



## Reduce Unnecessary Antibiotic Use and Enable Better Outcomes for Sepsis

Five Rivers Medical Center Depends on Procalcitonin (PCT) Testing to Provide Diagnostic Clarity and Support Antibiotic Stewardship

### Executive Summary

Today, fighting infections and managing antibiotic use go hand in hand. By adding procalcitonin (PCT) testing to lab and treatment protocols, healthcare systems could improve patient outcomes and potentially reduce the costs of care for certain bacterial infections and sepsis while curtailing unnecessary antibiotic use.<sup>1</sup>

#### How is PCT used?

Procalcitonin (PCT) has been used to evaluate the risk of progression to sepsis and septic shock in critically ill patients and 28-day mortality risk after diagnosis. Now the Elecsys® BRAHMS PCT assay may be used to support antibiotic treatment decisions in patients with suspected or confirmed lower respiratory tract infections (LRTI), defined as acute exacerbations of chronic obstructive pulmonary disease (aeCOPD), community-acquired pneumonia (CAP) and acute bronchitis, and aid in antibiotic discontinuation in patients with suspected or confirmed sepsis.

Five Rivers Medical Center is one healthcare organization that has benefited from using PCT to manage infections and antibiotic use. It has:



LOWERED MORTALITY RATES



CUT COSTS FOR CARE



REDUCED UNNECESSARY USE OF ANTIBIOTICS

## Challenge

The challenges surrounding bacterial infections, sepsis and antibiotic usage are twofold. First, diagnosing and treating sepsis and certain bacterial infections can be a challenge due to ambiguous signs and symptoms. Even after a definitive diagnosis, treatment requires adjusting the prescription of antibiotics such that the right drug at the right dose is administered. Consequently, without the right diagnostic tools in place, creating an appropriate treatment plan becomes a guessing game and a drain on resources. When any infection is not adequately controlled, sepsis becomes the concern. An estimated 1.7 million adults develop sepsis each year,<sup>2</sup> and it is the biggest financial burden on hospitals.<sup>3</sup>

Second, while antibiotics are an important treatment option, these medications may have severe medical and financial ramifications when doctors prescribe them inappropriately. When a patient takes antibiotics, sensitive bacteria are killed, yet resistant ones may be left to grow and multiply, leaving the patient susceptible to a severe infection. The medical burden and growing concern around antibiotic resistance also take a financial toll. In fact, antibiotic misuse accrues \$27 billion to \$42 billion in avoidable costs each year.<sup>4</sup>

### The Need — and Challenge — for Rapid Diagnosis with Sepsis

While as many as **80% of sepsis deaths could be prevented with rapid diagnosis and treatment**, achieving this goal can be challenging due to the non-specific signs and symptoms associated with sepsis.<sup>5</sup>

Deaths from drug-resistant infections are projected to increase from an estimated **700,000 in 2014 to 10 million annually by 2050.**<sup>6,7</sup>

**These challenges present the medical community with an opportunity to change what's possible.**

- What if your clinicians could determine if an antibiotic is truly necessary or if it is effectively managing the infection?
- What if your clinicians could reduce hospital stays in the ICU?

## Assessment and Strategy

To uncover critical, and previously invisible, insights into sepsis and certain bacterial infections, and reduce the use of unnecessary antibiotics, one medical center leveraged PCT. PCT is a sensitive and specific biomarker associated with the inflammatory response to bacterial infection, and it can provide valuable insights when combined with clinical judgment.<sup>3</sup>

**In conjunction with other laboratory findings and clinical assessments, PCT provides valuable information on the severity of a bacterial infection — both on presentation and during the course of treatment.<sup>8</sup>**

Dr. Mike Broyles, Director of Pharmacy and Laboratory Services at Five Rivers Medical Center, recognized that PCT testing would give him and other clinicians the information they needed to provide the right treatment to the right patient for the right duration.



