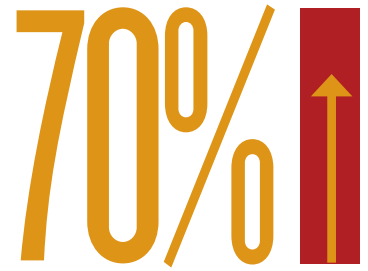


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OVERHAULING  
POCT STRATEGY



Increase in clinician  
response to  
improved POCT alerts

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## Interdisciplinary Teams Show Tenacity in the



# Pursuit of Quality

BY KIMBERLY SCOTT

**C**linical laboratorians are taking the lead in more than just SARS-CoV-2 testing.

Across the globe, laboratory medicine professionals are finding ways to amplify their powerful data and expertise as part of integrated healthcare teams.

One area where laboratorians are gaining visibility is in engineering healthcare systems for high quality care. Within the laboratory, quality usually means avoiding and correcting internal errors. However,

the quality problems with the largest effect on patients often happen in the pre- and postanalytical phases of testing. Such arenas are ripe for the scientific insight and medical data laboratorians have to offer, and they present unique opportunities for collaboration with clinical colleagues.

Multiple teams have been recognized by AACC, Abbott, and other leading healthcare organizations through the UNIVANTS of Healthcare Excellence program for quality, patient-focused

achievements, five of which are profiled in this issue. From reducing inpatient daily blood draws to increasing detection of acute myocardial infarction in women to optimizing detection of thyroid dysfunction in pregnant women, the initiatives profiled below have achieved measurable, innovative impact within their health systems.

### REDUCING DAILY INPATIENT BLOOD DRAWS

After noticing that many patients had daily blood tests

conducted without a stop date, a team at St. Paul's Hospital in Vancouver, British Columbia, decided to investigate further. They analyzed 2 years of inpatient laboratory data and found that 1,575 patients in the 500-bed system had experienced daily blood test runs of 14 days or more. Chart reviews revealed that 30% of patients had months of identical daily testing that was not contributing to their care and showing only expected homeostatic fluctuations.

In 2019, the team developed a guideline that any order written as “daily” would last only 3 days and then require reassessment by the ordering physician. This policy change led to a demonstrable decrease in core lab workload and the elimination of extended runs of daily blood draws except when specifically ordered by physicians.

**28%**  
**Reduction in the number of patients undergoing daily phlebotomy for more than 10 consecutive days**

**\$4,500**  
**Monthly savings in supplies and phlebotomy time**

St. Paul's Hospital, Vancouver

The guideline reduced the number of patients undergoing daily phlebotomy for more than 10 consecutive days by 28%, reported Janet Simons, MD, medical director of pre- and post-analytics in the pathology and laboratory medicine department and co-medical director of clinical informatics at Providence Health Care.

In a country with publicly funded universal healthcare, opportunities to reduce healthcare costs are paramount, Simons noted. This initiative, recognized with distinction by the UNIVANTS of Healthcare Excellence program, is estimated to save \$4,500 a month in supplies and phlebotomy time at St. Paul's Hospital alone. Other hospitals in the region have since adopted similar protocols, adding to the savings for the province. Compounding the benefits, the team also found that this shrinks the need for downstream follow-up testing, reducing iatrogenic anemia and the need for transfusions.

“Doctors don't often think about bloodwork as being invasive or a big deal, but for patients, especially when they get poked every day for the whole hospital stay, bloodwork can be the worst part of their day and can really negatively affect their hospital experience,” Simons said. “If we have

to put patients through that, it should be because the information we are getting really matters to their care.”

### INCREASED DETECTION OF ACUTE MYOCARDIAL INFARCTION IN WOMEN

Improving the quality of care often means that clinical laboratorians approach problems from a population-based level. For example, sex differences are common across multiple aspects of cardiovascular care, including diagnosis, treatment, and outcomes. Large, multi-center randomized clinical trials have shown that women are under-recognized for acute myocardial infarction (AMI) and consistently have higher fatality rates compared to men, even adjusting for age and comorbid conditions. Women tend to have atypical symptoms when presenting to emergency departments (EDs) and tend not to be recognized for experiencing AMI without male-patterned chest pains symptoms.

