COMPLIMENTARY WEBINAR

# Know the Pneumonia: Urinary Antigen Testing in Patient Care

Thursday, November 9, 2023
1:00 PM – 2:00 PM ET


**JANET E. STOUT, PHD**

Executive V.P. and Founder
Special Pathogens Laboratory
Pittsburgh, PA



**NORMAN MOORE, PHD**

Director, Medical Affairs
Infectious Diseases, North America
Abbott
Scarborough, ME


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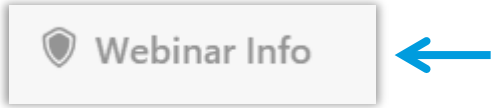


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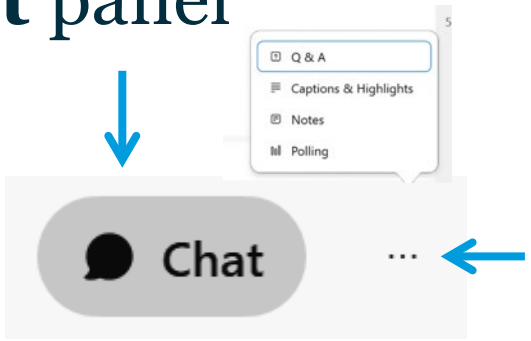


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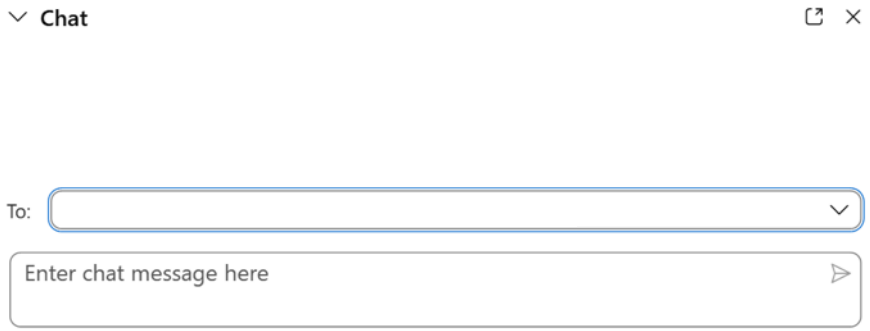


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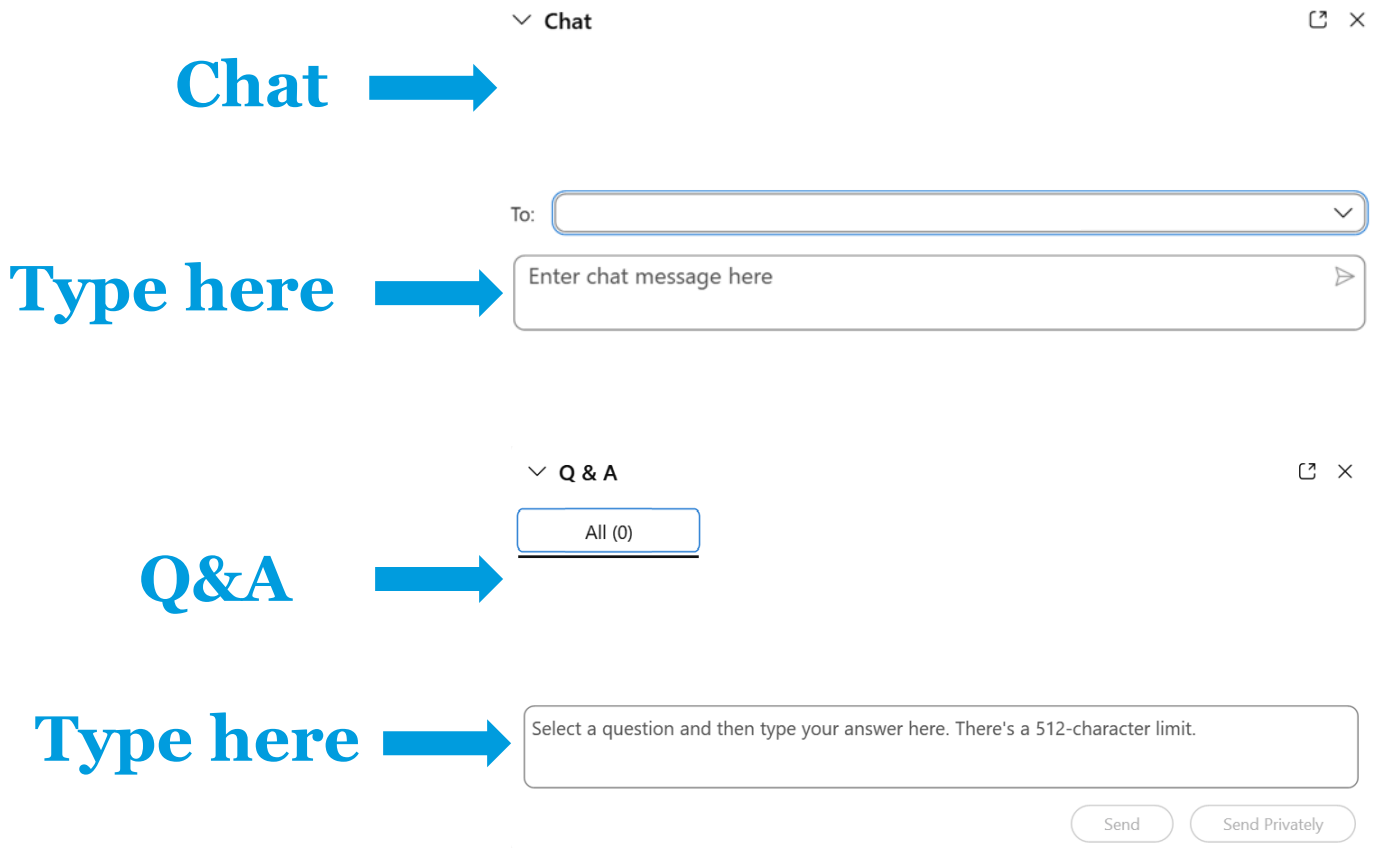

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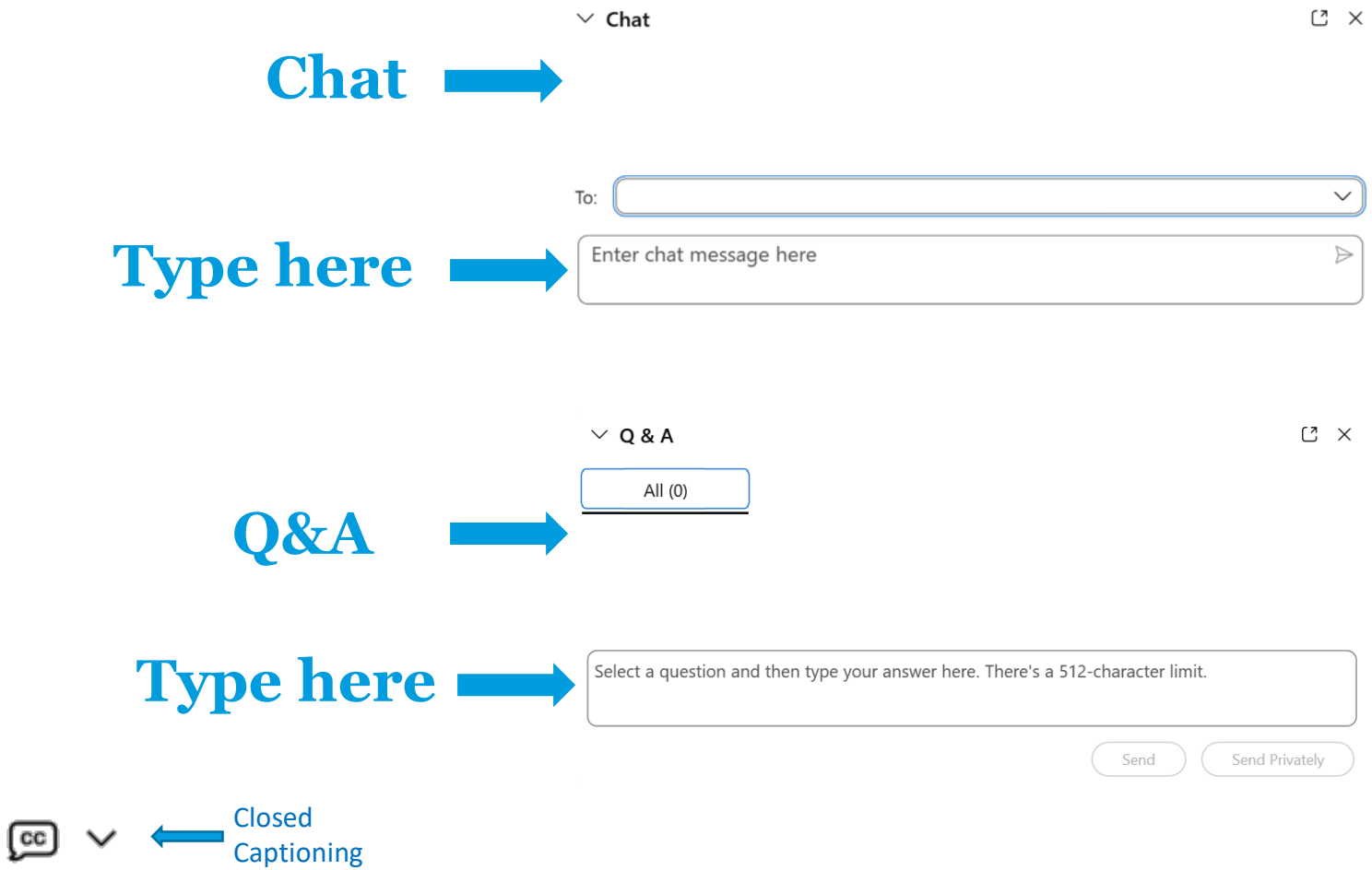

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  Forward email to colleagues who attended with you!!!
- Double-check email address

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Within a few days following today's event, visit

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## Know the Pneumonia: Urinary Antigen Testing in Patient Care

**Live Event: Thursday, November 9, 2023 | 1:00 - 2:00 PM Eastern Time**
**P.A.C.E.® credit available until November 9, 2024**
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RECORDING

SLIDES

Join this session for insights on improving the quality of care of patients with pneumonia. Experts will discuss the impact of this deadly infection and current gaps in identifying *Legionella* and *Streptococcus (S.) pneumoniae*. Practical applications of integrating urinary antigen testing (UAT) in patient scenarios will be explored, including an evidence-based review of mortality and antibiotic stewardship improvements achieved with UAT.

