

**Using the epoc<sup>®</sup> Point of Care Blood Analysis System  
Reduces Costs, Improves Operational Efficiencies, and  
Enhances Patient Care**

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## CLINICAL DILEMMA

Health care providers depend on the results of clinical laboratory testing to screen, diagnose and treat disease, and to monitor the results of treatment. Despite standard laboratory operating procedures and compliance monitoring, numerous factors can compromise the integrity of laboratory testing, resulting in errors and preventing prompt delivery of test results to providers.

An oft-cited report from the Institute of Medicine indicated that as many as 98,000 deaths and more than 1 million injuries occur each year in the United States as the result of medical errors. Included in this number are diagnostic errors, such as errors or delays in diagnosis, failure to employ indicated tests, use of outmoded tests, and failure to act on the results of monitoring or testing.<sup>1</sup>

Errors in clinical laboratory testing can occur any time during the preanalytical, analytical, or postanalytical phases and, in general, can be attributed to instrumental problems or operational processes that have gone awry.<sup>2</sup> Preventing errors promotes patient safety, improves patient outcomes, and reduces the cost of unnecessary retesting.

## THE POINT-OF-CARE SOLUTION

Point-of-care testing (POCT), first introduced in the 1990s, challenged the established paradigm of traditional laboratory testing methods that required the transportation of collected samples away from the patient to a central or near-patient laboratory while providers awaited the delivery of test results before diagnosis and treatment of the patient could occur. In contrast, POCT, which is typically performed at the patient's bedside and may also occur in surgical suites, clinician offices, or in small decentralized laboratories, provides nearly instantaneous results. As health care providers focus increased attention on patients' needs, POCT was perceived as one way to reduce turnaround time and improve the quality of the entire service provided. Thus, the overall effects of POCT can be assessed in terms of the benefit to the

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diagnostic or treatment strategy and overall health outcome of the patient.

Whereas first-generation POCT instruments offered the promise of faster turn-around time and improved provider efficiency, these benefits were often offset by

higher operating costs and greater oversight requirements resulting from the need to monitor refrigerated storage and room temperature expiration dates. The increased pressure on health care providers to reduce costs, while continuing to improve patient care has led to the

development of improved POCT instruments. Today, second-generation POCT instruments are available that fulfill the initial promise of rapid test results but also do so at a lower cost and with fewer oversight requirements.

## **GOALS OF POCT**

The objective of POCT is to generate a test result quickly so that appropriate treatment can be implemented in a timely fashion, leading to improved clinical and economic outcomes. Any test will be beneficial only if the provider takes appropriate action based on the result. Thus, the rate-limiting step in improving clinical outcomes and reducing length of hospital stay may not be rapid delivery of a test result, but acknowledgement of the result (communication, comprehension, and action).

## **THE PINNACLE EXPERIENCE WITH POINT-OF-CARE BLOOD GAS TESTING**

Formed in 1997 through the consolidation of the Polyclinic Medical Center and Capital Health System, and a second consolidation a year later with Community General Osteopathic Hospital, Pinnacle Health is the leading hospital and health care system in Central Pennsylvania, offering services from prenatal care to geriatrics. As a nonprofit organization, the health system is dedicated to the health and wellness of the people of Central Pennsylvania, and has a long tradition of caring, dating back more than 130 years. Pinnacle Health System comprises 2 acute care hospitals, with a total of 590 beds, 41 critical care beds, 32 level III neonatal intensive care beds, and inpatient rehabilitation.

The Respiratory Care department at Pinnacle Health includes 53 staff and serves a diverse population from neonates to geriatric patients in a multitude of settings. The department provides 24-hour services to the medical/surgical intensive care units (ICUs), cardiothoracic ICU, neonatal intensive care unit (NICU), a 10-bed respiratory unit for long-term ventilator patients and patients with chronic COPD, as well as the general medical/surgical and inpatient rehabilitation units. The department staff also attends to codes and serves as a vital member of the Rapid Response Team.

Not unlike many other respiratory departments we are challenged with reducing health care-associated costs while continuing to deliver high-quality patient care. Over the past decade staffing has been reduced and the need for efficiency has grown. In the fall of 2007, the Respiratory Care department, in an effort to improve patient care and streamline the process for blood gas testing, began to investigate the opportunities for POCT in our health care system.

The epoc® Blood Analysis System (Epcal, Inc., Ottawa, ON, Canada), which had been demonstrated to department leadership while in its earliest development stages, was selected after a thorough investigation of the available POCT options. The epoc® instruments were introduced as the sole blood gas analyzing system at Pinnacle Health System in October of 2009.