A greater awareness of this disparity is behind guidelines recommending implementation of sex-specific upper reference limits (URLs) into clinical pathways for patients that present to the ED with suspected acute coronary syndrome. In fact, research suggests the differences between sexes in the URLs of seemingly healthy individuals can be as high as 50%.

Recognizing that poorer outcomes for women post-intervention may result from delayed diagnosis, and with the full appreciation that some men may be more aggressively treated based on use of lower URLs that lack sex discrimination, the Biochemistry and Immunology Department at Kokilaben Dhirumhai Ambani Hospital & Medical Research Institute (KDAH) investigated moving from an overall URL for high-sensitive troponin I (hsTnI) to sex-specific URLs consistent with guideline-based care.

Before the initiative was implemented in 2018, the previous threshold for both men and women was 26ng/L. After implementation, the cutoff threshold value of hsTnI for women was set at 16ng/L and for men, 35ng/L. Implementation of sex-specific URLs at the hospital identified an additional 14% of at-risk women with potential acute myocardial infarction during a 6-month

period from October 2018 to March 2019. This in turn also decreased the number inappropriately diagnosed with acute myocardial infarction by 3%. The initiative was recognized with achievement by the UNIVANTS of Healthcare Excellence program.

In the evaluation of chest pain, the standard recommendation for serial troponins is 0, 3, and 6 hours for conventional troponin I and 0 and 3 hours for hsTnI. For cTnI, the team considered testing in compliance to protocol if a minimum of two serial tests were done, which occurred only 7% of the time. With hsTnI, however, the team could accomplish the prescribed two serial tests in 93% of cases.

Changes in the chest pain protocol have allowed emergency clinicians to diagnosis acute coronary syndrome (ACS) faster with a 3-hour protocol. Other changes KDAH made included skipping the immediate ED assessment and directly taking the patient for an electrocardiogram (ECG). If the ECG showed no new ischemic changes, hsTnI was tested at 0 hours and 3 hours, skipping the sixth hour testing necessary in serial protocols with cTnI, speeding the rule-in and rule-out of ACS.

Every unnecessary procedure and/or hospitalization that can be eliminated helps to reduce costs across the health ecosystem, noted Barnali Das, MD, a consultant in the biochemistry and immunology department at KDAH. With average length of hospital stay in patients with suspected ACS now reduced by 43%, the resources and costs associated with that time were also reduced, she said.

“The average emergency department length of stay is 7 hours for cTnI and 4 hours for hsTnI,” she explained. “This time-effective testing protocol has better acceptance by patients as well as ED physicians. Since a majority of patients in our hospital pay out of pocket, their acceptance and compliance to the hsTnI-based chest pain protocol markedly improved.”

### STRATEGIC ACTIVATION OF POINT-OF-CARE TESTING

Point-of-care (POC) testing can offer substantial benefits to patients in specific settings but must be strategically controlled and integrated into high-quality clinical care pathways to ensure accurate and timely results.

When POC testing was first implemented at the Aga Khan University hospital in Nairobi, Kenya, it was not through an integrated team. Test results were not standardized nor was the equipment maintained under a quality system. This led to substantial gaps in care with avoidable discrepancies, risks, and medical errors. Specific areas of concern included quality control (QC), manual transcription errors in patient reports, and mismatched result reporting/patient identification.

A cross-functional leadership effort at the Aga Khan University hospital invested in an overarching, patient-centric POC strategy that was lead and implemented by laboratory medicine in partnership with various departments.

According to John Waigwa, laboratory quality coordinator for the hospital, the collaborative overhaul radically changed internal processes, as well as patient flow, enhancing care at the hospital.

“Ultimately, the point-of-care strategy expanded to 33 additional sites,” Waigwa said. “In all cases, the accuracy and timeliness of point-of-care testing improved, ensuring high-quality results for our patients, as well as increasing the confidence of the clinicians.”

Altogether, there was a five-fold reduction in total medical errors, including elimination of mis-matched patient results, mitigation of pre-analytic confounders (20% reduction) and substantially enhanced compliance with routine QC. In addition, improved flagging of critical/panic values on POC testing devices resulted in a 70% increase in actions associated with alerts.