**The webinar will:**

- Evaluate the impact of pneumonia and risks for severe illness
- Examine gaps and potential delays in the diagnosis of pneumonia and quality measures to enhance patient care
- Review the identification of *Legionella* and *S. pneumoniae* with UAT
- Discuss practical examples where UAT testing supported improved patient outcomes through timely identification

**Presenter:**

**Janet E. Stout, PhD**

**Executive V.P. and Founder**
**Special Pathogens Laboratory**
**Pittsburgh, PA**

**Moderator/Speaker:**

**Norman Moore, PhD**

**Director, Infectious Diseases,**
**Medical Affairs, Rapid Diagnostics**
**Abbott**
**Scarborough, ME**

MODERATOR AND SPEAKER

## NORMAN MOORE, PHD

Director, Infectious Diseases
Scientific Affairs
Rapid Diagnostics, Abbott

# Disclosures

Employed by and speaking on behalf of Abbott

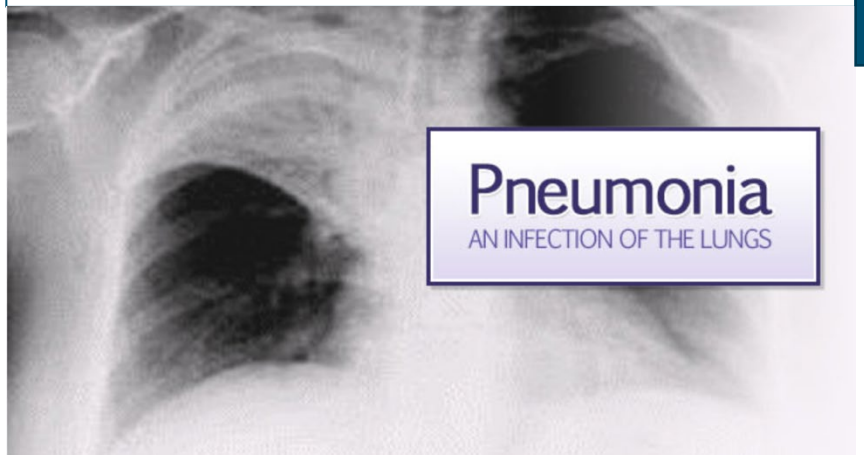
# Objectives

- Evaluate the impact of pneumonia and risks for severe illness
- Examine gaps and potential delays in the diagnosis of pneumonia and quality measures to enhance patient care
- Review the identification of *Legionella* and *S. pneumoniae* with UAT
- Discuss practical examples where UAT testing supported improved patient outcomes through timely identification

# Background on Urinary Antigen Testing

# What was the need for Urinary Antigen Testing?

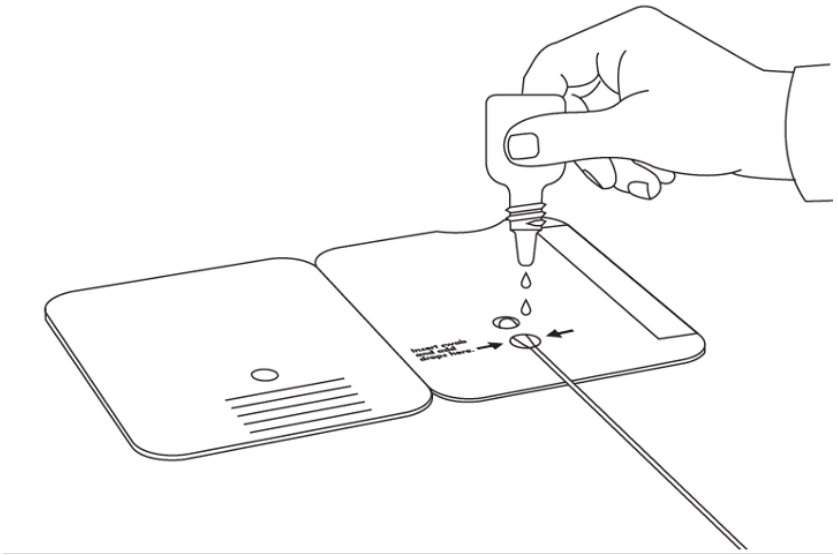
- High mortality
- No practical or timely detection method
  - Blood culture
  - X-ray
- Poor sputum specimen

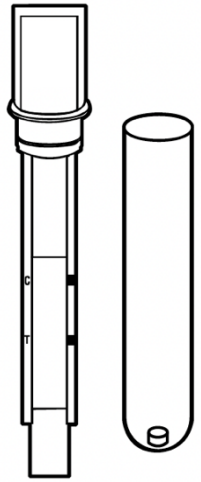


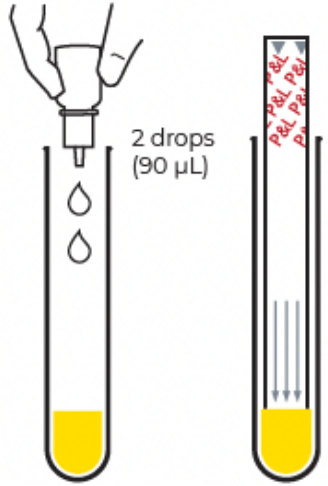

- Urinary Antigen Test technology developed to diagnose *Legionella*
- Urine provided ease of collection and faster detection
- Associated with reduction in *Legionella* mortality[1]
- Catalyst for development of UAT for *S. pneumoniae* detection

1. Benin AL, et al. Trends in Legionnaires Disease, 1980–1998: Declining Mortality and New Patterns of Diagnosis. Clinical Infect Dis. 2002; 35:1039–46.

# Examples of Urinary Antigen Testing








https://www.globalpointofcare.abbott/us/en/product-details/binaxnow-streptococcus-pneumoniae-us.html
https://www.meridianbioscience.com/diagnostics/disease-areas/respiratory/legionella/tru-legionella/?country=US
https://immuview.com/products/immuview-s-pneumoniae-and-legionella/

## JANET E. STOUT, PHD

Executive V.P. and Founder
Special Pathogens Laboratory
Pittsburgh, PA

# Update on Legionellosis: A Not So Atypical Pneumonia

**Janet E. Stout, PhD**
**President, Special Pathogens Technology**
**Founder, Special Pathogens Laboratory**

# Disclaimers

- Abbott is the program sponsor, the content of the presentation is consistent with applicable governing regulatory body requirements, and I was chosen by Abbott and am presenting the program material on Abbott's behalf.
- No conflicts of interest to disclose

# Infectious Disease Microbiologist


- Microbiologist with more than 30 years studying Legionnaires' disease

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  - I'm a Legionellologist

# Infectious Disease Microbiologist


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  - I'm a Legionellologist
- Mission: What I've learned can help you address risks from *Legionella*

# Objectives

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- What is Legionnaires' disease? It's pneumonia and more
- Why is Legionnaires' disease under-reported?
- Making the diagnosis of Legionnaires' disease
- Knowing what's in your water can inform diagnostic testing
- Some tricks of the trade

# What Is Legionellosis?

| | |
|---|---|
| Legionnaires' disease (LD) | is a multi-system illness, with pneumonia, caused by *Legionella* species |

# What Is Legionellosis?

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|---|---|
| Legionnaires' disease (LD) | is a multi-system illness, with pneumonia, caused by *Legionella* species |
| Pontiac fever | is a self-limited flu-like illness, without pneumonia, that is associated with *Legionella* species ... Resolves without treatment |

# Council of State and Territorial Epidemiologists (CSTE)

Adopted in June 2019 and put into effect January 1, 2020

## Addition - Extrapulmonary Legionellosis

- Disease at sites outside of lung (endocarditis, wound infection, joint infection)
- Now three clinically and epidemiologically distinct forms of Legionellosis.

# What Are Epidemiologic Risk Factors for Legionnaires' Disease?

- Recent travel with an overnight stay outside of the home
- Exposure to whirlpool spas and hot tubs
- Recent repairs or maintenance work on domestic plumbing
- Renal or hepatic failure
- Diabetes
- Systemic malignancy
- Smoking
- Immune system disorders
- Aged more than 50 years old

CDC. Legionella (Legionnaires' Disease and Pontiac Fever). https://www.cdc.gov/legionella/clinicians/disease-specifics.html, March 25, 2021.

# Resources

## CDC


**Sources:** US Centers for Disease Control and Prevention. *Legionella* (Legionnaires' Disease and Pontiac Fever): Disease Specifics. (Reviewed: Mar 25, 2021.) Accessed Jul 23, 2023. https://www.cdc.gov/legionella/clinicians/disease-specifics.html

US Centers for Disease Control and Prevention. *Legionella* (Legionnaires' Disease and Pontiac Fever): Diagnosis, Treatment & Prevention. (Reviewed: Mar 25, 2021.) Accessed Jul 23, 2023. https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html

Viasus D, Gaia V, Manzur-Barbur C, Carratalà J. Legionnaires' Disease: Update on Diagnosis and Treatment. Infect Dis Ther. 2022 Jun;11(3):973-986. doi: 10.1007/s40121-022-00635-7. Epub 2022 May 3. PMID: 35505000; PMCID: PMC9124264.

# Clinical Notes

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Anti-tumor necrosis factor (TNF)-alpha treatment

# Legionnaires' Disease

In the U.S. approximately 1 million adults are diagnosed with community-acquired pneumonia requiring hospitalization annually

Ramirez JA, Wiemken TL, Peyrani P, Arnold FW, Kelley R, Mattingly WA, Nakamatsu R, Pena S, Guinn BE, Furmanek SP, Persaud AK, Raghuram A, Fernandez F, Beavin L, Bosson R, Fernandez-Botran R, Cavallazzi R, Bordon J, Valdivieso C, Schulte J, Carrico RM; University of Louisville Pneumonia Study Group. Adults Hospitalized With Pneumonia in the United States: Incidence, Epidemiology, and Mortality. Clin Infect Dis. 2017 Nov 13;65(11):1806-1812. doi: 10.1093/cid/cix647. PMID: 29020164.

# Legionnaires' Disease

In the U.S. approximately 1 million adults are diagnosed with community-acquired pneumonia requiring hospitalization annually

2 – 5% are caused by *Legionella*,
at least 30,000 cases/year (minimum)

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# *Legionella* and Healthcare Costs

## Estimate of Burden and Direct Healthcare Cost of Infectious Waterborne Disease in the United States

Sarah A. Collier, Li Deng, Elizabeth A. Adam, Katharine M. Benedict, Elizabeth M. Beshearse, Anna J. Blackstock, Beau B. Bruce, Gordana Derado, Chris Edens, Kathleen E. Fullerton, Julia W. Gargano, Aimee L. Geissler, Aron J. Hall, Arie H. Havelaar, Vincent R. Hill, Robert M. Hoekstra, Sujan C. Reddy, Elaine Scallan, Erin K. Stokes, Jonathan S. Yoder, Michael J. Beach

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 27, No. 1, January 2021

# Results

- 7.15 million waterborne illnesses occur annually
- 6,630 deaths
- $3.33 billion in direct healthcare costs
- $2.39 billion (72%) of those costs due to hospitalizations and deaths from:
  - Nontuberculous mycobacteria, *Pseudomonas* and *Legionella*

