

# Personalized Antibiotic Therapy for Reduced Inappropriate Exposure to Antibiotics

## Swedish Covenant Hospital, Chicago, IL

Personalized antibiotic therapy is of significant importance globally as the overuse of antibiotics, and the prolonged duration of antibiotic therapy is associated with poor patient outcomes,<sup>1-2</sup> prolonged length of stay,<sup>1-2</sup> and antibiotic resistance.<sup>2-3</sup> For example, prolonged antibiotic exposure is associated with increased mortality, Q-T interval elongation, and Clostridium difficile (C. difficile) infection during hospitalization.<sup>2</sup> Patients who present to the emergency department with symptoms suggestive of an infection and/or sepsis (severe infection) are often started on antibiotic therapy before infection confirmation as early initiation of adequate antibiotic therapy is the cornerstone of infection and sepsis treatment.<sup>4</sup> The Center for Disease Control and Prevention estimates that nearly half of all antibiotic prescriptions are either inappropriate or insufficient<sup>5</sup> and current literature indicates that antibiotic stewardship can reduce hospital readmission rates by 50%,<sup>2</sup> reduce adverse drug reactions by 8.1%, including C. difficile infections from 2.5% to 0.9%,<sup>2</sup> reduce antibiotic exposure by between 22%–36%,<sup>6</sup> reduce hospital costs by between \$200,000–\$900,000 per year<sup>6</sup> and improve the overall patient outcomes.<sup>2,7-8</sup>

An integrated clinical care team at Swedish Covenant Hospital involving intensive care unit (ICU), Emergency Department (ED) and Infectious Disease (ID) physicians, pharmacists, laboratorians and nurses sought to optimize antibiotic stewardship to improve overall care of patients entering the ICU who have already been started on antibiotics. Implementation of standardized, evidence-based procalcitonin (PCT) criteria in concert with an antibiotic stewardship program has led to a 23% reduction in antibiotic exposure, reduced hospital length of stay by 2.3 days, and reduced the cost per patient by \$2,759 (US Dollars).<sup>7</sup>



PATIENT



CLINICIAN



HOSPITAL  
ADMINISTRATION



PAYOR

### KEY PARTNERS / STAKEHOLDERS



**Eric Gluck**  
MD, JD, FCCP, FCCM

Director of Critical  
Care Services



**Kathryn Rataj**  
Pharm D., BCPS

Clinical Pharmacy Specialist,  
Critical Care



**Susan Dawson**  
MBA, MT-ASCP

Laboratory Manager



**Steven Kalish**  
MD, FACP, FSHEA

Chair Section of  
Infectious Disease  
Chair Pharmacy and  
Therapeutics Committee



**Mark Richardson**  
MSN, RN, CCRN

ICU Nurse Educator

## SITUATION ANALYSIS

- Infection and Sepsis (severe infection) are severe conditions with an in-hospital mortality rate of approximately 1 in every 3 patients<sup>9</sup>
- Timely administration of the right antibiotics is crucial for the reduction in sepsis mortality<sup>4</sup>
- Over-prescription of antibiotics globally can result in antibiotic-resistant bacteria,<sup>2-3</sup> increased healthcare costs and increased patient length of stay<sup>1-2</sup>
- Implementation of evidence-based decisions pathways for antibiotic stewardship optimize therapy, reduce antibiotic resistance and improve patient outcomes<sup>1-3, 7</sup>

## PERSONALIZED ANTIBIOTIC THERAPY FOR REDUCED INAPPROPRIATE EXPOSURE TO ANTIBIOTICS

### DISCOVERY

Published best practices have already demonstrated the value of procalcitonin-guided algorithms for reducing unnecessary antibiotics, improving patient outcomes, reducing patient length of stay and avoiding unnecessary costs.<sup>1-3</sup> Optimized patient care is always a focus at Swedish Covenant Hospital. Thus, when procalcitonin was approved within the United States, an integrated multidisciplinary clinical care team was assembled and activated to further optimize a local care program using this novel biomarker.