Substantial improvement in data capture and associated documentation/billing processes resulted in reduced revenue loss of KES 19,109,800

(\$177,400) from June to December 2019. The initiative was recognized with distinction by the UNIVANTS of Healthcare Excellence program.

“Medical errors can have catastrophic effects on patients, resulting in potential medication errors, injury, and possible death,” said Majid Twahir, chief of staff and associate dean of clinical affairs for the hospital. “With medical errors being 20 times more likely in Africa compared to developed countries, a five-fold reduction has profound impact on mitigating preventable adverse outcomes and downstream costs.”

**OPTIMIZED DETECTION OF THYROID DYSFUNCTION DURING PREGNANCY**

Thyroid dysfunction during pregnancy (both hyper- and hypothyroidism) can be associated with increased risk of adverse outcomes for mothers and offspring. Optimal detection and management of thyroid dysfunction can decrease potential complications. But too often, thresholds used for diagnosis of hypothyroidism during pregnancy are not set correctly, leading to over- and underdiagnosis. To optimize the assessment of thyroid dysfunction, measurement method and regional factors (such as iodine intake) should be considered, according to guidelines. Determination of anti-thyroid peroxidase-antibody (Anti-TPO AB) is also recommended, as higher rates of complications are seen during pregnancy in women with Anti-TPO antibodies and increased thyroid-stimulating hormone (TSH).

To reduce complications in pregnant women, an integrated clinical care team at Hospital Virgen de la Luz in Cuenca, Spain, established improved reference ranges for TSH and improved the accuracy of diagnosis for

**9.2%**

**Increase in pregnant women accurately classified as euthyroid instead of hyperthyroid**

**12,800 euros**

**Savings within first year of implementation**

Hospital Virgen de la Luz

thyroid dysfunction during pregnancy, avoiding misclassification of hyper- and hypo thyroidism. Prior to 2019, pregnancy screening within the first trimester used the same reference interval as a healthy adult population (TSH from 0.35 to 4.94 mU/L). After a comprehensive review of records and pregnancy outcomes, the team established a new reference interval of 0.064 to 3.50 mU/L.

The results of this program were significant for pregnant patients. Of the 794 pregnancies after implementation of outcome-based ranges, 9.2% were more accurately classified as euthyroid when they previously would have been classified as hyperthyroid, noted Enrique Prada de Medio, head of laboratory medicine and pathology at the hospital. As every diagnosis of hyperthyroidism requires follow-up visits with the endocrinology department, 73 pregnant women (9.2% of 794) had more streamlined care while avoiding extra costs.

“Optimized detection and treatment of thyroid disorders enables better patient management, reducing complications and lowering overall cost of care,” de Medio explained. “Mitigating these costs of 176 euros per visit per patient results in annualized savings of more than 12,800 euros for the first year of implementation.”

The thyroid dysfunction initiative was recognized with achievement by the UNIVANTS of Healthcare Excellence program.

**REDUCING POST-OPERATIVE COMPLICATIONS IN CARDIAC SURGERY PATIENTS**

Perioperative coagulopathy and postoperative bleeding are the most common complications in patients

**14%**

**Increase in at-risk women identified with potential acute myocardial infarction**

**43%**

**Reduction in average length of stay in patients with suspected acute coronary syndrome**

Kokilaben Dhirumhai Ambani Hospital & Medical Research Institute

undergoing cardiac surgery, especially when the cardiovascular surgery is associated with cardiopulmonary bypass (CPB). Approximately 20% of patients present with significant post-operative bleeding after cardiovascular surgery, and 5% of these patients require unplanned re-exploration (up to 7% in valve surgery).

Often, managing the bleeding associated with CPB leads to excessive use of allogeneic blood products and hemostatic pharmacological agents. Blood transfusion is associated with increased morbidity (cardiac and non-cardiac adverse events), hospitalization cost, and mortality. Early diagnosis and targeted and effective therapy of perioperative and postoperative coagulopathy are critical.