# *Legionella* and Disease Burden

## Estimating Waterborne Infectious Disease Burden by Exposure Route, United States, 2014

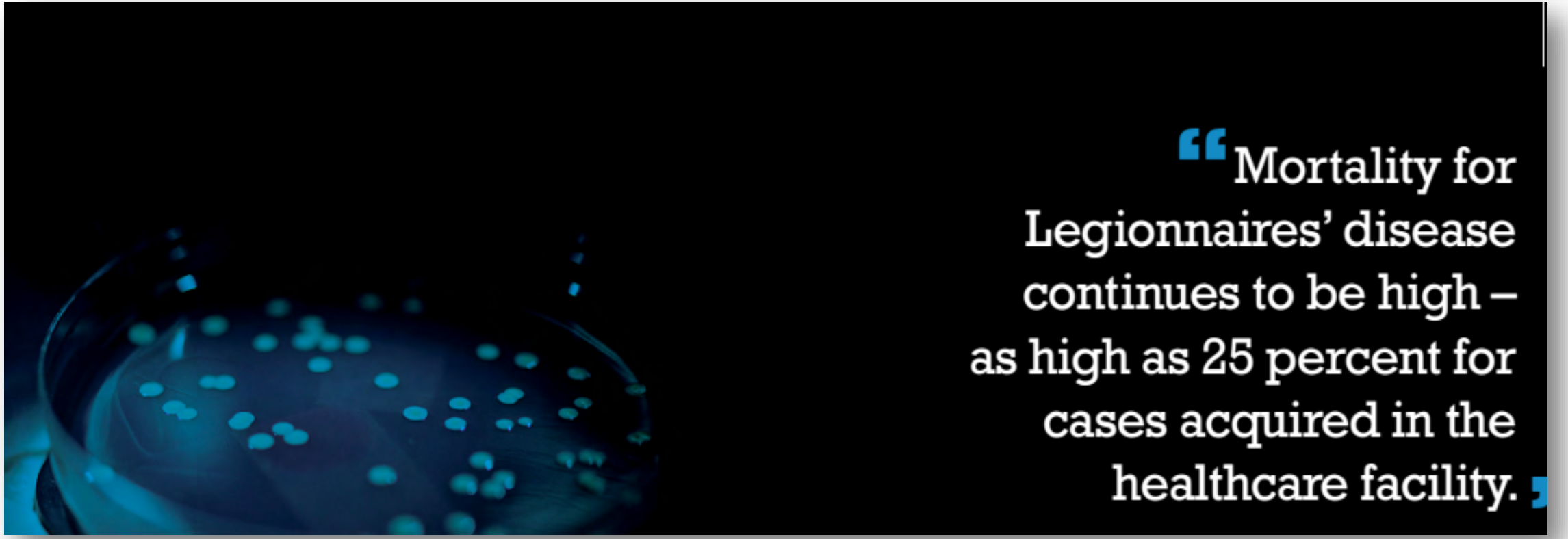
Megan E. Gerdes,[1] Shanna Miko,[1] Jasen M. Kunz, Elizabeth J. Hannapel, Michele C. Hlavsa, Michael J. Hughes, Matthew J. Stuckey, Louise K. Francois Watkins, Jennifer R. Cope, Jonathan S. Yoder, Vincent R. Hill, Sarah A. Collier

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 29, No. 7, July 2023

# *Legionella* A Major Contribution

- Waterborne infection types accounted for 72% of $3.33 billion total costs
  - Legionnaires' disease for 12%
  - Pseudomonas pneumonia for 14%
  - NTM infection was responsible for 46%

# Mortality and Healthcare-Acquired Legionnaires' Disease




Pierre DM, Baron J, Yu VL, Stout JE. Diagnostic testing for Legionnaires' disease. Ann Clin Microbiol Antimicrob. 2017 Aug 29;16(1):59. doi: 10.1186/s12941-017-0229-6. PMID: 28851372; PMCID: PMC5576257.

# Diagnosis of Legionnaires' Disease

- Adopt a proactive approach to diagnosis of pneumonias and anticipate the possibility of Legionnaires' disease.

Pierre *et al. Ann Clin Microbiol Antimicrob (2017) 16:59*
DOI 10.1186/s12941-017-0229-6

Annals of Clinical Microbiology and Antimicrobials

REVIEW Open Access

## Diagnostic testing for Legionnaires' disease

David M. Pierre[1], Julianne Baron[1,2], Victor L. Yu[1,3*] and Janet E. Stout[1,2]

# Something To Remember

Early Diagnosis = Better Outcome

Delayed diagnosis = Increased Mortality

# Delayed Diagnosis = Delayed Therapy



Eur. J. Clin. Microbiol. Infect. Dis., 1996, 15: 286–290

## Delay in Appropriate Therapy of *Legionella* Pneumonia Associated with Increased Mortality

C.H. Heath[1,2*], D.I. Grove[1], D.F.M. Looke[1,3]

# Early Diagnosis With UAT = Better Outcome

RESEARCH

## Legionnaires' Disease Outbreak in Murcia, Spain

Ana García-Fulgueiras,* Carmen Navarro,* Daniel Fenoll,† José García,* Paulino González-Diego,* Teresa Jiménez-Buñuales,* Miguel Rodriguez,* Rosa Lopez,* Francisco Pacheco,* Joaquín Ruiz,‡ Manuel Segovia,§ Beatriz Baladrón,¶ and Carmen Pelaz¶

Emerging Infectious Diseases • Vol. 9, No. 8, August 2003 915

# Murcia, Spain Very Low Case-Fatality

- 449 confirmed cases and an estimated total number of cases of 650.
- The reported case-fatality rate (1%) is much lower than those observed in other community outbreaks

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- 449 confirmed cases and an estimated total number of cases of 650.
- The reported case-fatality rate (1%) is much lower than those observed in other community outbreaks
- This rate can be attributed, at least partially, to the quick detection of the outbreak, early diagnosis of the disease with urine antigen testing, and appropriate treatment of patients.

# Something To Remember

*Legionella* is the problem
you don't think you have until you have it

Be Proactive!

# Diagnosis: Many Cases Missed

Diagnostic tests for *Legionella* not routine – often not done

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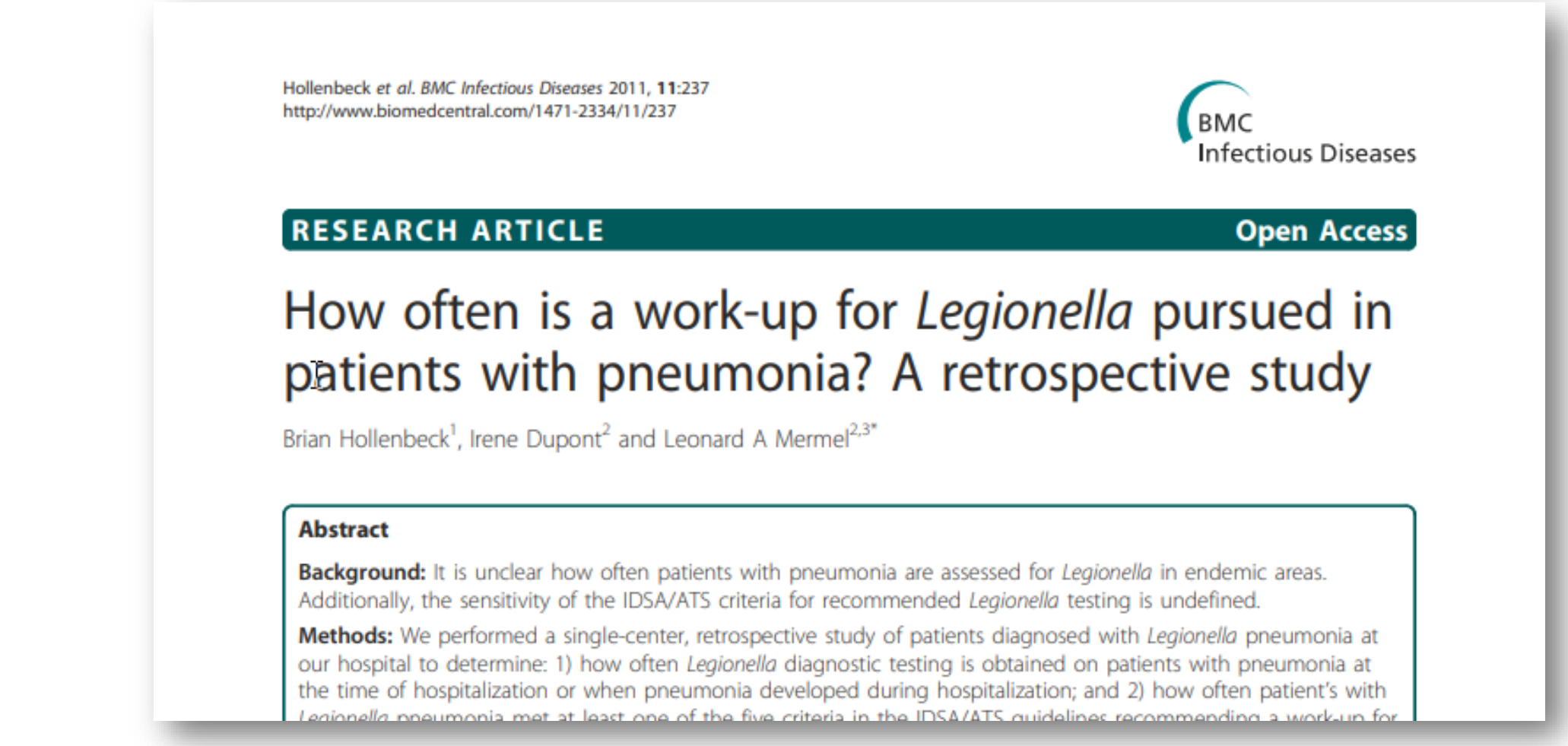
Diagnostic tests for *Legionella* not routine – often not done

Many studies have demonstrated under reporting/missed diagnosis

# Under Reporting Due to Missed Diagnosis



Hollenbeck *et al. BMC Infectious Diseases* 2011, **11**:237
http://www.biomedcentral.com/1471-2334/11/237

BMC
Infectious Diseases

RESEARCH ARTICLE Open Access

## How often is a work-up for *Legionella* pursued in patients with pneumonia? A retrospective study

Brian Hollenbeck[1], Irene Dupont[2] and Leonard A Mermel[2,3*]

**Abstract**

**Background:** It is unclear how often patients with pneumonia are assessed for *Legionella* in endemic areas. Additionally, the sensitivity of the IDSA/ATS criteria for recommended *Legionella* testing is undefined.

**Methods:** We performed a single-center, retrospective study of patients diagnosed with *Legionella* pneumonia at our hospital to determine: 1) how often *Legionella* diagnostic testing is obtained on patients with pneumonia at the time of hospitalization or when pneumonia developed during hospitalization; and 2) how often patient's with *Legionella* pneumonia met at least one of the five criteria in the IDSA/ATS guidelines recommending a work-up for

# Results for 37 Cases

41% of *Legionella* cases were missed when following current IDSA-ATS recommendations for *Legionella* testing

IDSA – Infectious Disease Society of America
ATS – American Thoracic Society

Hollenbeck, B., Dupont, I., & Mermel, L. A. (2011).

# Clinical Cultures

Providers should be educated to maintain a high index of suspicion for diagnosis of healthcare-associated Legionellosis

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Providers should be educated to maintain a high index of suspicion for diagnosis of healthcare-associated Legionellosis

Should perform cultures for *Legionella* of appropriate respiratory specimen **and** urinary antigen test

# Legionella Urinary Antigen Tests (UAT)

## Enzyme Immunoassay (EIA)


## Immunochromatographic Test (ICT)


https://www.globalpointofcare.abbott/us/en/product-details/binaxnow-legionella-urinary-antigen-eia.html
https://www.globalpointofcare.abbott/us/en/product-details/binaxnow-legionella-us.html
https://www.meridianbioscience.com/diagnostics/disease-areas/respiratory/legionella/tru-legionella/
https://immuview.com

# Diagnostic Methods: UAT Rules!

Urine antigen tests (UAT) confirmed 97% of U.S. cases

CDC. (2011). Legionellosis --- United States, 2000--2009. *(MMWR) (32nd ed., Vol. 60; 1083-1086)*.

