academy offers a wide range of courses that enable hospitalists to obtain leadership and management skills.

“The possibilities, in terms of career paths for hospitalists, are robust — and growing. Hospitalists were already being viewed as leaders in the hospital before the pandemic hit. Their impressive performance during COVID-19 cemented that.”

— Rohit Uppal, MD, TeamHealth Hospital Medicine
When Is It Time to Change Jobs?

By Nisha Mehta, MD, a physician leader whose work focuses on physician empowerment, community building, and career longevity in medicine

Statistically, the majority of physicians will change jobs within their first five years out of training. Additionally — even at later stages of physician careers — an increasing percentage of the physician population consider changes in their career. Physician turnover is an often talked about issue among hospital administrators and practice owners.

Why is this? Well, part of it has to do with the challenges associated with being a physician in the current health care landscape. My father, a cardiologist, spent four decades of his career with the same group. Many of his friends can say the same. On the other hand, I know a far lower percentage of colleagues who could say with confidence that they see themselves with the same group for the remainder of their careers. Aside from practical drivers of physician turnover, such as a desire to be closer to family or a change in the job of a significant other, many are finding their workplaces increasingly challenging. As consolidation within the health care space increases, physician demographics change, and the pressure to do more with less increases, more physicians find themselves asking if their situation is sustainable.

We all have aspects of our jobs that are pain points, and the expectation that any job will be perfect is unrealistic. How do you know you’re not...
A 66-year-old man with underlying chronic obstructive pulmonary disease (COPD) presents to the emergency department with a 2-day history of fever, dyspnea, and productive cough. He describes one episode of acute exacerbation of COPD that occurred 6 months earlier. The physical examination is notable for mild respiratory distress and confusion, with disorientation to time. His temperature is 38.6°C, heart rate 100 beats per minute, blood pressure 140/85 mm Hg, respiratory rate 24 breaths per minute, and oxygen saturation 92% while he is breathing ambient air. Auscultation of the lungs reveals coarse rhonchi over the right midlung field. Chest radiography reveals right upper-lobe consolidation (Fig. 1). His white-cell count is 14,000 per cubic millimeter, platelet count 159,000 per cubic millimeter, serum sodium 136 mmol per liter, blood urea nitrogen 19 mg per deciliter (6.8 mmol per liter), creatinine 1.1 mg per deciliter (97.2 μmol per liter), and procalcitonin 5.4 ng per milliliter (normal range, 0.00 to 0.05). A multiplex viral panel was positive for respiratory syncytial virus. How would you further evaluate and treat this patient?

The Clinical Problem

Community-acquired pneumonia is an acute infection of the pulmonary parenchyma in a patient who has acquired the infection in the community (as distinguished from an infection acquired in a hospital). In the United States, community-acquired pneumonia is one of the leading causes of hospitalization and death, with approximately 650 adults per 100,000 population, corresponding to 1.5 million unique hospitalizations of patients with pneumonia occurring each year.1 Factors that increase the risk of community-acquired pneumonia include advanced age, chronic lung disease, chronic heart disease, cardiovascular disease, diabetes mellitus, malnutrition, viral respiratory tract infections, immunocompromising conditions, and lifestyle factors such as smoking and excessive alcohol consumption.

The development of pneumonia is influenced by a combination of factors, including host susceptibility, pathogen virulence, and the inoculum of microorganisms reaching the lower airways. Respiratory pathogens must overcome several defense mechanisms of the respiratory system before reaching the alveoli. These defenses include mucus trapping, mucociliary clearance, coughing, and swallowing. Pathogens can reach the alveoli by means of microaspiration (aspiration of small amounts of oropharyngeal secretions that often occurs during sleep), inhalation, macroaspira-
The diagnosis of community-acquired pneumonia is made on the basis of compatible symptoms and signs, with evidence of a new infiltrate on an imaging study.

Most outpatients with mild community-acquired pneumonia can be treated empirically without diagnostic testing for bacteria. However, testing for SARS-CoV-2 and influenza should be considered.

