Implementation of the Procalcitonin Assay in a Rural Hospital

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Abstract

Objective: Most positive studies in procalcitonin (PCT) utilization were done in large, tertiary medical centers. Furthermore, there is a paucity of data describing the implementation process. This article is the first to describe in detail the implementation process and initial outcomes after 6 months of PCT testing in a rural, 65-bed, primary hospital. **Methods:** Education before and during PCT implementation as well as facility rollout are described. Initial outcomes were assessed using a before and after quasi-experimental study design comparing 2 identical 6-month time periods: May to October 2016 and May to October 2017. Antibiotic consumption is described with days of therapy (DOT) per 1000 patient days (PD). Antimicrobial purchasing costs, admission rates, and length of stay (LOS) are also compared. **Results:** Antimicrobial consumption was variable with the greatest reduction at 6 months: 856 DOT/1000 PD before versus 576 DOT/1000 PD after ($P < .0001$). Admission rates and LOS were unaffected. There was no associated savings in antibiotic purchasing costs: \$114 189.79 before and \$139 829.26 after (difference +\$25 639.47). **Conclusion:** Although implementation of PCT testing is feasible in a rural health care facility, after 6 months, it was associated with a marginal decrease in antibiotic consumption with no decrease in admission rates, LOS, or antibiotic cost savings.

Keywords

procalcitonin, rural hospital, antibiotic stewardship

Introduction

Antibiotic overuse is well documented in acute care facilities, often leading to adverse events, antimicrobial resistance, and increased health care costs.¹ The Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA) have issued guidelines for the development of antibiotic stewardship programs since 2007, and The Joint Commission recently added a new antimicrobial stewardship standard for acute care facilities that went into effect January 1, 2017.^{2,3} Recommendations for antibiotic treatment durations for specific infections are largely based on prespecified durations used in clinical trials. The utilization of biomarkers of infection has emerged as a tool to help curb unnecessary antibiotic usage.

Procalcitonin (PCT) is a biomarker for bacterial infection that provides a novel approach for guidance of antibiotic therapy. The PCT assay has US Food and Drug Administration (FDA)-approved indications to support decisions in starting and stopping antibiotics in lower respiratory tract infections (LRTIs) and stopping antibiotics in sepsis. PCT utilization has been repeatedly shown to decrease antimicrobial exposure without worsening patient outcomes in clinical trials. Subsequently, the IDSA guidelines included a weak recommendation for PCT testing in their list of options for antimicrobial stewardship programs to decrease antibiotic usage.²

PCT normally serves as a precursor to calcitonin release produced by C cells in the thyroid. Under normal circumstances, PCT has low concentrations in the bloodstream (<0.05 ng/mL). In the presence of bacterial infections, PCT is released systemically by the liver, kidney, adipocytes, and muscle tissue in proportion to bacterial insult. Levels >0.5 ng/mL are strongly associated with sepsis when combined with clinical signs and symptoms. Once the systemic infection is controlled, PCT is eliminated renally with a half-life of approximately 24 hours.⁴

PCT is notable for being highly sensitive and specific in bacterial infections compared with other biomarkers like white blood cell count and C reactive protein. PCT does not rise significantly in autoimmune diseases, viral infections, or noninfectious inflammation, making PCT elevations bacterial selective. Reported costs of a single assay have been listed as \$10 to \$30 per sample.⁵

There are some limitations reported with the PCT assay. False positives can arise from profound inflammatory

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conditions such as trauma, major surgery, pancreatitis, or extensive burns. In addition, end-stage renal failure or circulatory failure may cause higher baseline PCT levels with slower clearance.⁴ False negatives can occur with localized infections or if drawn early in the course of infection. Clinical context should always be considered.

The majority of preliminary clinical utilization of PCT was done in LRTIs such as acute exacerbations of chronic obstructive pulmonary disease, bronchitis, and community-acquired pneumonia. A 2011 meta-analysis demonstrated pooled data that PCT-guided therapy decreased both the number and duration of antibiotic prescriptions but did not have a statistically significant impact on mortality, intensive care unit (ICU) admissions, or length of stay (LOS).⁶ A 2012 meta-analysis demonstrated a mean decrease in antibiotic exposure of 3.47 days without an increase in treatment failure in the PCT group compared with standard therapy.⁷ The updated hospital-acquired and ventilator-acquired pneumonia guidelines from IDSA have incorporated the use of PCT in addition to clinical evaluation as a weak recommendation to discontinue antibiotic therapy.⁸ Of note, the guidelines discuss the limited diagnostic value of PCT for initiating antibiotics and recommend using clinical criteria alone.⁸