## Actions and Results

Dr. Broyles incorporated PCT testing at Five Rivers Medical Center to reveal critical insights that can help in the fight against certain bacterial infections and sepsis. The Elecsys® BRAHMS PCT assay has enabled clinicians to gain earlier insight so patients with these conditions can receive the right treatment sooner.

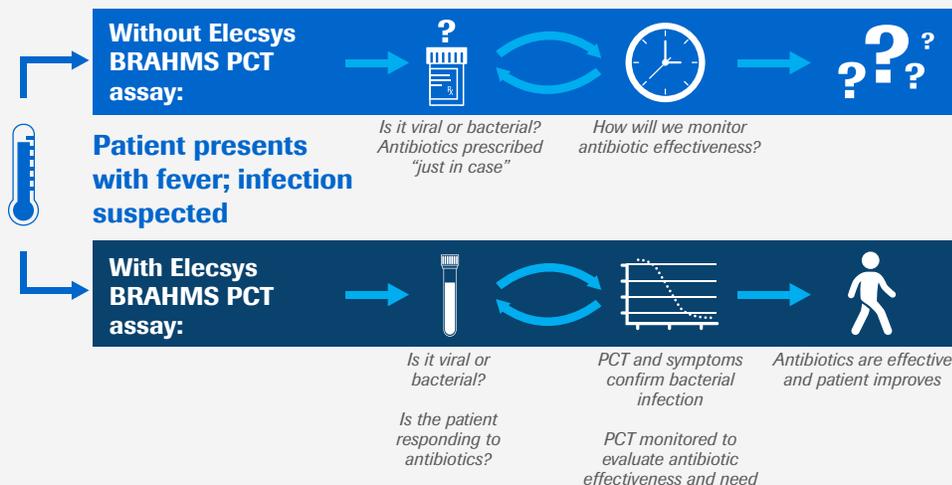
The Elecsys BRAHMS PCT assay:<sup>9</sup>

- Aids in assessing the risk of disease progression to sepsis and septic shock on the first day of ICU admission.
- Helps in assessing the cumulative 28-day risk of all-cause mortality based on the changes in PCT levels over four days in patients diagnosed with severe sepsis or septic shock.
- Aids in decision-making on antibiotic therapy for patients with suspected or confirmed lower respiratory tract infections (LRTI) — defined as community-acquired pneumonia (CAP), acute bronchitis and acute exacerbations of chronic obstructive pulmonary disease (aeCOPD) — in an inpatient setting or an emergency department.
- Aids in decision-making on antibiotic discontinuation for patients with suspected or confirmed sepsis.

**“Of the more than 175 biomarkers available to assess infection today, PCT is the only one that requires both bacterial toxins and an inflammatory response in order for levels to be elevated.”**

**Mike Broyles, PharmD**  
*Director of Pharmacy and Laboratory Services  
Five Rivers Medical Center  
Pocahontas, Ark.*

As many as 71% of patients with acute respiratory tract infections are treated with antibiotics, despite a mainly viral cause for these infections.<sup>8</sup> **Help provide clarity with PCT when guiding antibiotic decision-making for patients with lower respiratory tract infections**, like pneumonia, aeCOPD and acute bronchitis.<sup>9</sup>



Dr. Broyles found that the addition of the PCT testing resulted in significant reductions in antibiotic days of therapy (DoT) and certain adverse outcome measures, including hospital all-cause mortality.

**Integrating PCT into antibiotic stewardship programs:<sup>10</sup>**



Dr. Broyles says, "PCT has absolutely made a significant difference in improving patient outcomes." **PCT testing can help reduce antibiotic use by providing diagnostic clarity on bacterial infection management in certain infections**, making it an effective tool for antibiotic stewardship programs.<sup>10</sup>

## Application

### Change Made Possible for Antibiotic Stewardship and Infection Control

PCT testing can aid in decision-making on antibiotic therapy for patients with suspected or confirmed LRTI — defined as CAP, acute bronchitis and aeCOPD — in an inpatient setting or an emergency department. It also can aid in decision-making on antibiotic discontinuation for patients with suspected or confirmed sepsis.