A comprehensive approach to microbiologic testing for hospitalized patients is recommended for determining the appropriate pathogen-directed therapy.

The choice of antimicrobial therapy for community-acquired pneumonia varies according to severity, coexisting conditions, and the likelihood of antimicrobial-resistant organisms.

Pulmonary infiltrates

Hypoxemia

Rales or crackles

Dullness to percussion

Tachypnea

Pleuritic chest pain

Shortness of breath

Sputum production

Physiologic inflammatory response

Systemic inflammatory response

Organ dysfunction

Local inflammatory response

Severe CAP

Dysregulated inflammatory response

Organ failure

Cardiovascular failure

Renal failure

Neurologic failure

Hematologic failure

Metabolic failure

Multiple organ dysfunction syndrome

Clinical, Laboratory, and Imaging Correlation

Cough

Sputum production

Shortness of breath

Pleuritic chest pain

Tachypnea

Dullness to percussion

Rales or crackles

Hypoxemia

Pulmonary infiltrates

Fever

Chills

Malaise

Anorexia

Tachycardia

Leukocytosis

Left shift

Increased C-reactive protein

Increased erythrocyte sedimentation rate

Confusion

Hypothermia

Hypotension

Hyperlactatemia

Increased liver enzymes

Increased creatinine

Respiratory rate ≥30 breaths/min

Respiratory failure necessitating mechanical ventilation

Severe CAP

Clinician may use cap to define severe CAP

Major Criteria

Septic shock treated with vasopressors

Respiratory failure necessitating mechanical ventilation

Minor Criteria

Respiratory rate ≥35 breaths/min

Confusion or disorientation or both

Thermoregulatory dysfunction or hypothermia (core temperature <36°C or 98.6°F)

Hypotension necessitating aggressive fluid resuscitation

Leukopenia (white-cell count ≤4000 cells/µl)

Thrombocytopenia (platelet count ≤100,000 per µl)

Uremia (blood urea nitrogen level ≥20 mg/dl)

Ratio of PaO2 to FiO2 ≤250

Multiblock (≥2) infiltrates

Severe CAP

One major criterion or ≥3 minor criteria

Figure 1. Chest Radiographs.

A

B

Figure 1. Chest Radiographs.

Posteroanterior (Panel A) and lateral (Panel B) views show right upper-lobe infiltrate.

Figure 2. Pathogenesis of Community-Acquired Pneumonia (CAP) with Corresponding Clinical, Laboratory, and Imaging Abnormalities. PaO2 denotes partial pressure of arterial oxygen, and FiO2 the fraction of inspired oxygen.
Table 1. Respiratory Pathogens in Community-Acquired Pneumonia (CAP).*

<table>
<thead>
<tr>
<th>Pathogen Group</th>
<th>Pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common or core</td>
<td>Streptococcus pneumonia, methicillin-susceptible Staphylococcus aureus, Strept. pneum., other streptococci</td>
</tr>
<tr>
<td>Gram-positive bacteria</td>
<td>Hemophilus influenzae, Moraxella catarrhalis, Haemophilus influenzae (e.g., FlhB/aflF pneumonia)</td>
</tr>
<tr>
<td>Atypical bacteria</td>
<td>Legionella pneumophila, Mycoplasma pneumoniae, Chlamydia pneumoniae</td>
</tr>
<tr>
<td>Viruses</td>
<td>influenza virus, SARS-CoV-2, respiratory syncytial virus, parainfluenza virus, human meta-pneumovirus, rhinoviruses, common human coronaviruses</td>
</tr>
<tr>
<td>Uncommon or infrequent</td>
<td>M. catarrhalis, Staphylococcus aureus, rhodococcus equi, Rhodococcus equi</td>
</tr>
<tr>
<td>Gram-negative bacteria</td>
<td>Enterobacteriaceae, including extended-spectrum beta-lactamase- and carbapenem-resist resistant enterobacteriaceae, nonfermenting bacilli (e.g., pseudomonas or acinetobacter); Francisella tularensis</td>
</tr>
<tr>
<td>Atypical bacteria</td>
<td>Chlamydia psittaci, Coxiella burnetii</td>
</tr>
<tr>
<td>Mycobacteria</td>
<td>Mycobacterium tuberculosis, nontuberculous mycobacteria</td>
</tr>
<tr>
<td>Viruses</td>
<td>Cytomegalovirus, herpes simplex, varicella zoster, MERS-CoV</td>
</tr>
<tr>
<td>Fungi</td>
<td>Pneumocystis jirovecii, aspergillus species, mucorales species, histoplasma species, cryptococcus species, blastomyces species, coccidiodes species</td>
</tr>
<tr>
<td>Parasites</td>
<td>Strongyloides stercoralis, Toxoplasma gondii</td>
</tr>
</tbody>
</table>