The utilization of PCT in sepsis detection, treatment, and mortality prediction is also well studied. A 2013 meta-analysis in sepsis patients demonstrated a shorter average antibiotic duration with PCT-guided therapy and decreased overall antibiotic exposure.⁹ A recent multicenter study in the Netherlands reported more compelling evidence in sepsis patients with a decrease in mortality rates seen in PCT-guided therapy, both at 28 days and 1 year.¹⁰ The Society of Critical Care Medicine and the European Society of Intensive Care Medicine published a recent update to their Surviving Sepsis Campaign, which contained weak recommendations to utilize PCT to shorten antibiotic therapy both in patients who no longer appear septic and those patients who have ruled in for sepsis and are responding to therapy.¹¹

The publication of the Multicenter Procalcitonin Monitoring Sepsis (MOSES) trial provided evidence for the approval of PCT as a predictor of mortality in septic shock. In a multicenter, prospective, blinded study, PCT was measured daily over the first 5 days of ICU admission. Patients who did not have an 80% decrease in PCT over the first 4 days had a 2-fold increase in mortality.¹²

PCT has also been studied with positive outcomes in a number of other infectious diseases (IDs) including meningitis, febrile neutropenia, intra-abdominal infections, urinary tract infections, and postsurgical infections.¹³ It is not currently FDA approved for these indications, however. A recent retrospective study in the United States reported decreased LOS and overall costs of hospitalization with the utilization of PCT for nonspecific indications in the ICU.¹⁴

Despite growing evidence for PCT effectiveness in Europe, widespread use in the United States has been an issue of debate.¹⁵⁻¹⁷ Recent guidance from the National

Institute for Health and Care Excellence in the United Kingdom does not recommend routine utilization of PCT testing and states that the National Health Service should not cover the expense of testing, stating that it is not useful to rule out infection when there is a low pretest probability.¹⁸ A recent article by Fung et al featured an expert panel that discussed the challenges that commonly come with implementing PCT for antimicrobial stewardship.¹⁹ They described the reluctance of providers to de-escalate antibiotic therapy based on a lab result coupled with the expense of the test can result in a high-cost, low-efficacy intervention. They warned that positive results seen in meta-analyses may not be generalizable in individual facilities and argued that more “real-world” applicability is needed. In an effort to address these issues, the Procalcitonin Antibiotic Consensus Trial (ProACT) is a multicenter randomized study currently underway to determine the impact of PCT testing in US hospitals utilizing a “generalizable study design,” specifically looking at LRTIs.²⁰

Most single-center studies with successful outcomes in PCT testing are conducted in large, tertiary hospitals. Furthermore, details on their initial implementation processes are lacking. The optimal implementation strategy for PCT is not well defined, and this will likely vary based on the unique needs, culture, and barriers of an individual facility.²¹ There has been an established need for improved stewardship initiatives and reporting in smaller facilities which may face challenges of limited staff and resources.²² This article describes the education, implementation, and interim 6-month outcomes of PCT utilization in a rural, primary care hospital.

Methods

This was a single-center quasi-experimental before and after study to describe the implementation process and evaluate the impact of PCT implementation on antimicrobial usage compared with the same time period the previous year. Data collected from May to October 2016 (before PCT implementation) were compared with May to October 2017 (after PCT implementation). The study facility is a 65-bed Veterans Affairs (VA) primary care hospital. Licensed bed total includes 7 ICU beds and 15 mental health beds. The pharmacy and laboratory are staffed 24 hours a day. During the PCT implementation, there were 6 full-time hospitalists, not including rotating medical residents, fee-basis physicians, and nocturnists. The emergency department (ED) had 6 full-time physicians and 3 midlevel providers.

The facility's antimicrobial stewardship committee (ASC) consists of a pulmonologist, a pathologist, 3 clinical pharmacists, and 2 infection control nurses. There is no ID physician on staff to champion ASC initiatives. There is only 1 full-time clinical pharmacist to implement inpatient stewardship activities (in addition to other nonstewardship clinical responsibilities) Monday through Friday (7:30 AM-4 PM).

Table 1. PCT Algorithms for Lower Respiratory Tract Infections and Sepsis.

