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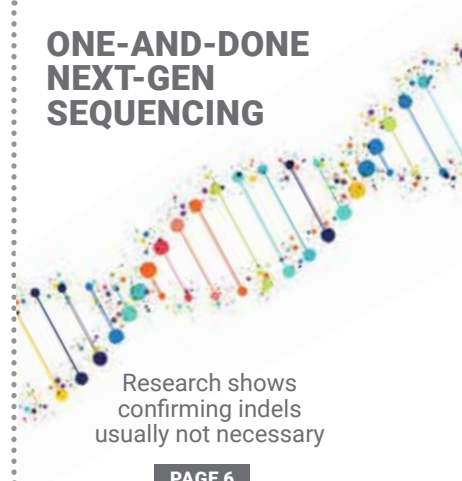
Clinical
Laboratory
News

An ADLM Publication | Volume 49, Number 8

ONE-AND-DONE
NEXT-GEN
SEQUENCING

Research shows
confirming indels
usually not necessary

PAGE 6



New Guidance on Diabetes Testing



The Next Frontier in Microbiology



Advancing the Lab's Data Infrastructure



Department of
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Endocrinology



Type 1 Diabetes

An Accurate Diagnosis Requires The Right Tools

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“Avidity testing ... differentiates between acute and chronic infections by assessing the strength of antibody binding to antigens, reflecting the immune response's maturity.”
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ADLM Hosts Congressional Briefing on Pediatric Reference Intervals

On October 10, the Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC) hosted a congressional briefing where experts in laboratory medicine described the need for more accurate pediatric reference intervals (PRIs) and the Centers for Disease Control and Prevention's (CDC's) plan for addressing this problem. PRIs are vital for effectively interpreting children's test results, yet there is considerable inconsistency in existing PRIs, putting children at risk for misdiagnosis and inappropriate treatment. The reference intervals available for many diagnostic tests fail to reflect normal health conditions in children, who may not always be able to communicate their symptoms like adults.

CDC projects it will need an additional \$10 million from Congress to establish appropriate PRIs. Over the next 10 years, the agency plans to improve PRIs by leveraging its existing infrastructure, particularly the National Health and Nutrition Examination Survey (NHANES). This program will be used to collect more data on children and develop new laboratory methods for various biomarkers.

● ADLM PROVIDES INPUT ON INITIATIVE TO MODERNIZE CDC

The Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC) wrote to congressional leaders to provide input on modernizing the Centers for Disease Control and Prevention (CDC), highlighting four patient-focused areas CDC should take the lead on or be involved in.

The association urged Congress to designate funding for CDC to improve the ability to interpret pediatric test results, including through the development of more accurate pediatric reference intervals. On a broader scale, harmonization of clinical laboratory tests leads to consistent diagnosis and early interventions, as evidenced by the success of cholesterol test harmonization. ADLM noted that if Congress invests in CDC's ongoing commitment to support clinical laboratory testing, the quality of lab tests can be greatly enhanced

without the need for additional Food and Drug Administration oversight, such as the agency's push to increase their oversight of laboratory developed tests, which ADLM opposes.

Additionally, the letter stressed the need for CDC to have the capacity to oversee pandemic surveillance efforts in coordination with state and local health departments. Congress should provide funds necessary for CDC to rebuild public health infrastructure and prepare for future health crises, ADLM wrote.

● CMS STATEMENT ON CURRENT STATUS OF BLOOD TESTS FOR ORGAN TRANSPLANT REJECTION

The Centers for Medicare & Medicaid Services (CMS) released a statement confirming that neither CMS nor the Medicare Administrative Contractors (MACs) have made changes that affect patients' ability to have

blood tests used to monitor for organ transplantation rejection. Traditionally, the standard for assessing transplant rejection or injury has been a biopsy in conjunction with serologic criteria. Because biopsies are invasive and carry risks, tests that negate the need for a biopsy can be used for patients with transplanted hearts, lungs, or kidneys, as laid out in a Local Coverage Determination (LCD).