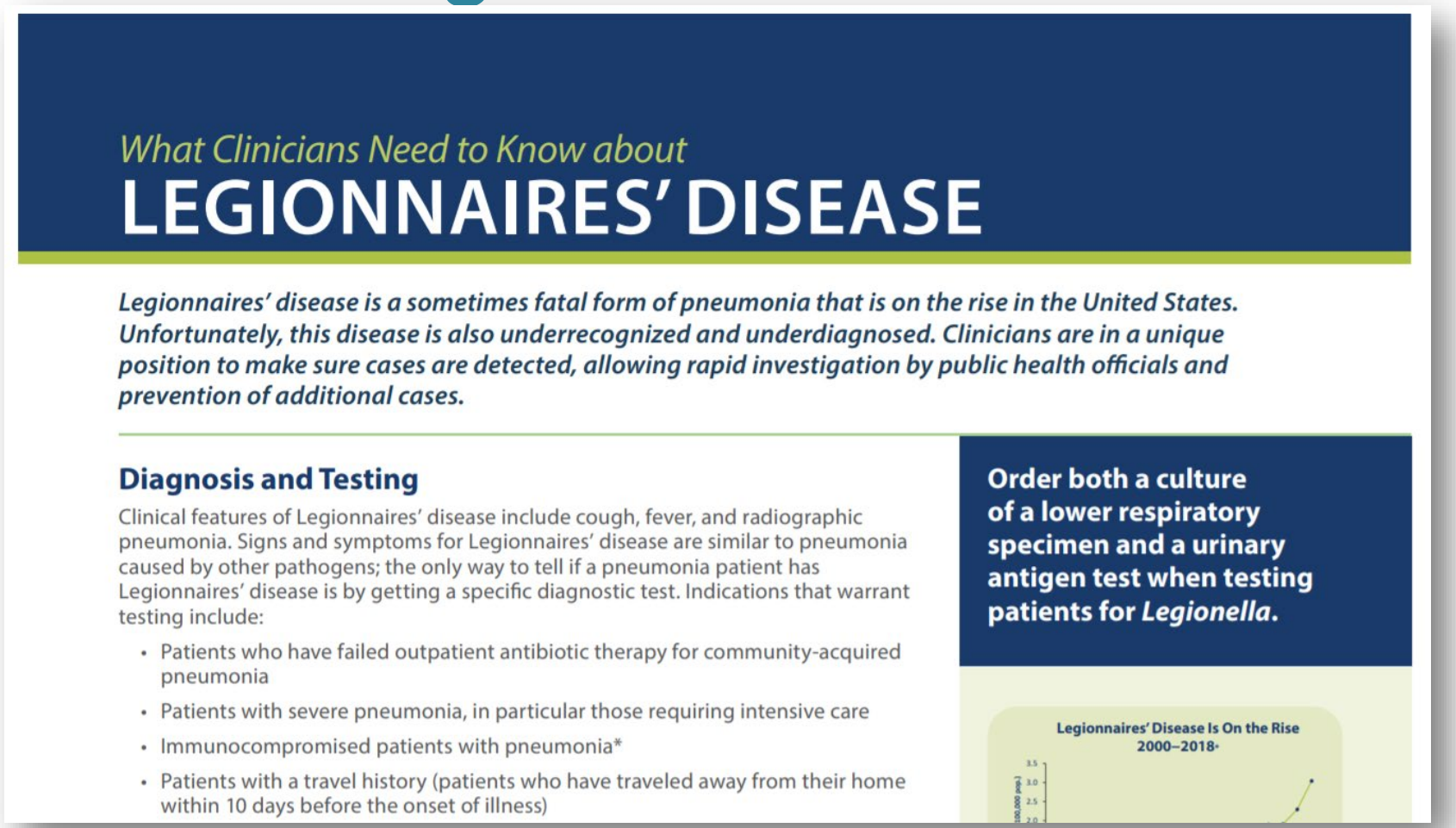
# Diagnostic Methods: UAT Rules!

Urine antigen tests (UAT) confirmed 97% of U.S. cases

Less than 10% of cases confirmed by culture – mostly because culture was not ordered

https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf

# Physicians Should Order Both Culture and Urine Antigen!



*What Clinicians Need to Know about*

## LEGIONNAIRES' DISEASE

***Legionnaires' disease is a sometimes fatal form of pneumonia that is on the rise in the United States. Unfortunately, this disease is also underrecognized and underdiagnosed. Clinicians are in a unique position to make sure cases are detected, allowing rapid investigation by public health officials and prevention of additional cases.***

### Diagnosis and Testing

Clinical features of Legionnaires' disease include cough, fever, and radiographic pneumonia. Signs and symptoms for Legionnaires' disease are similar to pneumonia caused by other pathogens; the only way to tell if a pneumonia patient has Legionnaires' disease is by getting a specific diagnostic test. Indications that warrant testing include:

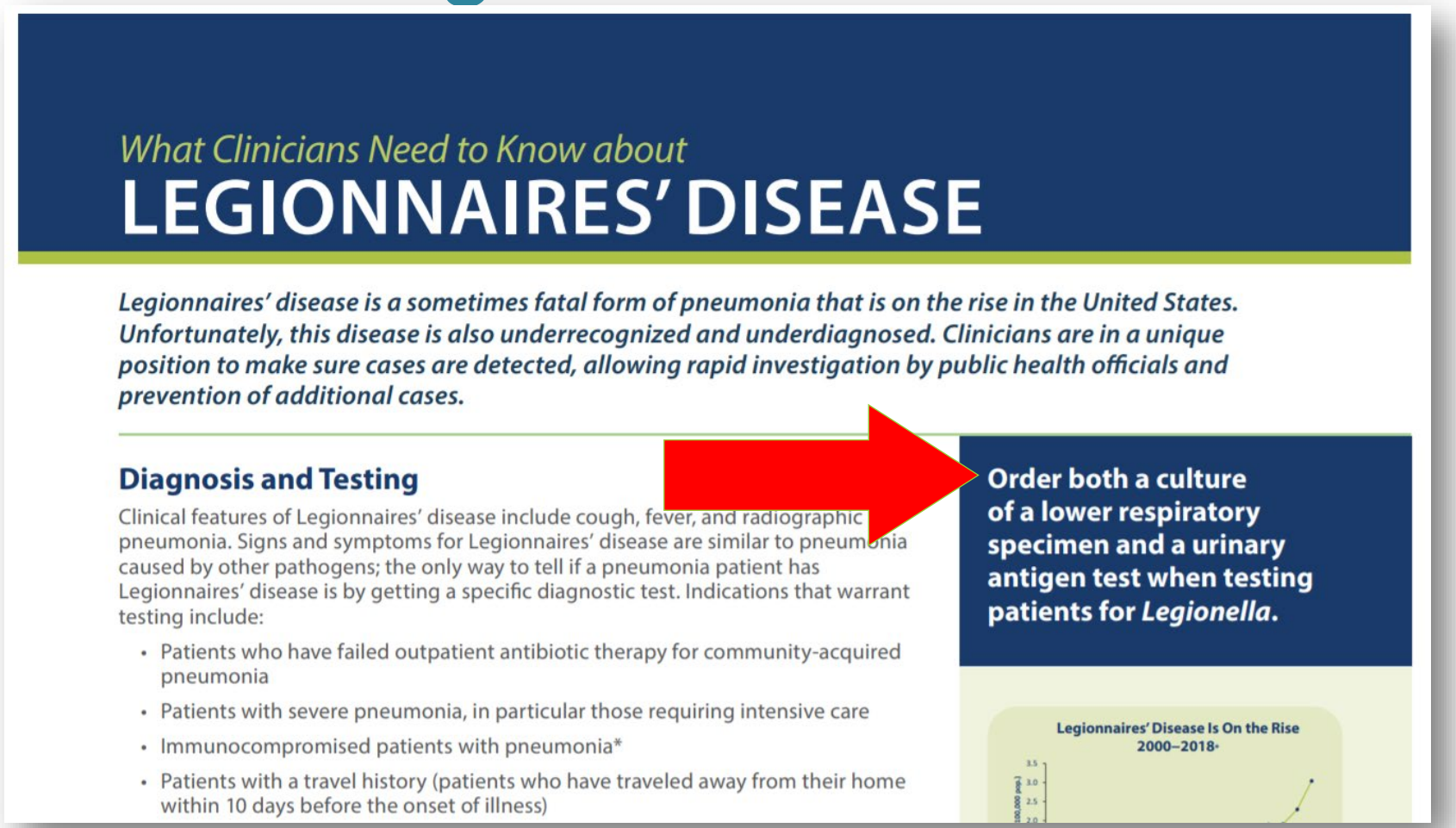
- Patients who have failed outpatient antibiotic therapy for community-acquired pneumonia
- Patients with severe pneumonia, in particular those requiring intensive care
- Immunocompromised patients with pneumonia*
- Patients with a travel history (patients who have traveled away from their home within 10 days before the onset of illness)

**Order both a culture of a lower respiratory specimen and a urinary antigen test when testing patients for *Legionella*.**



https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf

# Physicians Should Order Both Culture and Urine Antigen!



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https://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf

# Sensitivity and Specificity of Diagnostic Tests

Sensitivity varies depending on the quality and timing of clinical specimen collection, as well as technical skill of the laboratory worker performing the test. The table below provides general ranges for the sensitivity and specificity of each diagnostic test.

| Test | Sensitivity (%) | Specificity (%) |
|---|---|---|
| Culture | 20–80 | 100 |
| Urinary antigen for *L. pneumophila* serogroup[1] (Lp1) | 70–100 | 95–100 |
| Polymerase Chain Reaction (PCR)[2] | 95–99 | >99 |
| Direct Fluorescent Antibody (DFA) Stain | 25–75 | >95 |
| Paired serology[3] | 80–90 | >99 |

[1] Cross reactions with other species and serogroups have been documented.

[2]Avni T, Bieber A, Green H, et al. Diagnostic accuracy of PCR alone and compared to urinary antigen testing for detection of *Legionella* spp.: A

https://www.cdc.gov/legionella/clinicians/diagnostic-testing.html

# Urine Antigen Sensitivity/Specificity

| | |
|---|---|
| Duration | Excretion can be long (weeks and sometimes months in immuno-compromised) |

Pierre DM, Baron J, Yu VL, Stout JE. Diagnostic testing for Legionnaires' disease. Ann Clin Microbiol Antimicrob. 2017 Aug 29;16(1):59.