PCT in lower respiratory tract infections				
PCT value	<0.10 ng/mL	0.1-0.25 ng/mL	0.26-0.50 ng/mL	>0.50 ng/mL
Antibiotic recommendation	Strongly discouraged	Discouraged	Encouraged	Strongly encouraged
PCT in sepsis				
PCT value	<0.5 ng/mL	0.5-2.0 ng/mL	>2.0 ng/mL	
Interpretation	Low risk for sepsis	Consider sepsis	High risk for sepsis	
Antibiotic recommendation	Discontinue antibiotics if PCT <0.5 ng/mL or if Δ PCT >80%			

Note. PCT = procalcitonin.

Education and Rollout

Implementation of the PCT assay was first approved and supported by the facility's chief of staff, chief of medicine, and laboratory director. One ED provider and one hospitalist were approached by the ASC to serve as physician champions for this initiative. Physician champions served as liaisons between the ASC and the medical service and assisted in providing education, feedback, and support. Education began with medical providers 6 months prior to rollout of the PCT assay. A pharmacist from the ASC met with the hospitalists and ED providers during a regularly scheduled staff meeting. Educational handouts were provided on PCT pathophysiology, kinetics, limitations, and primary literature on PCT outcomes in clinical practice. These were discussed as a group. In addition, all were encouraged to become more familiar with the assay over the coming months. Two weeks prior to implementation, a representative from bioMérieux provided education to facility stakeholders, namely, laboratory personnel, the 2 physician champions, and pharmacy personnel. This education primarily covered PCT outcomes in clinical trials for LRTIs and sepsis with a focus on the latest FDA approval for mortality prediction in sepsis.

The hospitalists and ED personnel were educated again on the "go live" date. FDA approved and unapproved indications were reviewed as well as supporting medical literature. Application in clinical practice case examples, along with a multiple-choice quiz, was provided and discussed as a group. Limitations to the assay and false positives/negatives were reviewed again. A laminated pocket card was provided to all providers with therapy-guiding algorithms for LRTIs and sepsis (www.biomeriex-diagnostics.com/vidasr-brahms-pct).

Published PCT algorithms were discussed during education but not enforced during rollout (see Table 1). Based on feedback from other hospitals in the area, providers were given the general guidance to check PCT anytime they were considering starting antibiotics. Serial measurements every 24 to 48 hours are preferred, or if withholding antibiotics, consider rechecking PCT within 12 hours. Providers were also instructed to use the algorithm for de-escalation by stopping antibiotics according to PCT guidance.⁶

The PCT assay became available to order on May 1, 2017. Anyone with the appropriate scope of practice (licensed independent practitioner) was allowed to order PCT levels including clinical pharmacists, advanced practice nurses, and medical residents. The lab order for PCT was added to the existing sepsis clinical pathway as an available tool in the electronic medical record. The assay was augmented with prospective chart review and feedback, both verbally and in writing, from a clinical pharmacist.

Two months after the initial rollout, the ASC conducted a survey in an effort to engage providers and tailor future reporting and education needs. The details of this survey are reported elsewhere.²³ At this time, the ASC also began reporting facility antibiotic trends during monthly hospitalist meetings along with continued education on PCT utility and limitations. The education provided was based on feedback obtained from the facility survey. The monthly follow-up education was mostly performed in person; however, if a meeting could not be formed, the providers were sent emails with antibiotic utilization trends and a short, focused education piece.

All PCT orders were considered STAT orders and performed immediately unless specifically ordered for future draw (Vidas BRAHMS PCT). The laboratory collected PCT in lithium heparin tubes. This was done consistently to ensure that repeat levels are drawn in the same specimen type. PCT assays were run 24 hours a day, 7 days a week. PCT levels >2 ng/mL were considered critical values and reported to the on-call physician. All critical values were repeated and verified using the same specimen. The PCT algorithm was embedded into the lab report in the electronic medical record as a reminder for clinicians to interpret results. Quality control for high and low values was run once every 24 hours. Calibration was performed when a new assay lot of reagents was introduced or every 4 weeks.