The Molecular Testing for Solid Organ Allograft Rejection LCD became effective on June 6, 2021, but over time, MACs became aware of improper billing and overutilization of these tests. This year, MACs issued revised billing instructions to providers and released a new LCD in which coverage criteria remain intact. Patients with Medicare can continue to access blood tests for organ transplantation rejection when medically appropriate and ordered by their physicians.

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Strategic Planning in Laboratory Medicine



Mahesheema Ali, PhD, NRCC, FADLM

Strategic initiatives are an essential part of laboratory medicine. They involve making high-level decisions that align with the organization's mission and vision statement. Unlike tactical planning, which focuses on day-to-day operations, strategic planning takes a long-term view and considers the global impact on all levels of the laboratory's operations.

Implementing change is challenging, especially for small- to medium-sized organizations that lack the resources for change management. In most cases, external consultants must be brought in to facilitate the change management process. In addition, there are several stages of strategic planning, including information gathering, data analysis, strategy formulation, implementation, and evaluation.

Unlike tactical planning, strategic planning also involves collecting appropriate data by observing current and projected conditions from social, technological, economic, environmental, and policy factors. The tools for information gathering involve brainstorming, focus groups, and interviews.

To facilitate the strategic planning process, laboratorians can use various techniques to analyze data, including histograms, graphs, scattergrams, fishbone diagrams, storyboarding, Pareto analyses, and Delphi analyses. Successful strategic planning requires a thorough understanding of the organization's strengths, weaknesses, opportunities, and threats, or SWOT analysis. This process classifies internal factors as strengths and weaknesses and external factors as opportunities and threats. SWOT analysis helps guide marketing strategies and is particularly useful when implementing new technology or processes.

SWOT ANALYSIS FOR IMPLEMENTING A NEW PROGRAM

The following is an example of how to use the SWOT analysis approach from a strategic point of view.

Strengths: The program will use the latest technology and instrumentation, excess technical capacity that can be utilized, strong leadership support, and sufficient financial resources.

Weaknesses: Shortage of staff, morale issues, inadequate courier

system, lack of pathologists, limited experience in providing multihospital/client laboratory information system services, turnaround time issues.

Opportunities: Expanding the test menu and increasing revenue.

Threats: Competition from other laboratories and reduction in reimbursement.

STRATEGIES TO IMPROVE THE DECISION-MAKING PROCESSES

Decision-making techniques can be used after the data-gathering stage. The options vary from voting techniques such as unanimity, majority, and plurality. Autocratic or multicriteria decision-making techniques can be used to evaluate and rank ideas. It's important to note that this process is not the result of a single individual's creation but rather is derived from a committee.

IMPLEMENTATION STRATEGIES FOR LAUNCHING NEW SYSTEMS

When implementing a new strategic program, it's important to assign tasks to the right people, using the responsible, accountable, consulted, and informed (RACI) matrix. For example, when launching a new instrument, laboratorians should create validation protocols and provide technical training to ensure that staff are competent with the new system. Testing staff competencies is an important way to make sure they're proficient.



RACI MATRIX - NEW EQUIPMENT ACQUISITION					
Phase	Action Item	Responsible	Accountable	Consulted	Informed
Acquisition	Gather information including cost analysis, specifications, and menu expansion	Operations Manager	Operations Director	Medical Director	Dept. Chair
	Receive and review quotes from vendors	Operations Manager	Operations Director	Medical Director	Financial Director
	Award contract to vendor	Financial Director	Operations Director	Operations Manager	Medical Director
Installation	Electrical rough-in	Electrician	Operations Manager	Equipment Consultant	Operations Director
	Installation	Equipment Consultant	Operations Manager	Operations Director	Medical Director
	Connectivity	IT	Operations Manager	Equipment Consultant	Medical Director
Validation	Validations	Validation Consultant	Operations Manager	Medical Director	Dept. Chair
Reporting	Test reporting output	IT	Operations Manager	Medical Director	Dept. Chair
	Resolve any reporting issues	IT	Operations Manager	Medical Director	Dept. Chair
Go Live	Send communication to all stakeholders with a launch date	Medical Director	Dept. Chair	Operations Director	Operations Manager
	Fulfill staffing needs	Operations Manager	Operations Director	Dept. Chair	Medical Director
Monitoring	Monitor performance	Medical Director	Dept. Chair	Operations Manager	Operations Director
	Address anomalies	Medical Director	Dept. Chair	Operations Manager	Operations Director

Figure 1. RACI MATRIX

Moreover, it is also critical to discuss quality control requirements, reporting criteria, and billing. Finally, evaluate the processes using key performance indicators.