* Risk factors associated with specific pathogens are shown in Table S3. MERS-CoV denotes Middle East respiratory syndrome coronavirus, and SARS-CoV-2 severe acute respiratory syndrome coronavirus 2.

and some bacteria (e.g., mycoplasma) may cause a pneumonia in patients with normal procalcitonin levels. If access to chest radiography is limited, a diagnosis can be suggested by the findings from a comprehensive examination, including evidence of lung consolidation. Community-acquired pneumonia is considered to be severe if there are manifestations of organ dysfunction or organ failure. The American Thoracic Society and Infectious Diseases Society of America (ATS-IDSA) criteria for defining severe community-acquired pneumonia are shown in Figure 2.1

SITE OF CARE
The decision regarding the site of care depends on many variables, including severity of illness, associated disease, presence of hypoxemia, adequacy of home support, and probability of adherence to treatment. The severity of a patient’s illness is primarily a determination based on clinical judgment, which can be supplemented by the use of severity scores. The most commonly used severity scores are the Pneumonia Severity Index (PSI) and CURB-65, a score that incorporates confusion, urea, respiratory rate, blood pressure, and age 65 years or older.1,2 Calculations for determining PSI scores are provided in the Supplementary Appendix. The CURB-65 scale ranges from 0 to 5 and is calculated by assigning 1 point each for the presence of new-onset confusion, blood urea nitrogen level greater than 19 mg per deciliter, respiratory rate greater than 30 breaths per minute, systolic blood pressure less than 90 mm Hg or diastolic blood pressure less than 60 mm Hg, and age of 65 years or older. Outpatient treatment is recommended for a patient with a CURB-65 score of 0 or 1, or a short hospital stay or close observation can be provided for a patient with a score of 2, and hospitalization is recommended for a patient with a score of 3 to 5. Indications for ICU care are based on further criteria, including the use of mechanical ventilation and the presence of shock (Fig. 2). Severity score thresholds have not been defined for the treatment of patients who are immuno-compromised; thresholds for admission should be based on clinical judgment.12

MICROBIOLOGIC TESTING
The identification of the causative agents of community-acquired pneumonia was limited in the past because there were no rapid, easily performed, accurate, and cost-effective methods of obtaining results for most patients at any setting. However, molecular diagnostic techniques that combine sensitivity, specificity, and a rapid turnaround time are becoming increasingly available.13,14 The coronavirus disease 2019 (COVID-19) pandemic has illustrated the etiologic importance of respiratory viruses that are primarily identified by molecular testing.