Data Collection

The primary monitoring parameter was antibiotic days of therapy (DOT) per 1000 patient days (PD). One DOT represents the administration of a single antibiotic on a given day, regardless of dose or number of doses given. For example, a

Figure 1. Total number of procalcitonin assays ordered after the 2017 implementation.
 Note. Number of emergency department (ED) visits and hospital admissions (ADM) also provided.

patient receiving vancomycin, ceftriaxone, and azithromycin for 3 days would be 9 DOT, whereas a patient receiving levofloxacin for 3 days would be 3 DOT. Most antibiotic classes (both oral and intravenous) were included in the analysis except antituberculosis agents, oral vancomycin, and rifaximin. Antiviral agents and antifungals were also excluded. All patient wards were included in the analysis with the exception of the mental health ward.

Secondary measurements included number of PCT assays ordered each month and antimicrobial procurement costs. Admission rates during the 2 study periods as well as average LOS were compared. These methods were granted non-research status by the local Research and Development committee. The Institutional Review Board (IRB) concurred based on their analysis and waived their requirement for informed consent and study oversight.

Statistical Analysis

Reported statistics are largely descriptive. Before and after DOT/1000 PD measurements were compared using a chi-square test of proportions.^{24,25} Continuous variables were compared with a 2-sided Student *t* test with a 95% confidence interval (CI). A *P* value of <.05 was considered statistically significant. Analyses were performed in R Foundation for Statistical Computing version 3.4.1 (2017; Vienna, Austria).

Results

The number of PCT tests ordered declined over the first 6 months despite relatively static ED and hospital admission rates (see Figure 1). Days of antibiotic therapy per 1000 PD is delineated in Figure 2. There was a small trend toward decreased consumption, the most notable at 6 months: 856

DOT/1000 PD (before) versus 576 DOT/1000 PD (after) ($P < .0001$). The use of intravenous antibiotic consumption was evaluated but did not show a difference in overall 6-month proportions of DOT/1000 PD: 50.6% before versus 51.4% after ($P = .37$).

There was not a substantial cost savings in purchasing of antibiotic agents analyzed in DOT: \$114 189.79 before and \$139 829.26 after (difference +\$25 639.47). Admission rates did not differ between the study periods: 18.5% before versus 17.5% after ($P = .23$; CI: -0.66 to 2.70). Average length of hospital stay was not decreased by the intervention, and in fact increased: 3.6 days before versus 4.0 days after ($P = .02$; CI: -0.72 to -0.08).

The laboratory department reported the cost of the PCT assay as \$26 each, with an average expenditure of \$6 600 per month. Total PCT procurement cost for the facility during the 6-month study period was \$40 560. Average specimen timing was 24 minutes. Projected staffing hours devoted to PCT testing and reporting during the study period was 321 hours, not including hours dedicated to calibration and obtaining specimens.

Discussion

During the rollout phase of the intervention, providers overall were curious about the new assay if not somewhat skeptical. Feedback received were concerns that they would be pressured to withhold antibiotics on an infected patient based on PCT results. The physician champions were particularly useful in mitigating concerns from their colleagues. The application cases were helpful in generating discussion. Most providers expressed interest in gaining clinical experience with the assay and receiving monitoring data over the coming months.

Figure 2. Days of antibiotic therapy per 1000 patient days before procainin implementation (2016) and after (2017).

Although the primary purpose of the study was to provide descriptive statistics seen with PCT implementation, it is also important to note monitoring parameters. Although overall DOT/1000 PD analysis demonstrated a statistical difference between the 2 study periods, the decrease in utilization proportions was marginal. Given the short duration of observation and variation seen, this should be interpreted as interim analysis only and it would be premature to call this a positive intervention. Studies with negative or null findings are less likely to be published than those that support a positive finding with an intervention.²⁶ However, given the growing popularity of PCT testing, one can argue that much can be gleaned from negative findings that may prompt clinicians to critically evaluate current assumptions.^{27,28} Of related concern, there is evidence that some hospitals may not adequately monitor the effectiveness of new and existing antimicrobial stewardship initiatives.²⁹

McGregor et al highlighted the need to publish stewardship interventions in a broad array of patient care settings, as what may work for one facility may not work for another.³⁰ Smaller, primary care hospitals may have lesser patient acuity needs than tertiary centers, making endpoints like decreased ICU LOS and decreased sepsis mortality rates less applicable. Smaller hospitals may not have 24-hour staffing in the laboratory, limiting reliable PCT availability. These facilities may also lack ID physicians to champion antimicrobial stewardship initiatives. In cases where there is any ambiguity in the clinical presentation, it may require the expertise and influence of an ID physician to persuade a change in therapy.³¹

Negative PCT studies have been criticized for lack of education and stewardship during implementation.³² The education prior to rollout was extensive. This was followed by

further engagement and continued education that was tailored to the facility's needs using interactive, rather than passive, teaching methods such as clinical case development³³ and group discussion. PCT findings during patient stays were routinely discussed with providers, both verbally and in writing, by a clinical pharmacist. There were 85 recorded interventions related to PCT during the study period, most commonly for de-escalation or discontinuation of therapy (acceptance rate was not recorded).