CHANGE AND COMMUNICATION MANAGEMENT

Strategic planning involves several key elements essential for ensuring a successful change process. One important aspect is developing a communication strategy and plan that aims to keep employees informed and up to date throughout the entire lifecycle of the change. This means educating employees on the different stages associated with the change model

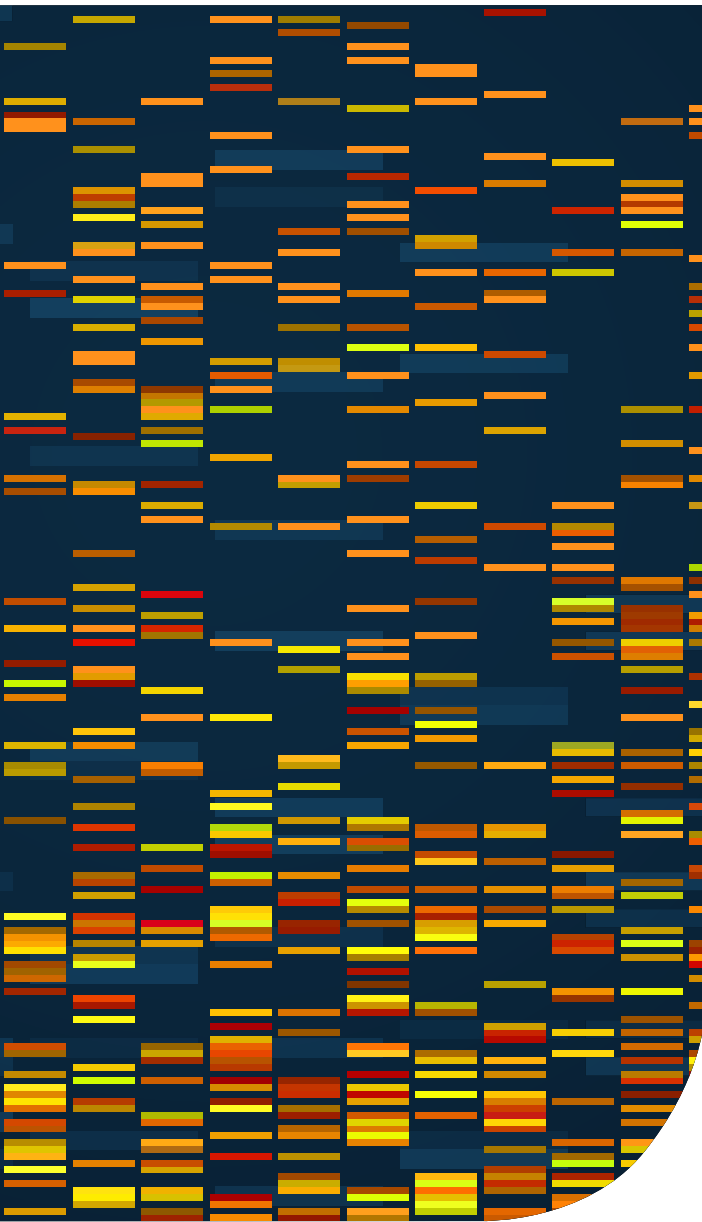
and providing them with the necessary tools to be successful, such as information, resources, and training. It also means assigning employees tasks aligned with their knowledge and skills, setting clear objectives, direction, and goals, and trusting them with information. By doing so, fear, anger, and anxieties can be mitigated, and employees can receive timely feedback and positive reinforcement to help them stay motivated and engaged.