Microbiologic testing for bacterial causes is generally not recommended for patients who are treated in ambulatory settings, since empirical antibiotic therapy is largely successful. However, testing for viruses (e.g., SARS-CoV-2 and influenza) should be considered, since the results can affect the choice of therapy. Establishing an etiologic diagnosis of community-acquired pneumonia in hospitalized patients is important for several reasons, including the appropriate selection of an antibiotic for use against a specific pathogen, promote good antimicrobial stewardship, and allow identification of pathogens associated with notifiable diseases such as SARS-CoV-2 infection or legionnaires’ disease. Available recommended tests include sputum or blood culture, urine immunochromatographic analysis for Strep-tococcus pneumonia and Legionella pneumophila serogroup 1, and molecular techniques such as multiplex assays that include SARS-CoV-2. In addition, if there is a risk of methicillin-resistant Staphylococcus aureus (MRSA) infection, obtaining a nasal swab for a MRSA polymerase-chain-reaction (PCR) assay can be useful, since a negative result can allow for discontinuation of anti-MRSA therapy.14 A more comprehensive microbiologic workup should be performed on the basis of epidemiologic exposures as well as individual patient characteristics such as immunosuppression.12

TREATMENT
Empirical antimicrobial therapy targets common pathogens on the basis of risk factors.12 Antiviral therapy for influenza or SARS-CoV-2 infection should be administered according to clinical factors, the results of diagnostic tests, or both.1,2,15 Therapy should be administered as soon as possible after community-acquired pneumonia is diagnosed. Therapy for patients who are immunocompromised is beyond the scope of this article and has been described elsewhere.12

For patients who have taken antibiotics within the past 3 months, have serious conditions (e.g., chronic heart, lung, kidney, or liver disease; diabetes mellitus; or alcohol dependence), who are smokers, oxacillin–clavulanate (875 mg orally twice daily extended-release, 2 g twice daily) or either a macrolide (preferred) or doxycycline are recommended. Patients who cannot take beta-lactam agents owing to hypersensitivity or adverse effects can instead be treated with a respiratory fluoroquinolone (levofloxacin at a dose of 750 mg daily or moxi-floxacin at a dose of 400 mg daily) or one of two more recently approved agents, lefamulin or omadacycline.16

For most patients who are younger than 65 years of age, otherwise healthy, and have not recently received treatment with antibiotics, recent ATS–IDSA guidelines recommend one of the following oral medication options: amoxicillin (1 g three times daily), doxycycline (100 mg twice daily), or a macrolide (azithromycin at a dose of 500 mg on day 1, then 250 mg daily, or clarithromycin at a dose of 500 mg twice daily extended-release, 1000 mg daily). Macrolides should be used for 7 days and not be used in patients with a CURB-65 score of 0 or 1, or a short hospital stay or close observation can be provided for a patient with a score of 2, and hospitalization is recommended for a patient with a score of 3 to 5. Indications for ICU care are based on further criteria, including the use of mechanical ventilation and the presence of shock (Fig. 2). Severity score thresholds have not been defined for the treatment of patients who are immuno-compromised; thresholds for admission should be based on clinical judgment.12

Ambulatory Patients

Pulmonary dysfunction (e.g., persistent shortness of breath, hypoxemia)
Cardiovascular dysfunction (e.g., myocardial infarction, heart failure, stroke)
Musculoskeletal dysfunction (e.g., generalized weakness affecting activities of daily living)
Neurologic dysfunction (e.g., memory loss, confusion)
Dysfunction of other organs (e.g., kidney, lung)
Deterioration of coexisting conditions (e.g., chronic obstructive pulmonary disease, heart failure, diabetes, kidney disease)
Rehospitalization
Death (approximately 10 to 12% of patients 1 year after hospitalization for CAP)
Hospitalized Patients
The choice of the appropriate antibiotic agent for treatment of a patient who has been admitted to the hospital is based on the presence of risk factors for MRSA or pseudomonas (or both), as shown in Figure 4. In patients admitted to a general ward without risk factors for MRSA or pseudomonas, combination therapy with a beta-lactam plus a macrolide or doxycycline or monotherapy with a fluoroquinolone is recommended (see group 1 in Fig. 4). Although data from randomized trials are lacking, many observational studies have suggested that macrolide combination regimens are associated with better clinical outcomes in patients with severe community-acquired pneumonia, possibly owing to the immunomodulatory effects of macrolides.6,8,9 If risk factors for MRSA, pseudomonas, or other gram-negative pathogens not covered by the standard community-acquired pneumonia regimens outlined above are present, coverage should be expanded (see groups 2, 3, and 4 in Fig. 4).