From crowded emergency departments in big cities to small community hospitals in rural areas, there are multiple benefits of implementing PCT testing as part of infectious disease and sepsis protocols.

Any healthcare system can assess the potential impact of PCT in its setting by looking at key data points. The use of PCT testing on the first day of ICU admission was associated with a significant saving of resources and reducing the length of stays, according to an analysis of more than 619 million patient encounters in the Premier Healthcare Database over three-and-a-half years.<sup>11</sup>

**The Elecsys® BRAHMS PCT on the Roche Diagnostics automated platform offers new possibilities for promoting more appropriate antibiotic use and winning the fight against sepsis and LRTI.**

### PCT testing in the ICU is associated with significantly lower costs and lengths of stay.<sup>11</sup>

Reductions Enabled by PCT	
Total Cost of Care	-\$2,759
ICU Costs	-\$1,310
Pharmacy Costs	-\$331
Length of Stay	-1.2 days
Laboratory Costs	+\$81



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<sup>1</sup>Schuetz, P. M. Christ-Crain, R. Thomann et al. (September 2009). "Effect of procalcitonin-based guidelines vs standard guidelines on antibiotic use in lower respiratory tract infections: the ProHOSP randomized controlled trial." *JAMA* 302(10): 1059–1066. <https://www.ncbi.nlm.nih.gov/pubmed/19738090> (accessed November 6, 2018).

<sup>2</sup>Centers for Disease Control and Prevention. <https://www.cdc.gov/sepsis/datareports/index.html> (accessed September 21, 2018).

<sup>3</sup><https://www.hcup-us.ahrq.gov/reports/statbriefs/sb168-Hospital-Costs-United-States-2011.jsp> (accessed September 21, 2018).

<sup>4</sup>National Quality Forum. "National Quality Partners Playbook: Antibiotic Stewardship in Acute Care." [http://www.qualityforum.org/Publications/2016/05/National\\_Quality\\_Partners\\_Playbook\\_Antibiotic\\_Stewardship\\_in\\_Acute\\_Care.aspx](http://www.qualityforum.org/Publications/2016/05/National_Quality_Partners_Playbook_Antibiotic_Stewardship_in_Acute_Care.aspx) (accessed February 6, 2018).

<sup>5</sup>Kumar, A. et al. (June 2006). "Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock." *Crit Care Med* 34(6):1589–1596.

<sup>6</sup>Jasovsky, D. et al. (August 2016). "Antimicrobial resistance—a threat to the world's sustainable development." *Ups J Med Sci* 121(3):159–164.

<sup>7</sup>Review on Antimicrobial Resistance. (December 2014). *Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations*. Commissioned by the UK Prime Minister. London, United Kingdom.

<sup>8</sup>Macfarlane, J., S.A. Lewis, R. Macfarlane and W. Holmes. (1997). "Contemporary use of antibiotics in 1089 adults presenting with acute lower respiratory tract illness in general practice." *U.K. Respir Med* 91(7):427–434.

<sup>9</sup>Elecsys® BRAHMS Procalcitonin Package Insert 2018.

<sup>10</sup>Broyles, M.R. (October 2017). Impact of Procalcitonin-Guided Antibiotic Management on Antibiotic Exposure and Outcomes: Real-world Evidence, *Open Forum Infectious Diseases* 4(4) ofx213. <https://doi.org/10.1093/ofid/ofx213> (accessed September 21, 2018).

<sup>11</sup>Balk, A. et al. (January 2017). Procalcitonin Testing on Health-care Utilization and Costs in Critically Ill Patients in the United States. *Chest* 151(1):23–33. Available at: <https://doi.org/10.1016/j.chest.2016.06.046> (accessed November 8, 2017).