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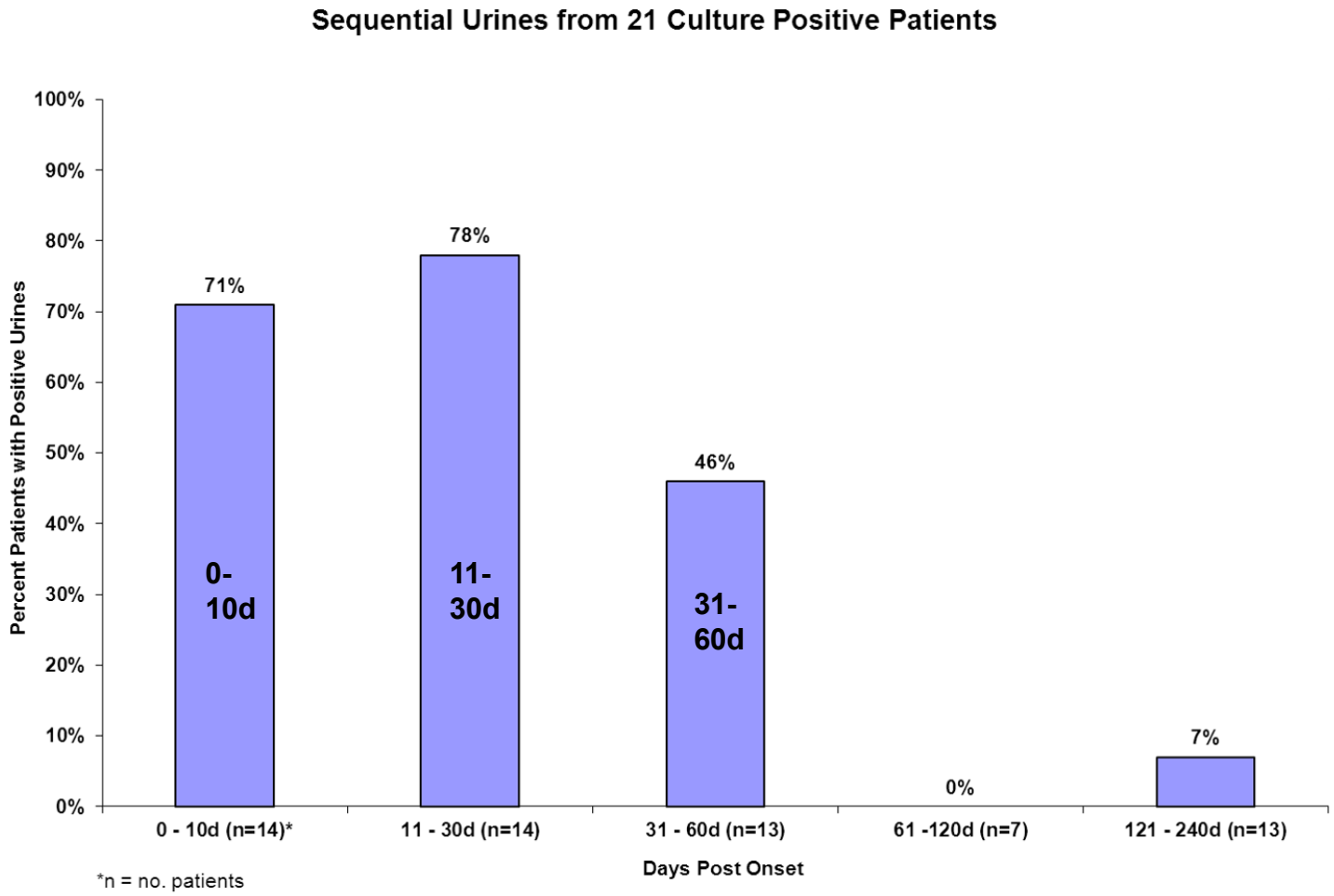
# Urine Antigen Sensitivity/Specificity

| | |
|---|---|
| Duration | Excretion can be long (weeks and sometimes months in immuno-compromised) |
| False negative results | In confirmed cases |
| False positive results | Non-specific binding in EIA format |
| | Proteins in urine |

Pierre DM, Baron J, Yu VL, Stout JE. Diagnostic testing for Legionnaires' disease. Ann Clin Microbiol Antimicrob. 2017 Aug 29;16(1):59.

# Early Detection And Duration of Urine Antigen Positivity




Stout - Personal communication

# Why Combine Urine Antigen With Culture?

Urine antigen specific for
*Legionella pneumophila* (Lp), serogroup 1 only

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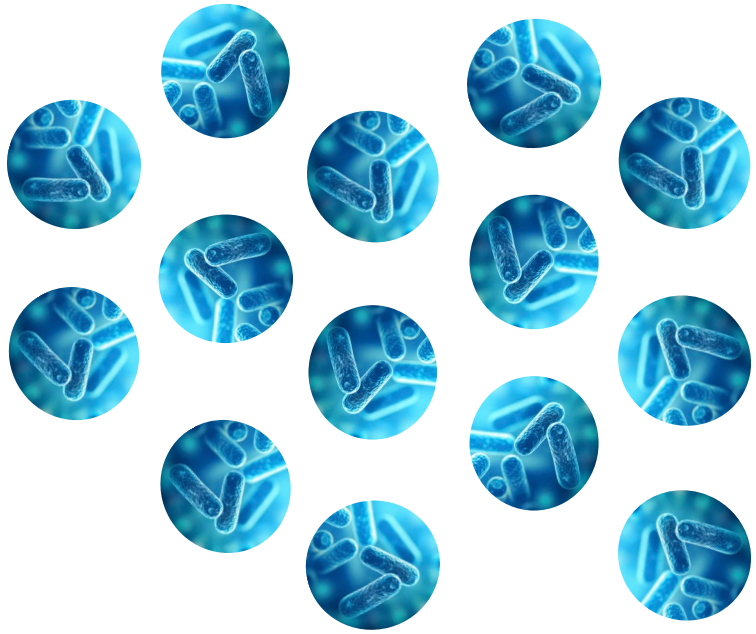
# Why Combine Urine Antigen With Culture?

Urine antigen specific for *Legionella pneumophila* (Lp), serogroup 1 only

Legionnaires' disease has been caused by other serogroups and species of *Legionella*

CDC. (2011). Legionellosis --- United States, 2000--2009. *(MMWR) (32nd ed., Vol. 60; 1083-1086)*.

# *Legionella pneumophila*, serogroup 1: Most virulent and cause of most infections



# Know What's In Your Water

The urine antigen test can help detect cases of healthcare-acquired Legionnaires' disease

If used to screen for healthcare-acquired LD, you'd better know what's in your water!

- If Lp-6 in the water, diagnosis will be missed

CDC. (2011). Legionellosis --- United States, 2000--2009. *(MMWR) (32nd ed., Vol. 60; 1083-1086)*.

# Tips

- Create an electronic ward order to prompt physicians to order both *Legionella* urine antigen and culture.

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- Do not discard sputum if epithelial cells present

# Tips

- Create an electronic ward order to prompt physicians to order both *Legionella* urine antigen and culture.
- If you suspect that a bloody urine or proteins in the urine have caused a false positive EIA urine antigen test, follow with an ICT test.
- Do not discard sputum if epithelial cells present.
- If urine antigen test is positive, retrieve the sputum that was ordered for routine work-up.