The article by Fung et al suggests that when implementing PCT, it should be clearly defined up front who will order it and on which patients.¹⁹ In addition, the ProACT study focused eligibility criteria on those patients who are most likely to be impacted by PCT guidance (LRTI).²⁰ This conflicts with the shotgun approach used during implementation, and this could be a key lesson learned. At a minimum, this likely would have curbed the reported expenditure. Furthermore, by allowing free reign on PCT testing in disease states other than LRTIs and sepsis, this could have clouded the picture on when this assay is most beneficial. A lack of clear guidance on how to interpret results can result in overutilization with minimal efficacy. To minimize unnecessary testing, providers should ask themselves if and how the results are going to change their management.^{34,35}

One observation early in the study period was that providers were willing to de-escalate antibiotics based on a low PCT, but not discontinue them entirely. For patients who remained hospitalized during their entire antibiotic course, providers rarely utilized PCT to shorten therapy despite recommendations from pneumonia and sepsis guidelines and preferred to treat for prespecified durations.^{8,11} It is important for providers to realize that PCT has limited utility as a diagnostic tool and most data indicate this is better utilized as a

tool for antibiotic discontinuation.³⁶ Facilities may need to place particular emphasis on this during initial PCT education. Education during the latter stages of the study period tended to focus on checking PCT later in therapy for antibiotic discontinuation. Another observation was that negative PCT levels were often ignored in cases of severe respiratory failure and radiographic evidence of pneumonia. These observations are anecdotal and not obtained objectively; however, a recent study on provider insights on PCT testing supports these findings.³⁷

Published PCT algorithms were not enforced in the rollout, and this would be difficult in any nonstudy environment. Research shows that poor adherence to published PCT algorithms in real-world practice is common.³⁸ This is thought to be due to unfamiliarity with the assay, reluctance to change prescribing habits, lack of incentive, or a discordant clinical picture. Nonetheless, the ASC members were encouraged by observational, real-world reports that antimicrobial reduction could be obtained without strict protocol enforcement.^{14,39,40} There was a mixed level of alacrity among the providers regarding PCT utilization and adherence. Feedback from the providers during monthly discussions was that ultimately their trust in their own clinical judgment outweighed their trust in the assay and they did not want to risk withholding antibiotics. In theory, barriers in practice change can be overcome with time and experience.¹⁷ Unfortunately, for this intervention, waiting for practice change comes at a substantial cost.

Prior to the PCT rollout, other antimicrobial stewardship initiatives were already in place including an intravenous to oral conversion policy, computerized automatic stop dates (10 days), annual antibiogram reporting, antimicrobial restriction, prospective audit and feedback, pharmacokinetic dosing, and a stewardship note directed specifically at pneumonia treatment duration.⁴¹ Days of antibiotic therapy is routinely and openly discussed and documented during daily rounds. The only rapid detection technology in place is a Group A *Streptococcus* chromatographic immunoassay, fluorescent immunoassay for Influenza A and B, and a polymerase chain reaction (PCR) assay for *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus*, the latter primarily used for surveillance. None of these methods were introduced during the same time frame as the PCT assay. Despite these interventions, there is room for improvement in antibiotic consumption at the study facility. The argument of maxing out stewardship potential does not seem plausible as participation in Medication Use Evaluations consistently revealed that treatment courses for common IDs exceeded those recommended in national guidelines.⁴¹⁻⁴³

Unintended Consequences

With any new intervention, the law of unintended consequences can be expected. It was observed that in a few cases where PCT levels were incongruent with the clinical picture,

further workup was obtained to rule out an infectious process, potentially subjecting the patient to unnecessary testing and increasing the overall cost of hospitalization.³³ This was not objectively evaluated, however, and could be an area of needed future research.

During routine chart review, it was observed that a calcitonin level was ordered twice and a prolactin level was ordered on 2 occasions. It was felt that these were inadvertently ordered instead of a PCT level given the supporting documentation in the chart. Given the observational nature of this study, these may be underreported events.