To ensure the success of a new initiative, it is important to have a clear plan for monitoring and measuring progress. This should include specific deliverables and timelines that individuals and

teams are held accountable for. Soliciting feedback is also essential to identify areas where support is needed to achieve success. Encouraging teamwork and emphasizing its importance can help to facilitate a successful shift from an individual-oriented mindset to a team-oriented one. Rewards and recognition should be aligned with this value to promote a culture of collaboration and mutual support.

Mahesheema Ali, PhD, NRCC, FADLM, is section head of clinical chemistry, toxicology, and point-of-care testing at The Metro Health System in Bay Village, Ohio.

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Next-Generation Sequencing Accurately Detects Indels

Next-generation sequencing (NGS) can accurately assess reportable insertion, deletion, and deletion-insertion variants (indels) as long as 68 base pairs (bp), according to recent research (*Clin Chem* 2023; doi: 10.1093/clinchem/hvad110). The paper also adds that Sanger sequencing confirmation of indels assessed by NGS usually is unnecessary for particular regions or variants, provided the variants meet appropriate coverage and allele frequency thresholds.

The clinical genetics laboratory community lacks consensus on which NGS testing situations require Sanger sequencing prior to reporting. Previous studies have led to variable recommendations. Many clinical laboratories continue to confirm variants with Sanger sequencing, increasing testing costs and turnaround time. Although many studies have demonstrated NGS's accuracy in detecting single nucleotide variants (SNVs), few have done so for indels.

Thanks to recent advances in NGS, labs are detecting indels more frequently now. Recent recommendations on orthogonal confirmation note that indels are far less prevalent than SNVs, but account for a proportion of pathogenic variants, particularly in genes where loss of function can cause disease. These variants require special consideration for confirmation because indels have been thought to have higher error rates.

To address this situation, the researchers retrospectively analyzed indel results from NGS-targeted gene panel tests offered through the Mayo Clinic Genomics Laboratories. The indels came from a variety of sequencing capture reagents, bioinformatics pipelines, and clinical tests.

They found 100% concordance between NGS and Sanger sequencing for 492 indels—including 217 unique ones—ranging in size from 1 to 68 bp. Seventy percent of the indels were deletions, and 90% were 1 to 5 bp long. Variant frequencies ranged from 11.4% to 67.4% and 85.1% to 100% for heterozygous and homozygous variants, respectively, with a median depth of coverage of 2,562x. NGS accurately detected the 7% of indels located in complex regions of the genome.

Researchers also demonstrated 100% reproducibility of detection of 179 indels during intra-assay validation, according to the paper.

● BLOOD TEST MAY PREDICT HEART AND KIDNEY DISEASE RISK IN TYPE 2 DIABETES

A four-biomarker blood test may predict risk of kidney disease progression in patients with type 2 diabetes and albuminuria (*Circulation* 2023; doi: 10.1161/

CIRCULATIONAHA.123.065251).

The four biomarkers are N-terminal pro-B-type natriuretic peptide, high-sensitivity cardiac troponin T, growth differentiation factor-15, and insulin-like growth factor binding protein 7 (IGFBP7). They were identified in the

Canagliflozin and Renal Events in Diabetes With Established Nephropathy Clinical Evaluation (CREDENCE) trial. The trial involved 2,627 participants and also found that patients treated with the sodium-glucose cotransporter-2 inhibitor (SGLT2)

canagliflozin had lower levels of the biomarkers after 1 year than those who took a placebo.

The researchers observed high baseline concentrations of the four individual biomarkers in plasma samples from trial participants, who had diabetic kidney disease and were treated with canagliflozin or placebo. The researchers assessed each biomarker's prognostic potential for end-stage kidney disease.

Baseline concentrations of all four biomarkers in these samples were generally elevated, compared with samples from healthy reference populations. The median concentrations for study participants were: NT-proBNP, 180 ng/L; high-sensitivity cardiac troponin T, 19 ng/L; growth differentiation factor-15, 2,595 ng/L; and IGFBP7, 121.8 ng/mL. A 50% increase in all four biomarkers was associated with risk of end-stage kidney disease.