# Save the Sputum!

# End Legionnaires' Disease


# Know what's in your water so you can respond, not react

# THANK YOU!

**Janet E. Stout, PhD**
**President, Special Pathogens Technology**
**Founder, Special Pathogens Laboratory**

**E: jstout@specialpathtech.com**

**W: SpecialPathogensTechnology.com**

## NORMAN MOORE, PHD

Director, Infectious Diseases
Scientific Affairs
Rapid Diagnostics, Abbott

PNEUMONIA

# *S. pneumoniae*

# *S. pneumoniae*

## Most common pathogen for community-acquired pneumonia (CAP)[1]

**~150,000** hospitalizations annually in the U.S.[2]

**~$1.3 billion** in direct medical costs

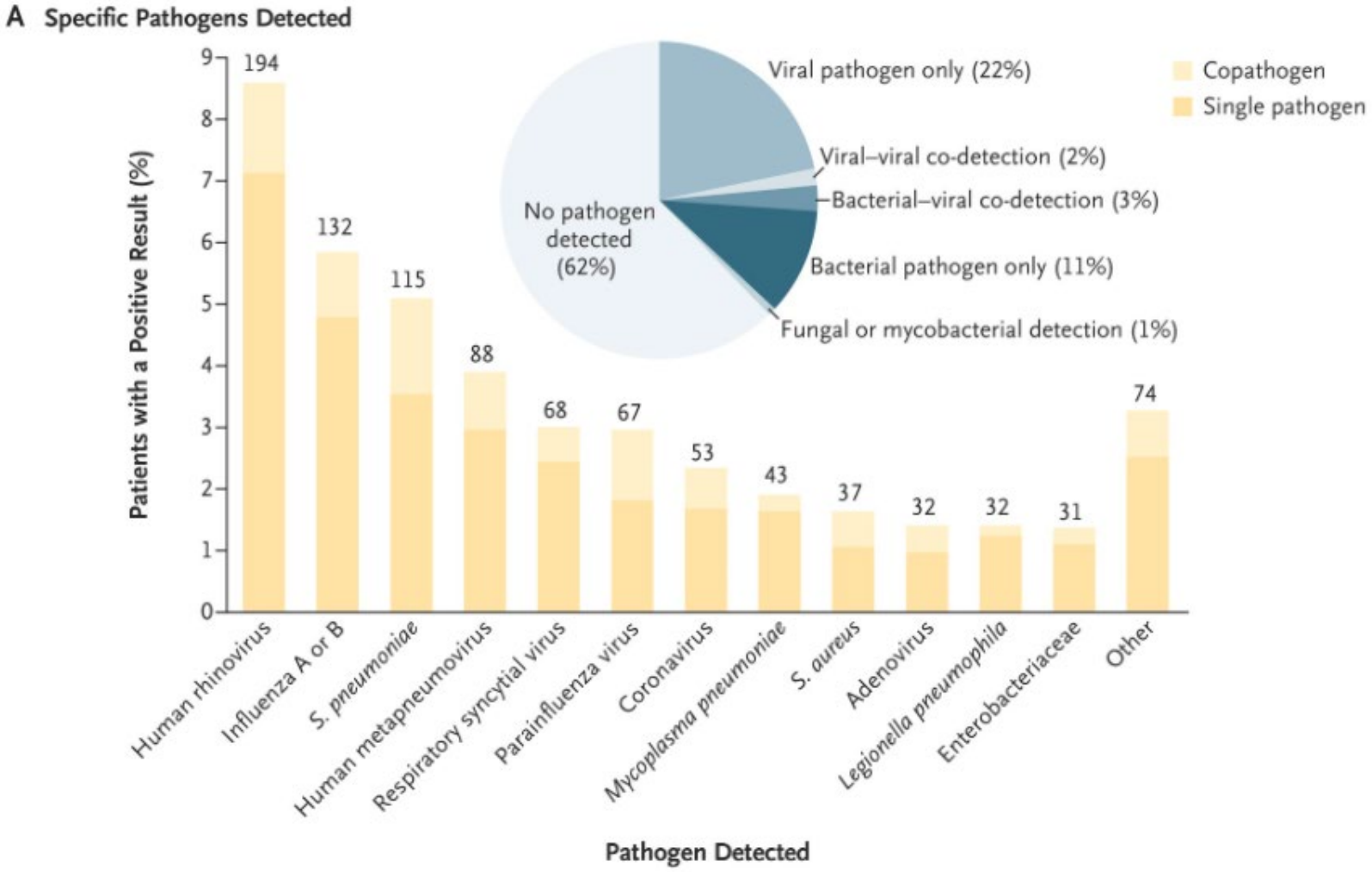
**~$4 billion** in total costs

**~6,000** deaths annually

## Most common secondary infection with influenza diagnosis[3]

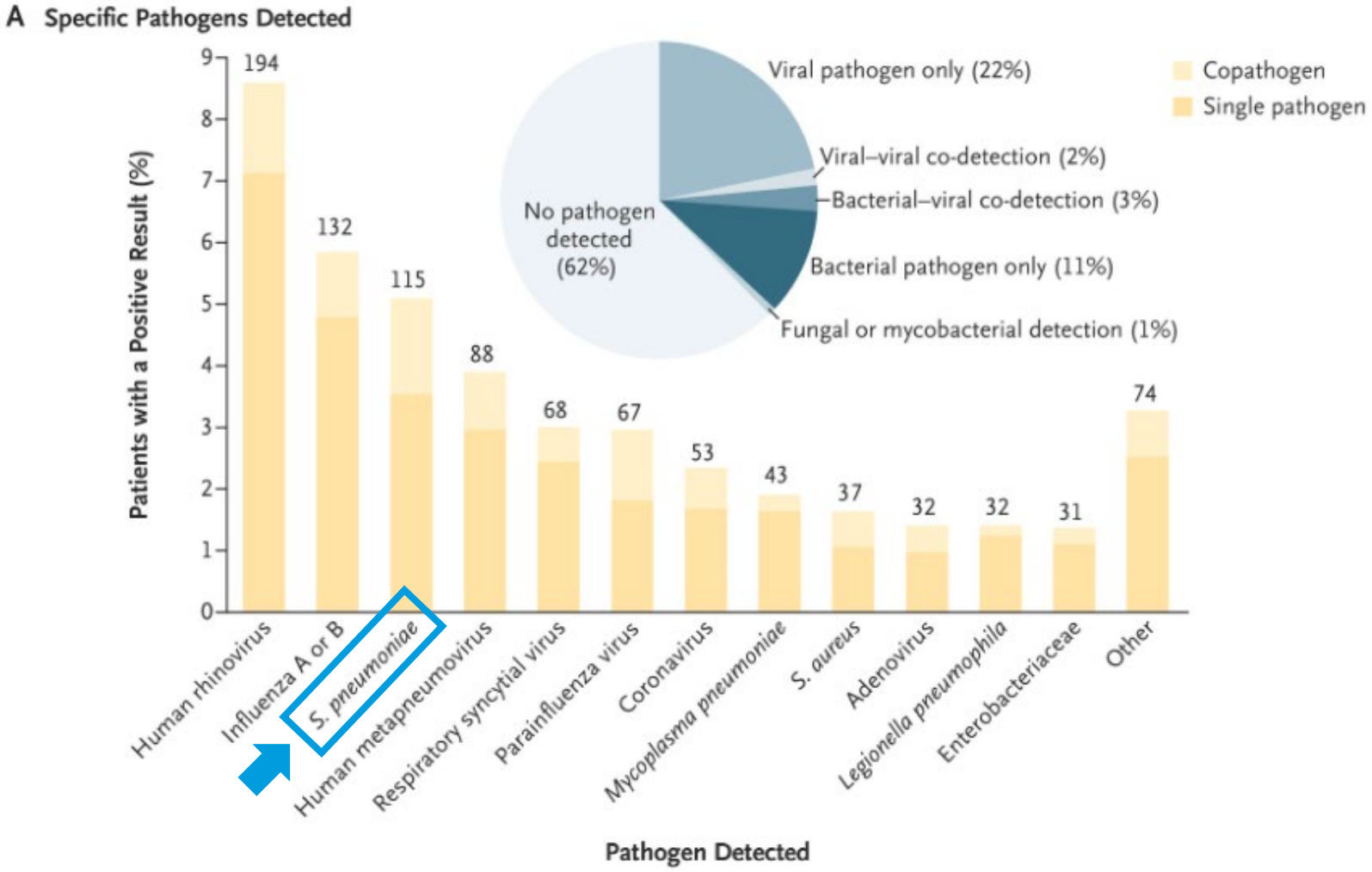

1. Dion CF, Ashurst JV. Streptococcus Pneumoniae. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan.
2. CDC. Pneumococcal Disease. Fast Facts. https://www.cdc.gov/pneumococcal/about/facts.html, updated January 27, 2022.
3. Morris et al. Secondary Bacterial Infections Associated with Influenza Pandemics. Frontiers in Microbiology. 2017; 8:1041.

# Etiology of Community-Acquired Pneumonia



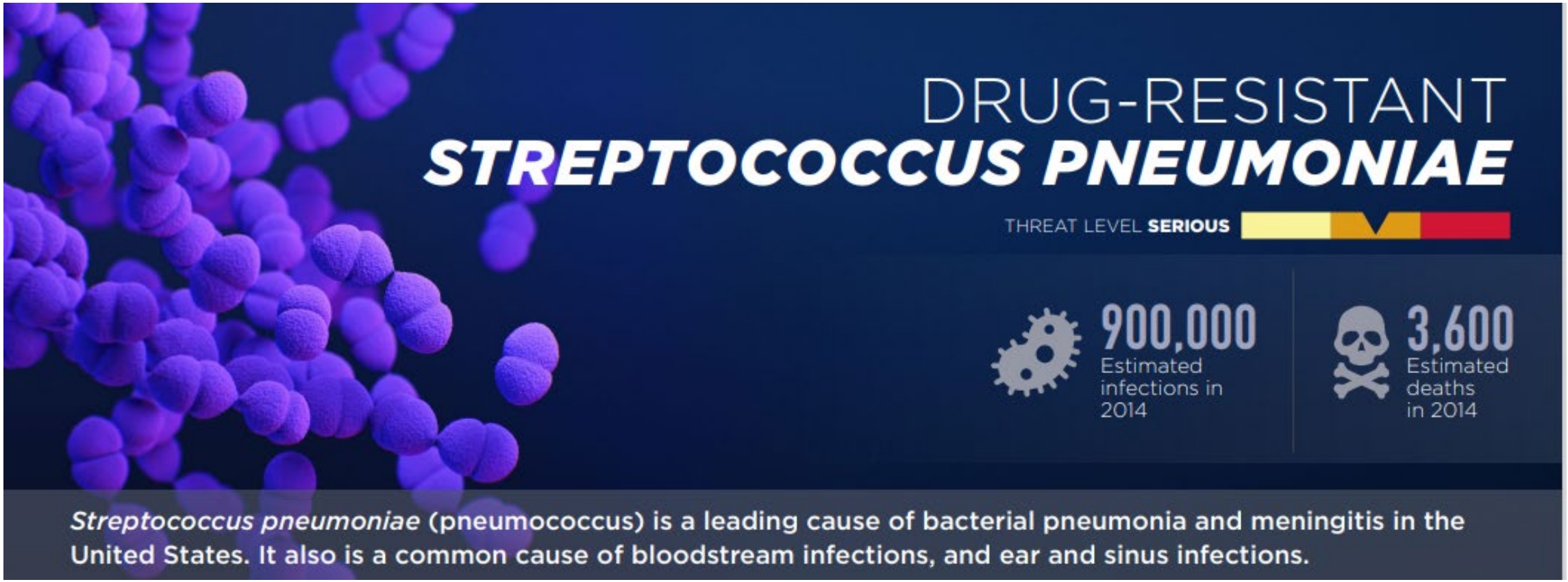

Jain S, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. *N Engl J Med*. 2015;373(5):415-427.

# Etiology of Community-Acquired Pneumonia



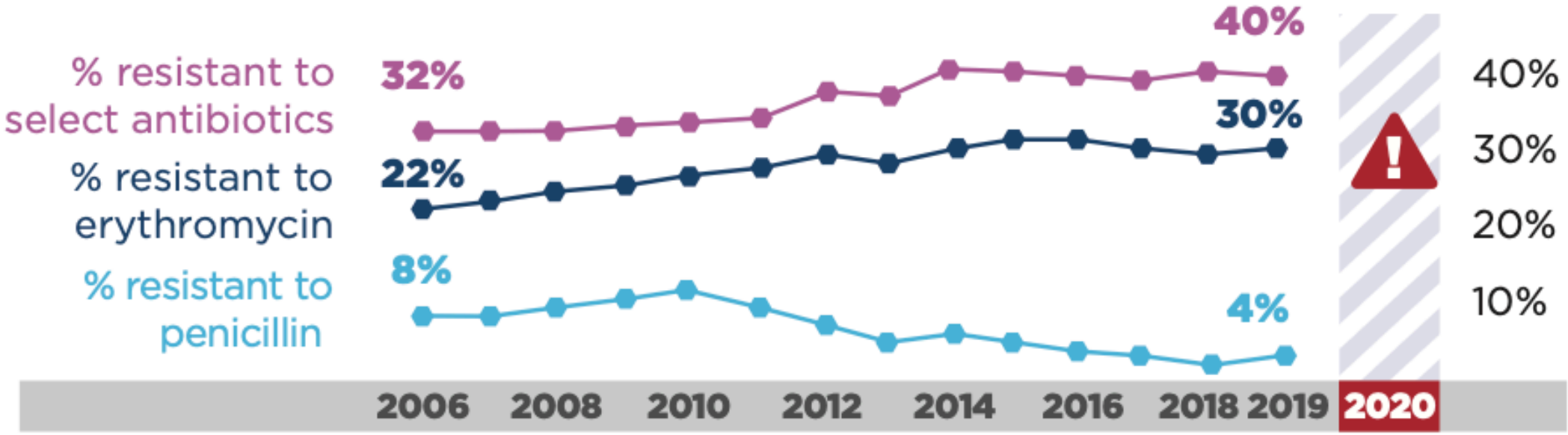

Jain S, et al. Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults. *N Engl J Med*. 2015;373(5):415-427.

# *Streptococcus pneumoniae* Drug Resistance




Antibiotic Resistance Threats in the United States, 2019 (cdc.gov) Accessed October 17, 2023

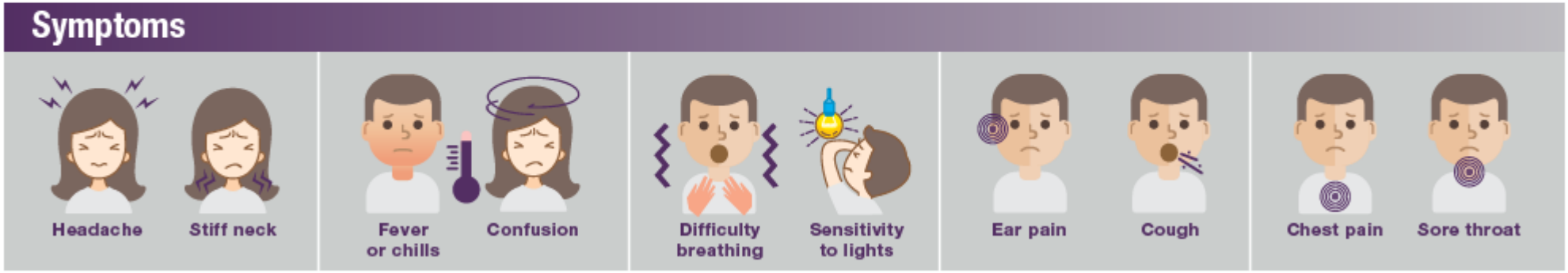
# Drug-resistant *Streptococcus pneumoniae*




CDC. COVID-19: U.S. Impact on Antimicrobial Resistance, Special Report 2022. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2022. https://www.cdc.gov/drugresistance/covid19.html

# Symptoms of Pneumococcal Pneumonia Can Vary

Pneumococcal disease can include many different types of infections. Symptoms depend on the part of the body that is infected. Most pneumococcal infections are mild. However, some can be deadly or result in long-term problems.