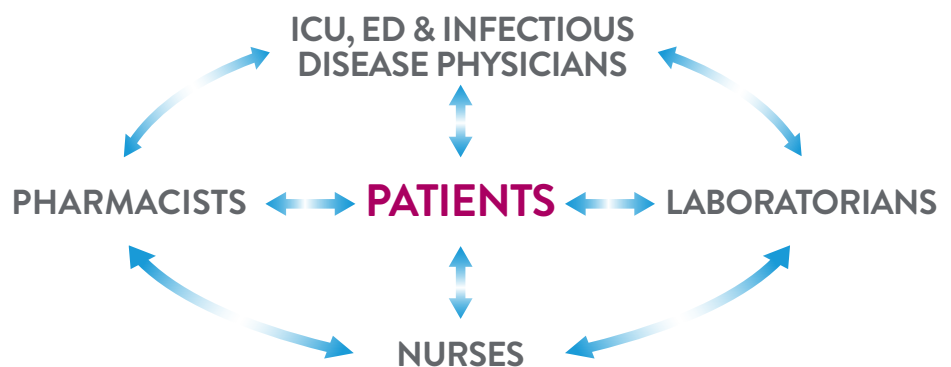
### HYPOTHESIS

Application of evidence-based procalcitonin change criteria can effectively guide antibiotic administration in the ICU for patients admitted from the emergency department on antibiotics. When PCT testing is initiated early in a patient's stay (i.e., in the ED), early decision-making surrounding antibiotics and patient flow can be optimized.



### PARTNERS

Skepticism can exist with change. A best practice at Swedish Covenant Hospital for alignment across teams involved continuous cross functional review of emerging data, interactive peer-to-peer discussions and endorsement of procedures for feasibility and safety. Activation of a project champion that serves as a central resource and/or point of contact across disciplines is recommended for seamless project adoption. At Swedish Covenant Hospital, the ICU director assumed this role.



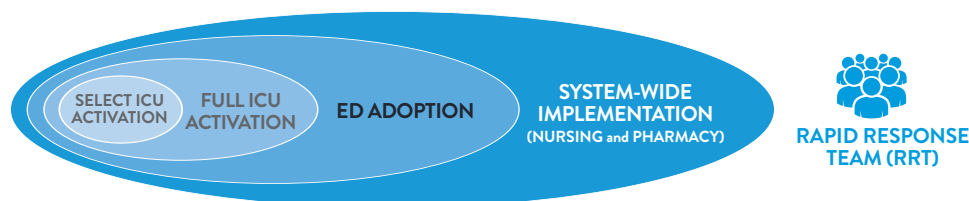
# PERSONALIZED ANTIBIOTIC THERAPY FOR REDUCED INAPPROPRIATE EXPOSURE TO ANTIBIOTICS

## SUCCESS FACTORS

### EXECUTION

Implementation began with select activation within the ICU. Early success lead to adoption in the ED, followed by system-wide adoption of the procalcitonin-guided antibiotic stewardship program with endorsement from nurses, ED pharmacists, and infectious disease specialists, ultimately incorporating PCT measurement as part of the Rapid Response Team (RRT) protocol for sepsis. (RRT = ED physician, ICU physician, pharmacy, nurse)

BETTER AND WIDESPREAD PATIENT CARE

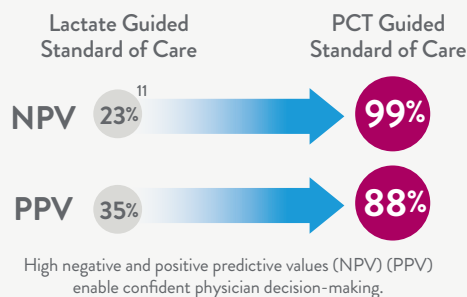


- Procalcitonin is a proven biomarker for antibiotic stewardship in a variety of settings including the ED, ICU, and NICU (Neonatal ICU)<sup>7-8, 10</sup>
- Strategies that employ evidence-based pathways using procalcitonin for antibiotic stewardship have shown to be both safe and cost-effective<sup>7-8, 10</sup>
- Interdisciplinary, cross-functional teams are essential in ensuring activation of evidence-based pathways for appropriate antibiotic therapy and the betterment of health in patients with infection and sepsis

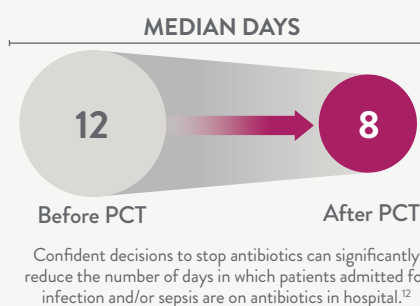
### PROOF OF VALUE

PCT-guided care resulted in safe and effective antibiotic stewardship with improved decision making, reduced antibiotic exposure, reduced patient length of stay and reduced total cost of care.