Patients with severe community-acquired pneumonia who are admitted to the ICU are more likely to be at risk for resistant pathogens, including MRSA and pseudomonas.1,32,33 The establishment of an etiologic diagnosis is important in the treatment of these patients. Evidence to guide appropriate therapy in patients with severe community-acquired pneumonia is limited, but common practice is to administer anti-MRSA therapy and antipseudomonal therapy to patients in the ICU who have shock that is being treated with vasopressors or respiratory failure that necessitates mechanical ventilation, pending results of cultures and PCR tests (group 4 in Fig. 4).34 Therapies that modify the host response, such as dexamethasone, interleukin-6 inhibitors, and kinase inhibitors, have been established for patients with community-acquired pneumonia due to SARS-CoV-2 infection.25 The use of glucocorticoids in the treatment of other causes of community-acquired pneumonia is evolving, with recent evidence showing a benefit of survival among patients with severe community-acquired pneumonia (i.e., patients admitted to the ICU and who had received mechanical ventilation) and patients at high risk for respiratory failure who had been treated with hydrocortisone at a dose of 200 mg daily initially, followed by a taper.35 Glucocorticoid therapy should be avoided in patients with influenza or aspergillus pneumonia.

Figure 4. Empirical Therapy for Hospitalized Patients with CAP.

In the presence of severe CAP with respiratory failure necessitating mechanical ventilation or shock treated with vasopressors, initial therapy against methicillin-resistant Staphylococcus aureus (MRSA) and pseudomonas can be considered, pending assessment for risk factors and subsequent microbiologic test results. Strong risk factors for pseudomonas include known colonization or previous infection and gram-negative bacilli on Gram’s staining; weak risk factors include receipt of intravenous (IV) antibiotics in the previous 3 months, bronchiectasis, and frequent exacerbations of chronic obstructive pulmonary disease necessitating glucocorticoid therapy or antibiotic use. Strong risk factors for MRSA include known colonization or previous infection and gram-positive cocci in clusters on Gram’s staining; weak risk factors include receipt of IV antibiotics in the previous 3 months, recent influenza-like illness, cavitory infiltrate or empyema, and end-stage renal disease. In the presence of any strong risk factors, initiation of empirical therapy targeting MRSA or Pseudomonas aeruginosa is recommended. However, in patients with weak risk factors, the decision to initiate empirical therapy for multidrug-resistant pathogens should be based on clinical judgment and individual assessment. For patients in group 1 who are receiving care in the intensive care unit, combination therapy is recommended with a beta-lactam plus macrolide or a beta-lactam plus fluoroquinolone. The selection of an antipseudomonal antibiotic should be made on the basis of the susceptibilities of previous isolates or hospital antibiograms (or both), if available. Empirical therapy with two agents may be needed if the local prevalence of drug-resistant strains is high or in patients with a history of multidrug-resistant infection. The combination of piperacillin–tazobactam and vancomycin has been associated with acute kidney injury; we generally avoid this combination if possible. Recommended therapies and doses for patients with normal renal function are ampicillin–sulbactam (3 g IV every 6 hours), ceftriaxone (1 to 2 g IV daily), cefotaxime (1 to 2 g IV every 8 hours), azithromycin (500 mg IV orally or IV daily), clarithromycin (500 mg twice daily) or clarithromycin XL (two 500-mg tablets once daily), doxycycline (100 mg orally or IV twice daily), levofloxacin (750 mg IV or orally daily), moxifloxacin (400 mg IV or orally daily), omadacycline (200 mg IV loading dose on day 1 followed by 100 mg IV daily, or 300 mg orally twice daily on day 1 then 300 mg daily), leflunomide (150 mg IV every 12 hours or 600 mg orally every 12 hours), vancomycin (25 to 35 mg per kilogram of body weight IV every 8 to 12 hours or a loading dose of 20 to 35 mg per kilogram IV not to exceed 3000 mg for severe CAP; subsequent dose amounts should be based on area-under-the-curve values), linezolid (600 mg IV or orally twice daily), piperacillin–tazobactam (4.5 g IV every 6 hours), cefepime (2 g IV every 8 hours), cefazidime (2 g IV every 8 hours), imipenem (500 mg IV every 6 hours), and meropenem (1 g IV every 8 hours).