"Older adults with pneumococcal pneumonia may experience confusion or low alertness, rather than the more common symptoms listed above." CDC

Symptoms and Complications of Pneumococcal Disease | CDC Accessed October 24, 2023

# Diagnostic Tests for *S. pneumoniae*

| METHODOLOGY | TURNAROUND TIME | SENSITIVITY | SPECIFICITY | SAMPLE TYPE | COMPONENT DETECTED |
|---|---|---|---|---|---|
| **UAT[1]** | 15 minutes | 86%* | 94%* | urine | antigen |
| **Sputum Gram Stain[6]** | 15 minutes | 15% - 100% | 11% - 100% | sputum | organism |
| **Blood Culture** | 24 - 48 hours | 10% - 30%[2] | N/A | blood | organism |
| **Sputum Culture** | 24 - 48 hours | 29% - 94%[3] | 66%[4] - 94%[5] | sputum | organism |

* Sensitivity and specificity data are retrospective for urine only.


1. BinaxNOW™ *S. pneumoniae* Urinary Antigen Card Package Insert.
2. Schrag SJ, et al. Resistant Pneumococcal Infections, WHO/CDS/CSR/DRS/2001.6.
3. Musher D, et al. Diagnostic Value of Microscopic Examination of Gram-Stained Sputum and Sputum Cultures Inpatients with Bacteremic Pneumococcal Pneumonia; CID: 2004:39.
4. Stralin K, et al. Etiologic Diagnosis of Adult Bacterial Pneumonia by Culture and PCR Applied to Respiratory Tract Samples, J Clin Micro, Feb. 2006, 643-645.
5. Garcia-Vazquez E, et al. Assessment of the Usefulness of Sputum Culture for Diagnosis of Community-Acquired Pneumonia Using the PORT Predictive Scoring System, Arch Inter Med/Vol. 164, Sept. 13, 2004, 1807-1811.
6. Reed, W, et al. Sputum Gram's Stain in Community Acquired Pneumococcal Pneumonia – A Meta-analysis; West J. Med 1996; 165:197-204.

# ATS/IDSA CAP Clinical Practice Guidelines, 2019

In adults with CAP ***Legionella* and pneumococcal urinary antigen testing should be performed** at the time of diagnosis

C Conditional

## Recommendation

***S. pneumoniae* and *Legionella* antigen testing**

- **Adults with severe CAP**
- Where indicated by **epidemiological factors** (***Legionella***)
  - i.e., known outbreaks or recent travel

**Minor criteria**
- Respiratory rate ⩾ 30 breaths/min
- $Pa_{O2}/F_{IO2}$ ratio ⩽ 250
- Multilobar infiltrates
- Confusion/disorientation
- Uremia (blood urea nitrogen level ⩾ 20 mg/dl)
- Leukopenia* (white blood cell count < 4,000 cells/μl)
- Thrombocytopenia (platelet count < 100,000/μl)
- Hypothermia (core temperature < 36°C)
- Hypotension requiring aggressive fluid resuscitation

**Major criteria**
- Septic shock with need for vasopressors
- Respiratory failure requiring mechanical ventilation

Metlay JP, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.

# Importance of Flu Testing During Respiratory Season

## *S. pneumoniae*: A Secondary Complication to Influenza

- 2009 pandemic Influenza A (H1N1) & Spanish flu 1918
  - Many deaths were attributed to the flu combined with the secondary complication of pneumonia[1]
- Testing for *S. pneumoniae* and Influenza helps inform the appropriate use of antibiotic therapy[2]
  - Is it flu (viral)?
  - Is it pneumonia (bacterial or viral)?
  - Is it both?


1. Bacterial Coinfections in Lung Tissue Specimens from Fatal Cases of 2009 Pandemic Influenza A (H1N1) — United States, May–August 2009: CDC MMWR, September 29, 2009; Vol. 58.
2. Metlay JP, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.

# ATS/IDSA Clinical Practice Guidelines Recommend Influenza Testing in Patients with Pneumonia

In adults with CAP, **test for Influenza** at the time of diagnosis[1]

S Strong Recommendation

**Test for influenza with a rapid influenza molecular assay,**

i.e., influenza nucleic acid amplification test; preferrable to a rapid antigen test[1]

---

In outpatients (including emergency department) and hospitalized patients[2]

**Clinicians should test for influenza in patients with pneumonia[2]**


1. Metlay JP, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.
2. Uyeki TM, Bernstein HH, Bradley JS, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America: 2018 Update on Diagnosis, Treatment, Chemoprophylaxis, and Institutional Outbreak Management of Seasonal Influenzaa. Clin Infect Dis. 2019 Mar 5;68(6):e1-e47.

CLINICAL, ECONOMIC AND OPERATIONAL

# Improved Outcomes Associated With UAT

*Open Forum Infectious Diseases*

MAJOR ARTICLE

# Impact of *Streptococcus pneumoniae* Urinary Antigen Testing in Patients With Community-Acquired Pneumonia Admitted Within a Large Academic Health System

**Adam Greenfield,[1] Kassandra Marsh,[1] Justin Siegfried,[1] Ioannis Zacharioudakis,[2] Nabeela Ahmed,[2,3] Arnold Decano,[2,3] Maria E. Aguero-Rosenfeld,[4] Kenneth Inglima,[4] John Papadopoulos,[1] and Yanina Dubrovskaya[1,2]**

[1]Department of Pharmacy, New York University Langone Health, New York, New York, USA, [2]Division of Infectious Diseases, Department of Medicine, New York University Langone Health, New York, New York, USA, [3]Department of Pharmacy, New York University Langone Hospital–Brooklyn, Brooklyn, New York, USA, and [4]Department of Pathology, Grossman School of Medicine, New York University, New York, New York, USA

*"We observed earlier de-escalation in the PUAT-positive group. … due to discontinuation of atypical rather than anti-MRSA or antipseudomonal coverage."*

Greenfield A, et al. Impact of Streptococcus pneumoniae Urinary Antigen Testing in Patients With Community-Acquired Pneumonia Admitted Within a Large Academic Health System. Open Forum Infect Dis. 2021 Oct 22;9(1):ofab522.

# Shorter Duration of Antibiotic Therapy with Positive UAT Result

**Table 3. Antimicrobial Days of Therapy During Entire Admission**

| Antimicrobial | Positive PUAT (n = 121) | Negative PUAT (n = 789) | *P* Value |
|---|---|---|---|
| Azithromycin | 2 (1–3) | 3 (1–4) | .024 |
| Doxycycline | 2 (1–3) | 3 (2–4) | .027 |
| Vancomycin | 3 (1–4) | 2 (2–4) | .908 |
| Piperacillin-tazobactam | 3 (2–6) | 4 (3–7) | .053 |
| Cefepime | 1 (1–4) | 1 (1–4) | .370 |
| Ceftriaxone | 4 (3–7) | 2 (3–4) | .0005 |
| Fluoroquinolone | 2 (1–9) | 2 (1–4) | .649 |
| Linezolid | 1 (1–2) | 2 (1–8) | .272 |
| Meropenem | 3 (1–12) | 5 (3–8) | .397 |
| Ampicillin-sulbactam | 1 (1–1) | 1 (1–2) | .564 |
| Broad-spectrum days of therapy | | | |
| Atypical coverage | 2 (1–3)<br>n = 103 | 3 (2–4)<br>n = 722 | .007 |
| MRSA coverage | 2 (1–4)<br>n = 64 | 2 (2–4)<br>n = 368 | .625 |
| *Pseudomonas aeruginosa* coverage | 3 (2–5)<br>n = 61 | 4 (2–6)<br>n = 368 | .315 |

Data are presented as median (interquartile range) unless otherwise stated; Antimicrobial exposure was determined throughout entire admission and patients may have received multiple agents.

Abbreviations: MRSA, methicillin-resistant *Staphylococcus aureus*; PUAT, pneumococcal urinary antigen test.

Greenfield A, et al. Impact of Streptococcus pneumoniae Urinary Antigen Testing in Patients With Community-Acquired Pneumonia Admitted Within a Large Academic Health System. Open Forum Infect Dis. 2021 Oct 22;9(1):ofab522.

# More Rapid Antibiotic De-escalation and Discontinuation with Positive UAT Result

**Table 4. Comparison of De-escalation Between Pneumococcal Urinary Antigen Test–Positive and –Negative Groups**

| | All Patients (N = 910) | | |
|---|---|---|---|
| Characteristic | Positive PUAT (n = 121) | Negative PUAT (n = 789) | *P* Value |
| Overall initial de-escalation | 97/117 (82.9) | 629/775 (81.2) | .746 |
| Time to de-escalation from PUAT, d, median (IQR) | 1 (0–2) | 1 (1–2) | .01 |
| Atypical coverage | n = 103 | n = 722 | |
| Discontinuation | 80/103 (77.7) | 509/722 (70.5) | .165 |
| Within 24 h of PUAT | 49/80 (61.3) | 240/509 (47.2) | .026 |
| Time to discontinuation, median (IQR) | 1 (1–2) | 2 (1–2) | .04 |
| MRSA coverage | n = 64 | n = 368 | |
| Discontinuation | 45/64 (70.3) | 265/368 (72) | .898 |
| Within 24 h of PUAT | 24/45 (53.3) | 127/265 (47.9) | .610 |
| Time to discontinuation, d, median (IQR) | 1 (1–2) | 2 (1–2) | .131 |
| *Pseudomonas aeruginosa* coverage | n = 61 | n = 368 | |
| De-escalation[a] | 35/61 (57.4) | 177/368 (48.1) | .228 |
| Within 24 h of PUAT | 20/35 (57.1) | 99/177 (55.9) | .895 |
| Time to de-escalation, d, median (IQR) | 1 (1–2) | 1 (1–2) | .621 |

Data are presented as No. (%) unless otherwise stated.

Abbreviations: IQR, interquartile range; MRSA, methicillin-resistant *Staphylococcus aureus*; PUAT, pneumococcal urinary antigen test.

[a]De-escalation defined as ≤3 days of therapy (discontinued within 3 days from initiation of antibiotic).

Greenfield A, et al. Impact of Streptococcus pneumoniae Urinary Antigen Testing in Patients With Community-Acquired Pneumonia Admitted Within a Large Academic Health System. Open Forum Infect Dis. 2021 Oct 22;9(1):ofab522.