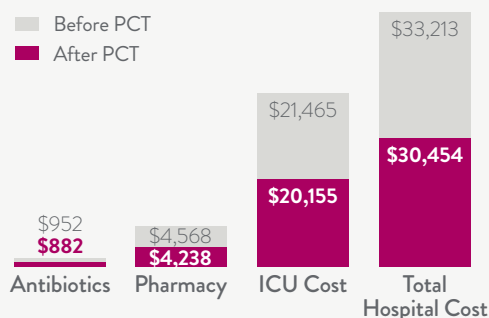
#### INCREASED CONFIDENCE IN DECISION-MAKING\*



#### REDUCED ANTIBIOTIC EXPOSURE\*\*

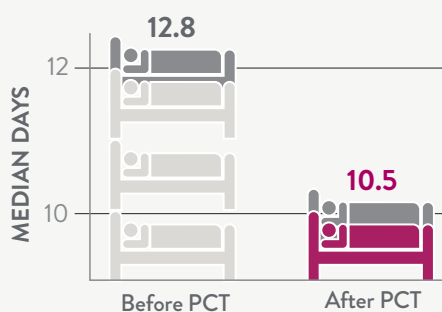


#### REDUCED OVERALL PATIENT COSTS\*\*\*



Procalcitonin guided decision-making can reduce the cost per visit for patients admitted for sepsis (USD) due to the significant reductions in costs in several key departments.

#### REDUCED PATIENT LENGTH OF STAY\*\*\*







Activation of the PCT into decision-making can significantly reduce the number of days in hospital for patients admitted for infection and/or sepsis.

\*Data adapted from Singer, et al. 2014 and site data.

\*\*Data adapted from Schuetz, et al. 2013.

\*\*\*Data adapted from Balk, et al. 2017.

# SPOTLIGHT ON STAKEHOLDER SUCCESS

	<b>PATIENT</b>	<b>INCREASED PATIENT WELLNESS</b>	<ul style="list-style-type: none"> <li>• 23% reduction in antibiotic exposure or 4 days fewer of antibiotics (average)</li> <li>• 2.8% increase in the number of patients discharged home safe<sup>7</sup></li> </ul> <p>“In my ICU patient population having PCT available has been a vital tool in my antimicrobial stewardship practice.”</p> <p>– Kathryn Rataj, Pharm D., BCPS, Clinical Pharmacy Specialist, Critical Care</p>
	<b>CLINICIAN</b>	<b>INCREASED CLINICIAN CONFIDENCE</b>	A 99% negative predictive value for PCT-guided care vs. standard of care (NPV = 23% for lactate <sup>11</sup> ) allows for confident decision making with respect to antibiotic prescription(s).
		<b>REDUCED UNCERTAINTY</b>	<p>“Introduction of procalcitonin into clinical care has significantly reduced the angst associated with stopping antibiotics in the ICU.”</p> <p>– Eric Gluck, MD, JD, FCCP, FCCM, Director of Critical Care Services</p>
	<b>HOSPITAL ADMINISTRATION</b>	<b>REDUCED LENGTH OF STAY</b>	Reduced total LOS for patients with infections by 2.3 days. <sup>7</sup>
		<b>RESOURCE OPTIMIZATION</b>	2.6% reduction in escalation of patient care resulted in reduced burden on acute care setting, nurses and intermediate and long-term care facilities. <sup>7</sup>
	<b>PAYOR</b>	<b>REDUCED COSTS</b>	Reduced total hospital costs per ICU patient with sepsis by \$2,759 (US Dollars). <sup>7</sup>

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