Some studies suggest that implementation of viscoelastic POC tests,

such as rotational thrombo-elastometry, in conjunction with a specific algorithm for coagulation management in cardiac surgery, allow for better control of hemostatic pathology.

A clinical care initiative implemented by the Hospital Virgen Macarena in Sevilla, Spain, used pre- and post-implementation comparison of transfusion rates, the main associated cardiac surgery complications rates, and other clinical outcome parameters to assess the impact of viscoelastic POC tests with algorithm-based coagulation management in cardiac surgery with cardiopulmonary bypass.

The POC initiative reduced the length of stay in the intensive care unit (ICU) from 6.0 days to 5.3 days, and the incidence of cardiac complications in the ICU decreased (57.8% to 55.8%), especially acute postoperative pericarditis (3.6% vs. 1.2%), according to Isabel Rodríguez Martín, MD, PhD, a physician in the clinical biochemistry department.

“We observed a lower rate of ICU admissions for viscoelastic testing patients – 4.6% versus 2.7%, a decrease in total hospital stay, and a decrease in hospital mortality associated with cardiac surgery, from 4.5% to 2.4%,” she said. “Reducing readmissions to the ICU saves the system money, allows optimal resource utilization, and reduces poor patient outcomes.”

Although the cost of POC viscoelastic testing was higher than conventional laboratory coagulation

tests (52.30 euros vs. 22.70 euros), the overall cost of blood products plus laboratory testing was less in the viscoelastic testing group (20,803 euros vs. 31,059 euros). Costs associated with hematological complications also decreased significantly in patients who underwent cardiac surgery after the implementation of viscoelastic testing.

The cardiac surgery initiative was recognized with distinction by the UNIVANTS of Healthcare Excellence Program.

### THE SECRET WEAPON FOR TOPPLING QUALITY BARRIERS

Each of these initiatives demonstrates how when clinical laboratorians get involved with care teams outside the laboratory, overall care quality and outcomes improve. Beyond simply providing test results, laboratorians are finding success taking leadership roles in helping diagnose health conditions earlier when they can be treated most effectively. Not only are these laboratories performing crucial testing, they also are helping to develop integrated care practices that are improving current standards of care across the healthcare enterprise.

To learn more about these and other 2020 UNIVANTS winners, visit [univantshce.com](http://univantshce.com). ■

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## 4.5% to 2.4%

Reduction in hospital mortality associated with cardiac surgery

## 31,058 euros – 20,803 euros

Reduction in cost of blood products plus laboratory testing

Hospital Virgen Macarena

## UNIVANTS 2020 Teams Recognized in This Issue

**Reducing Medical Errors and Enhancing Patient Care through Pathology Lead Strategic Activation of Point-of-Care Testing in an Emerging Market** | Aga Khan University Hospital | John Waigwa, Serafino Gatwiri, Samuel Ng'aaru, Gregory Muruga, Nancy Kuniyiha, and Daniel Maina

**Optimized Detection and Management of Thyroid Dysfunction During Pregnancy for Improving Maternal and Offspring Outcomes** | Hospital Virgen de la Luz | Enrique Prada de Medio, Dulce María Calderón Vicente, Andrés Moya Plaza, Vanesa Martínez Madrid, and Sandra Serrano Martínez

**Reduction of Inpatient Daily Blood Draws With Data Science and Clinical Collaboration** | St. Paul's Hospital | Janet Simons, Deborah Shaw, Mirjana Besir, Astrid Levelt, and Camille Ciarniello

**Increased Detection of Acute Myocardial Infarction in Women Using Sex-Specific Upper Reference Limits in Clinical Pathways for Patients Presenting With Suspected Acute Coronary Syndrome** | Kokilaben Dhirubhai Ambani Hospital & Medical Research Institute | Barnali Das, Jamshed Dalal, Sanjay Mehta, Prashant Nair, and Santosh Shetty

**Reducing Post-Operative Complications in Cardiac Surgery Patients** | Hospital Virgen Macarena | Isabel Rodríguez Martín, Jesús Villanueva Mena-Bernal, Francisco Javier González Fernández, Juan Galán Páez, and José Garnacho Montero