# Improved Antibiotic Use and Length of Stay Achieved

## Effect of a 3-Step Critical Pathway to Reduce Duration of Intravenous Antibiotic Therapy and Length of Stay in Community-Acquired Pneumonia

A Randomized Controlled Trial

Jordi Carratalà, MD; Carolina Garcia-Vidal, MD; Lucía Ortega, MD; et al

### OBJECTIVE CRITERIA USED FOR SWITCHING TO ORAL ANTIBIOTIC THERAPY

Pneumonia order set included:

- *Legionella* UAT
- *S. pneumoniae* UAT

### RANDOMIZED TRIAL RESULTS:

- Median duration of IV antibiotic therapy **reduced 50%** (2.0 vs 4.0 days)
- Fewer patients experienced adverse drug reactions
- Median LOS **decreased 22%** (3.9 days vs 6.0 days)

LOS, Length of stay

Carratalà J, Garcia-Vidal C, Ortega L, et al. Effect of a 3-step critical pathway to reduce duration of intravenous antibiotic therapy and length of stay in community-acquired pneumonia: a randomized controlled trial. Arch Intern Med. 2012 Jun 25;172(12):922-8.

# Key Takeaways for UAT

SUMMARY

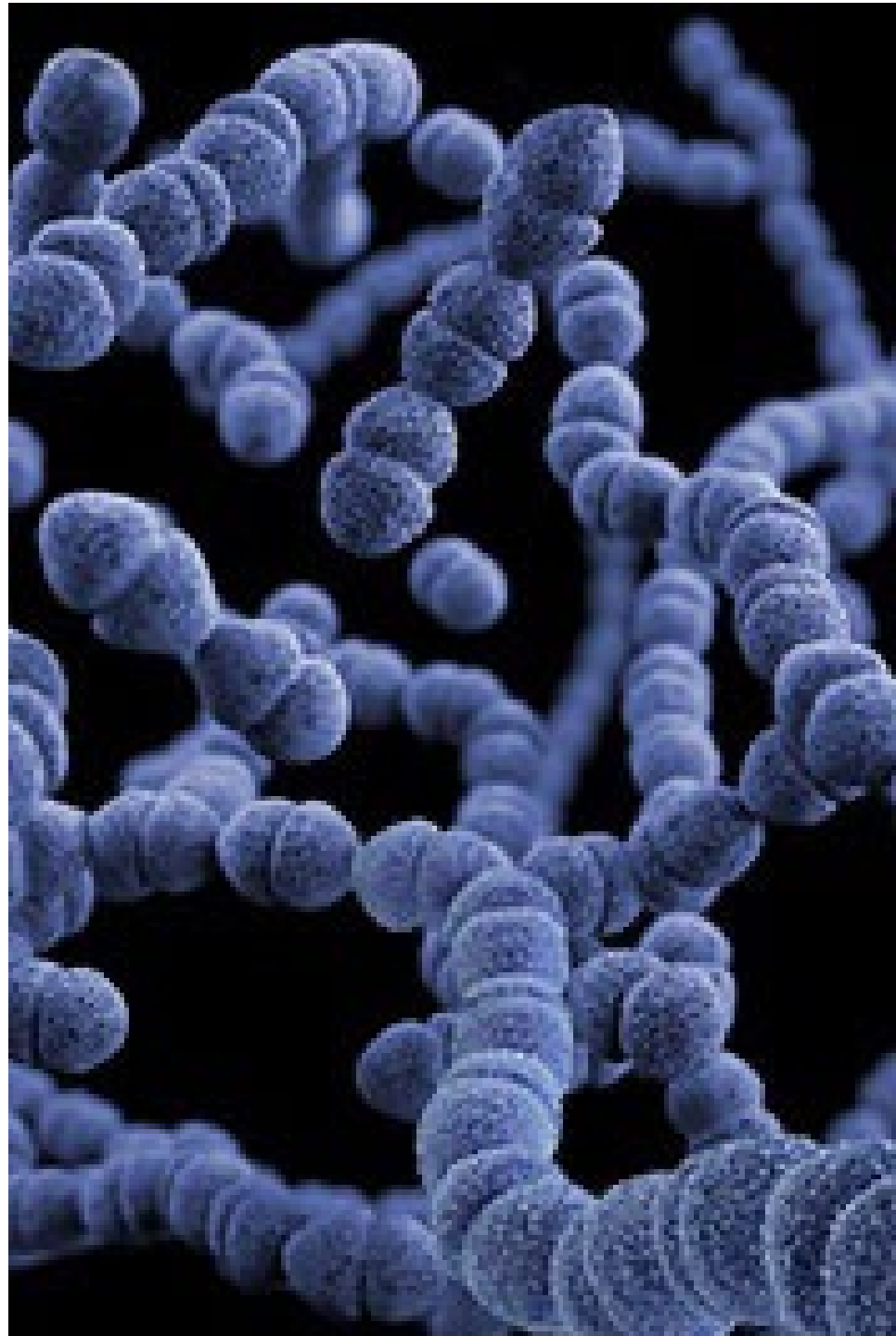
# Guidelines Supporting UAT

## ATS/IDSA CAP GUIDELINES[1]

**UAT recommended in:**

Adults with **severe CAP** → *S. pneumoniae* and *Legionella*

Where indicated by **epidemiological factors** → *Legionella*



Metlay JP, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67.

SUMMARY

# Evidence Supporting UAT | Reported Outcomes

| | |
|---|---|
| Reduced **mortality**[1,2,3] | • **57%** reduced odds of in-hospital mortality[2]<br>• **25%** reduced odds of 30-day mortality in UAT patients[3] |
| Improved **antibiotic stewardship** with positive UAT | • **125.9%** increase in narrowed therapy[4]<br>• **57%** of patients de-escalated antibiotic therapy[1]<br>• **15%** of patients changed antibiotic therapy[2] |
| Shorter **Hospital Length of Stay** (LOS) | • **57.8%** reduction[1] |
| Fewer **adverse drug reactions** | |
| Avoidance of ***Legionella* outbreaks**[5] | |

See Appendix

SUMMARY

# Why UAT for *S. pneumoniae* and *Legionella?*

## CLINICAL RATIONALE

Guideline-concordant testing[1]

Guide for antibiotic de-escalation[2,3]

Demonstrated clinical utility and associated with mortality outcomes[2-6]

UAT IS SUPPORTED BY THE ATS/IDSA, ENHANCES ANTIBIOTIC STEWARDSHIP AND IS ASSOCIATED WITH IMPROVED CLINICAL OUTCOMES

## LABORATORY RATIONALE

Non-invasive, ease of urine sample collection[2]

No instrument required, easy to use[2,3]

Rapid results[2,3]

Low cost per test[2,3]

UAT IS A COST-EFFECTIVE, REQUIRES NO INSTRUMENT TO MINIMIZE MOLECULAR WORKFLOW DISRUPTION AND OPTIMIZE UTILIZATION OF LIMITED RESOURCES


1. Metlay JP, et al. Am J Respir Crit Care Med. 2019;200(7):e45-e67.
2. West, et al. ERJ Open Res 2016; 2: 00011-2016.
3. Schimmel JJ, et al. Clin Infect Dis. 2020 Sep 12;71(6):1427-1434.
4. Costantini E, et al. Intern Emerg Med. 2016;11(7):929-940.
5. Uematsu H, et al. 2014;26(1):100-107.
6. Puri S, et al. 2020;17(2):533. Published 2020 Jan 15.

# Summary

- High mortality rates, particularly *Legionella*
- *S. pneumoniae* is most likely bacterial cause of CAP
- Guidelines support the use of UAT
  - In severe CAP (*S. pneumoniae* and *Legionella)*
  - In cases of outbreak or recent travel (*Legionella*)
- Demonstrated clinical outcome improvements include
  - Reduction in in-hospital and 30-day mortality
  - De-escalation of broad-spectrum antibiotic treatment
- Shorter time to optimizing therapy associated with additional improved outcomes
  - Fewer adverse drug reactions
  - Shorter hospital length of stay
  - Reduced risk of *C. difficile* infection
  - Reduced cost of care

# Thank You!

# Appendix – Additional Citations

## EVIDENCE SUPPORTING UAT – REPORTED OUTCOMES


1. West DM, et al. Pneumococcal urinary antigen test use in diagnosis and treatment of pneumonia in seven Utah hospitals. ERJ Open Res. 2016 Oct 19;2(4):00011-2016.
2. Costantini E, Allara E, Patrucco F, Faggiano F, Hamid F, Balbo PE. Adherence to guidelines for hospitalized community-acquired pneumonia over time and its impact on health outcomes and mortality. Intern Emerg Med. 2016;11(7):929-940.
3. Uematsu H, Hashimoto H, Iwamoto T, Horiguchi H, Yasunaga H. Impact of guideline-concordant microbiological testing on outcomes of pneumonia. Int J Qual Health Care. 2014;26(1):100-107.
4. Schimmel JJ, Haessler S, Imrey P, Lindenauer PK, Richter SS, Yu PC, Rothberg MB. Pneumococcal Urinary Antigen Testing in United States Hospitals: A Missed Opportunity for Antimicrobial Stewardship. Clin Infect Dis. 2020 Sep 12;71(6):1427-1434.
5. Puri S, Boudreaux-Kelly M, Walker JD, Clancy CJ, Decker BK. Clinical Presentation of Community-Acquired Legionella Pneumonia Identified by Universal Testing in an Endemic Area. Int J Environ Res Public Health. 2020;17(2):533.

# Questions

# Available CE Credit

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- Must complete Eval to receive Certificate link via email
- For groups: Those logged in will receive Email from messenger@webex.com with link to evaluation. Forward email to colleagues who attended with you!!!
- Double-check email address

# Joined Using a Mobile Device?

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- Watch for email with link to evaluation!

# Recording

Within a few days following today's event, visit

**https://www.whitehatcom.com/abbott**

## Know the Pneumonia: Urinary Antigen Testing in Patient Care

**Live Event: Thursday, November 9, 2023 | 1:00 - 2:00 PM Eastern Time**
**P.A.C.E.® credit available until November 9, 2024**
**Florida Laboratory CE Credit available**

RECORDING

SLIDES

Join this session for insights on improving the quality of care of patients with pneumonia. Experts will discuss the impact of this deadly infection and current gaps in identifying *Legionella* and *Streptococcus (S.) pneumoniae*. Practical applications of integrating urinary antigen testing (UAT) in patient scenarios will be explored, including an evidence-based review of mortality and antibiotic stewardship improvements achieved with UAT.

**The webinar will:**

- Evaluate the impact of pneumonia and risks for severe illness
- Examine gaps and potential delays in the diagnosis of pneumonia and quality measures to enhance patient care
- Review the identification of *Legionella* and *S. pneumoniae* with UAT
- Discuss practical examples where UAT testing supported improved patient outcomes through timely identification

**Presenter:**

**Janet E. Stout, PhD**

**Executive V.P. and Founder**
**Special Pathogens Laboratory**
**Pittsburgh, PA**

**Moderator/Speaker:**

**Norman Moore, PhD**

**Director, Infectious Diseases,**
**Medical Affairs, Rapid Diagnostics**
**Abbott**
**Scarborough, ME**

# Know the Pneumonia: Urinary Antigen Testing in Patient Care

NOTE: If you have just viewed the archived recording of this webinar, you can access the evaluation using the link in the email you received after submitting the recording request form. Alternatively, you can access the evaluation for **12 months** after the live event at:

https://www.whitehatcom.com/Abbott_Evals/Pneumonia_110923/Testing_110923_eval.html

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