During the initial phase, the laboratory reported that the actual number of PCT assays utilized exceeded predicted numbers by 4-fold. Prior to rollout, the department was initially budgeted for 2 boxes per week based on feedback from hospitals of similar size. The number of orders fell off gradually, however; facilities should be prepared for an initial spike in utilization. In part, this could also be attributed to repeating critical values and performing quality analysis. This could be especially wasteful during sepsis monitoring, where PCT levels >2 ng/mL are expected. Facilities may wish to discuss local policies for efforts to curb unnecessary repeat testing.

Limitations

There are several limitations to consider with the interpretation and applicability of these results. First would be the quasi-experimental study design. The reported outcomes were not a result of randomization, and limitations in internal validity should be considered. Potential confounding variables could include changes in providers during the 2 study periods. Any differences seen could be due to increased engagement of providers and reporting rather than the PCT intervention itself. In addition, given the small facility size, a few outliers could have a substantial impact on DOT. Patients were not matched for comparison, and the impact of drug shortages was not accounted for in cost comparisons.

The utilization of DOT/1000 PD as an endpoint to determine PCT impact should be examined. The optimal monitoring parameter for PCT effectiveness is not yet defined. Most randomized controlled trials utilize duration of antibiotic therapy or "antibiotic free days" per patient case as an endpoint of PCT effectiveness. This is time-consuming, may require IRB approval, and requires detailed chart review; thus, rural facilities should determine up front whether they have the manpower for this type of monitoring. DOT, with a common denominator (1000 PD) to adjust for variations in bed utilization, is often utilized by ASCs to monitor hospital-specific interventions and is considered a more meaningful outcome to primary stakeholders.⁴⁴ Unfortunately, this method also encompasses antibiotic treatment durations that would not be affected by PCT testing such as endocarditis, cellulitis, perioperative antibiotics, or localized infections. Another notable limitation of this endpoint is that it excludes

outpatient antibiotic prescribing. Defined daily dose (DDD) methods would have the same limitations.

At the time of writing, a retrospective cohort study focusing on PCT impact on LRTIs in the study facility was underway to provide a matched patient comparison with more detailed endpoints. Certainly, there could be positive outcomes related to PCT testing that will be uncovered with a retrospective cohort study focusing on respiratory infections or perhaps with a longer observation period. However, at such a steep projected expense, facilities will have to decide what constitutes an acceptable return on investment.

Endpoints like changes in pathogen resistance are not addressed, but given the number of antimicrobial stewardship efforts, changes in the facility's annual antibiogram trending would not likely be attributable to any single intervention.²⁸ Safety and clinical endpoints were beyond the scope of this study.

Limitations in broad applicability to similar sized facilities should be noted. In 2014, the Veterans Health Administration (VHA) mandated that antimicrobial stewardship programs be developed in their hospitals through VHA directive 1031. This directive states that local administrative support is expected, which may not be applicable in non-VA facilities. In addition, the VHA National Antimicrobial Stewardship Taskforce (ASTF) was developed in 2011. The ASTF provides monthly educational webinars and other supportive measures for ASCs available to all VA facilities.⁴⁵ Non-VA hospitals may not have such resources available free of charge. Resources from the Centers for Disease Control and Prevention (CDC) are readily available, however, and they recently updated their recommendations in implementing core elements of antimicrobial stewardship at small and critical access hospitals.⁴⁶

The 6-month interim data were reported to the ASC and Pharmacy and Therapeutics committee. The recommendation was to continue with ongoing monthly education efforts, monitoring and reporting for another 6 months to evaluate 12 data points for comparison.²⁴ They also wanted to consider the results of the ongoing retrospective cohort study in LRTIs prior to making a decision on the fate of the PCT assay at the facility.

Conclusion

This report provides much needed real-world, nonstudy experience with PCT testing in a US rural facility. There was no detectable benefit in antibiotic purchasing costs, admission rates, or LOS. DOT/1000 PD outcomes after 6 months of utilization were varied but overall decreased. The optimal PCT efficacy endpoint for hospitals is not well defined. PCT testing appears to be a feasible addition to existing antimicrobial stewardship programs in smaller hospitals; however, facilities should clearly define what is considered a successful endpoint prior to implementation with vigorous monitoring and reporting after implementation.

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