### ***Features of the epoc® Point of Care Blood Analysis System***

The epoc® Point of Care Blood Analysis System is the only wireless bedside testing solution to use “smart card” technology. This breakthrough technology provides patient test results directly to a hand-held mobile computer while at the patient’s bedside. Fresh blood is passed across biosensors on the epoc® test card, and results are sent to the mobile computer in approximately 30 seconds. Other POCT systems often require more time between sample acquisition, sample entry, and analysis, which may result in sample degradation and possibly compromised results. Test cards can be placed at the patient bedside with the card reader, carried by the therapist, or stored in the operating suite.

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The epoc® Point of Care Blood Analysis System is easy to use, requires no refrigeration of consumables, and connects and interfaces easily with the facility’s existing wireless network. A complementary system, known as the epoc® host, allows the user to enter patient information and to generate an accession number at the bedside, eliminating the need to locate an accession number and create or modify an order on a laboratory computer. The user-friendly epoc® host does not require any codes to input information, which has increased operator efficiency, decreased mistakes, and simplified and shortened the orientation process. Using this system, therapists have the ability to capture and document key respiratory parameters at the bedside while performing the testing. The epoc® Blood Analysis System also features bar code scanning for patient and operator identification, minimizing transcription errors and improving patient safety.

The epoc® data manager (EDM) provides information that enables providers to monitor both patient results and work efficiency. Therapists can access the EDM to determine whether they have entered correct information, allowing the results to be transmitted into the hospital information system (HIS) and then into the patient’s chart. The EDM also provides statistics documenting how well therapists utilize the system. We have used the information gathered from the EDM to improve staff education, analyzer allocation, and work flow.

### ***Correlation Results***

Our experience with the epoc® Point of Care Blood Analysis System has shown that the quality of test results from this instrument is equal to the results generated by traditional blood gas or

chemistry analyzers run in a traditional laboratory setting. We analyzed more than 50 samples in duplicate and triplicate comparing the epoc® Blood Analysis System and the standard. Hematocrit, sodium, and potassium analytes were also compared with the main laboratory standard. The method comparison, calibration verification, and results analysis were performed in accordance with the Clinical and Laboratory Standards Institute. The results demonstrated a strong correlation with the comparison methods within a 95% confidence interval.

### ***Patient Care Benefits***

We realized several patient care benefits after implementing POCT using the epoc® blood analyzers in our Respiratory Care department:

***After using the epoc® Point of Care Blood Analysis System for 8 months, a 48% reduction in operating costs over the previous year was achieved.***

- The volume of blood necessary for analysis has been reduced from approximately 0.2 cc necessary for traditional bench blood gas analyzers to 100 µL for the epoc® Blood Analysis System, making the experience less traumatic for the patient.
- The therapist no longer has to leave the patient to transport the sample to a central location, await the results, and then return to the bedside.
- The cycle time from sample introduction to results has been reduced from approximately 3 minutes to about 30 seconds.
- The almost instantaneous delivery of blood gas and electrolyte results at the bedside enables the therapist to effect change to clinical care in a much more efficient manner.
- The immediate introduction at the bedside of a patient's blood sample into an epoc® test card minimizes preanalytical sample degradation.
- Data entry and transcription errors have been minimized as a result of the bar code scanning process that is part of the epoc® Blood Analysis System. Additionally, the epoc® Blood Analysis System provides automated monitoring of all steps in the testing process, assuring error detection and reduction.

### ***Operational Benefits***

When the epoc® instruments were introduced in October of 2009, our 5-year projected cost reduction was \$195,000. By the end of June 2010, we achieved a 48% reduction in operating costs compared with 2009, with the same utilization and sample volume. This represents an 8 - month break-even return on investment.

## **SUMMARY**

In our Respiratory Care department, implementation of POCT using the epoc® Point of Care Blood Analysis System has enabled therapists to obtain blood gas testing results in a fraction of the time it took previously using traditional bench instruments. Preanalytical sample degradation has been minimized, data entry and transcription errors have been reduced, and operating costs have decreased.

## **ABOUT PINNACLE HEALTH SYSTEM**

Pinnacle Health System has achieved numerous awards and recognitions:

- Thomson Reuters 100 Top hospitals: Cardiovascular Benchmarks for Success winner 2008, 2009
- American Heart Association Get with the Guidelines – Heart Failure Gold Achievement Award 2010, 2011
- Society of Chest Pain Centers; Accredited Chest Pain Center 2010
- The Joint Commission, Primary Stroke Center Certification 2010
- The Joint Commission, Center of Excellence in Diabetes Care, Gold Seal Award
- Us News and World Report's 18<sup>th</sup> Annual America's Best Hospitals: Neurology and Orthopedics
- American Nurses Credentialing Center; Magnet recognition, redesignation 2010
- Center of Excellence, American Society of Bariatric Surgery

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