Clinical Findings

- Evidence of clinical deterioration 24–48 hr after admission
- Continue therapy for bacterial CAP
- Discontinuation of antibiotic therapy for bacterial CAP

Viral CAP without evidence of bacterial coinfection

Discontinuation of antibiotic therapy for bacterial CAP

Shunt therapy with a fluoroquinolone is recommended for patients with severe CAP and bacterial coinfection, such as bacterial meningitis or sinusitis.35 Sources of infection include the lower respiratory tract, sinuses, and cranial cavity. Additional sources may include local skin or soft-tissue infections, as well as medical devices or indwelling catheters.35 Pathogens that are more likely to cause coinfection include Gram-negative bacilli, atypical organisms (i.e., Chlamydia, Mycoplasma), and fungi such as Candida.35

Figure 5. Discontinuation of Antibacterial Therapy in Viral Pneumonia without Evidence of Bacterial Coinfection.

CRP denotes C-reactive protein, PCR polymerase chain reaction, and PCT procalcitonin.
DE-ESCALATION OF ANTIMICROBIAL THERAPY

If the etiologic cause of community-acquired pneumonia has been identified by means of reliable microbiologic methods and there is no laboratory or epidemiologic evidence of coinfection, treatment regimens should be simplified and directed toward that pathogen.6,17,18 If a causative pathogen is not identified, empirical treatment should be provided until diagnostic tests are available. When a screening nasal swab for MRSA is negative, empirical anti-MRSA therapy can usually be discontinued.

In patients who view the community-acquired pneumonia is suspected owing to the identification of a virus (including SARS-CoV-2) by means of a molecular test and in whom there is no evidence of concurrent bacterial infection or clinical deterioration, antibacterial treatment can be discontinued (Fig. 5). Most patients have some clinical improvement within 48 to 72 hours after the start of antibacterial treatment. Intravenous antibiotic regimens can be transitioned to oral regimens with a similar spectrum activity as the patient’s condition improves.19,20

DURATION OF TREATMENT

Typically, patients continue to receive treatment until they have been afebrile and in a clinically stable condition for at least 48 hours. Treatment should usually continue for a minimum of 5 days; however, 3 days may be an adequate treatment duration for certain patients whose condition is completely stable.8,21 Extended courses of therapy may be required in patients with immunocompromising conditions, infections caused by certain pathogens (eg, P. aeruginosa), or complications such as sepsis. Serial procalcitonin thresholds as an adjunct to clinical judgment may help guide the discontinuation of antibiotic therapy.22,23

HOSPITAL DISCHARGE AND FOLLOW-UP

Hospital discharge is appropriate when the patient is in a clinically stable condition, is able to take oral medication, and has a safe environment for continued care; overnight observation after discharge should not be necessary. Early discharge based on clinical stability and criteria for the switch to oral therapy is encouraging to reduce unnecessary hospital costs and risks associated with hospitalization.

Communication and coordination with the patient’s primary care clinician for early outpatient follow-up is encouraged to reduce the likelihood of readmission to the hospital.4,24 A follow-up chest radiograph is indicated in only a minority of patients, such as those at risk for lung cancer on the basis of smoking history, history of persistent symptoms.14,14

PREVENTION

Smoking and excessive alcohol consumption should be addressed. In addition, vaccines against influenza, Covid-19, and Streptococcus pneumoniae should be administered according to current Advisory Committee on Immunization Practices recommendations.46

GUIDELINES

The recommendations we describe align with the most recent ATS–IDSA guidelines.1 We agree with the recommendation that the addition of anaerobic coverage for suspected aspiration pneumonia should not be routine practice unless there is evidence of a lung abscess or empyema. The current guidelines were published before the Covid-19 pandemic and suggest selective microbiologic testing. For new approaches to a comprehensive approach to microbiologic testing for all hospitalized patients with community-acquired pneumonia, including testing for SARS-CoV-2 infection.

AREAS OF UNCERTAINTY

The role of the lung microbiome in community-acquired pneumonia is an area of ongoing research.4 Further understanding of the lung microbiome may provide information regarding the diagnostic response and susceptibility to specific pathogens. Microbiologic diagnosis with the use of rapid multiplexed molecular platforms is a swiftly advancing technology.24 Further studies are needed to determine the clinical effect and cost-benefit ratio of these rapid molecular tests. Although ATS–IDSA guidelines recommend monotherapy with amoxicillin as a first-line treatment for ambulatory patients at low risk, we often add a macrolide that targets atypical pathogens, since such patients are relatively common and not readily identified in low-risk patients, and treating such patients may hasten recovery. There is an observed association between community-acquired pneumonia and an increased risk of cardiovascular disease.19,25 Further studies are needed to gain a better understanding of this relationship and to develop interventions aimed at reducing cardiovascular risk as well as the risk of other sequelae of community-acquired pneumonia.

CONCLUSIONS AND RECOMMENDATIONS

The patient described in the vignette was clinically stable, had a CURB-65 score of 2, and had evidence of a viral pathogen identified. We would be concerned about secondary bacterial infection, particularly given the elevated procalcitonin level. In the absence of known risk factors for MRSA or pneumomomas, we would initiate treatment aimed at reducing cardiovascular risk as well as the risk of other sequelae of community-acquired pneumonia.

REFERENCES


18. Schuetz P, Wirz Y, Sager R, et al. Procalcitonin for ambulatory patients at low risk, and treating such patients may hasten recovery. There is an observed association between community-acquired pneumonia and an increased risk of cardiovascular disease.19,25 Further studies are needed to gain a better understanding of this relationship and to develop interventions aimed at reducing cardiovascular risk as well as the risk of other sequelae of community-acquired pneumonia.


27. Eaton ML, Aitken DH, Bean DW. Antibiotics for bacterial pneumo-


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GLOBA L SPOTLIGHT: The Medical AI Forum Elevates Suzhou’s Entrepreneurship Week, aiming to Boost Biopharma and Attract Global Healthcare Talent

On July 11, 2023, the Medical AI Forum took center stage at the 15th Suzhou International Elite Entrepreneurship Week and Suzhou Scientist Day. The forum attracted distinguished scholars and industry leaders from around the world to gather in Suzhou to discuss the cutting-edge applications and potential impacts of artificial intelligence in the medical field.

With a global emphasis, the forum convened numerous industry insiders. The speakers and panelists were from College of Future Technology Peking University, University of California, San Francisco, Macou University of Science and Technology School of Medicine, SING Digital Health, Insilico Medicine, and Global Health Education Foundation. Experts delved deep into medical AI's direction, sharing their insightful views on development and research topics.

In his keynote speech, Dr. Louis Paseck emphasized the potential of using AI to analyze vast amounts of genetic data related to sleep disorders. This approach promises to significantly advance our understanding of sleep research, offering new insights and implications. Professor Kang Zhang and Dr. Alex Zhavoronkov reviewed new directions in AI application in medical care and drug research. Dr. Charlotte Haug emphasized that for AI tools to gain acceptance, clinical trials must demonstrate their benefits for patients, health professionals, and the broader healthcare system.

Upholding the philosophy of cross-disciplinary and cross-industry integration, the forum sought to play a crucial role in advancing a shared vision for humanity, by spearheading the transformation of global medical services and by leveraging AI to enhance healthcare quality for all.

The forum showcased Suzhou’s biopharmaceutical achievements and dedication, while also aiming to attract global healthcare and pharmaceutical talent to enhance human well-being.

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