Treatment with canagliflozin for 1 year modestly reduced the longitudinal increase in all biomarkers. The biomarkers all rose by 6% to 29% in the placebo arm, compared with 3% to 10% in the canagliflozin arm. The reduction in NT-proBNP with canagliflozin was particularly noteworthy, averaging a decrease of 15% after 1 year, with a drop in the number of individuals above a prognostic NT-proBNP threshold of 125 ng/L.

The researchers noted that these results further strengthen earlier findings that have shown the value of biomarkers for prognosticating major complications and the consistent benefit of SGLT2 inhibitors in reducing event rates across patients with wide ranges of risk.

Although many studies have demonstrated NGS's accuracy in detecting single nucleotide variants, few have done so for indels.

● NEW POSSIBLE BREAST CANCER GENES IDENTIFIED


Recent research has identified multiple new genes associated with breast cancer that may eventually be included in tests for increased risk of the disease (*Nature Genetics* 2023; doi.org/10.1038/s41588-023-01466-z).

Current tests consider only a few genes, such as *BRCA1*, *BRCA2*, and *PALB2*. Linkage and candidate gene studies have identified several breast cancer susceptibility genes, but their overall contribution to breast cancer is unclear.

To better determine the role of rare coding variants, researchers performed a meta-analysis of three whole exome data sequencing studies, which included a total of 26,368 breast cancer patients and 217,673 control subjects. Subjects were primarily of European ancestry. The researchers performed burden tests for 15,616 protein truncating variants and 18,602 genes.

The researchers found associations between protein-truncating variants and breast cancer in five previously known susceptibility genes at exome-wide significance: *ATM*, *BRCA1*, *BRCA2*, *CHEK2*, and *PALB*. They also found a similar association in another gene, *MAP3K1*, and associations for *LZTR1*, *ATR*, and *BARD1*. Finally, they discovered an association of exome-wide significance between predicted deleterious rare missense or protein-truncating variants and breast cancer identified for *CDKN2A*.

The researchers concluded that their results demonstrate how large exome sequencing studies, combined with efficient burden analyses, can identify additional breast cancer susceptibility genes. They called for further studies to replicate their findings in large datasets.




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THE DEFINITIVE GUIDE TO Diabetes Testing

In this encyclopedic guidance, experts give the latest recommendations on continuous glucose monitoring, gestational diabetes testing, and noninvasive glucose measurement systems.

BY KAREN BLUM

After 4 years of work, the Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC), in collaboration with the American Diabetes Association, released an update to their evidence-based guidelines and recommendations to diagnose and manage patients with diabetes using the most recent laboratory analysis tools (Clin Chem 2023;69:777-84).

The guidelines replace previous versions published in

2002 and 2011. To prepare this update, an expert committee comprising five clinicians, three clinical laboratorians, and one chemist painstakingly pored over the medical literature to rate the quality of the evidence (high, moderate, low, or very low) and grade the strength of the studies' recommendations, from an A grade (strongly recommend for or against adoption of a particular practice or technique) to a C grade (insufficient information to

make a recommendation). The guidance also includes a number of good practice points—recommendations mostly driven by expert consensus or widely accepted standards of best practice—as well as information about emerging considerations and knowledge gaps or research needs in the areas covered.

As the document authors write, the guidance addresses numerous “practical aspects of care to assist decisions related to the use or interpretation of



laboratory tests while screening, diagnosing, or monitoring for diabetes,” including use of glucose and glucose meters, and diagnosis and management of gestational diabetes. The document also addresses the potential roles of noninvasive glucose monitoring, genetic testing and measurement of ketones, autoantibodies, urine albumin, insulin, proinsulin, and C-peptide.

KEEPING UP WITH A RAPIDLY EVOLVING FIELD

Overall, the number of recommendations has increased over the previous guidance released in 2011 because there is substantially more evidence now, said lead author David Sacks, MBChB, FRCPath, senior investigator and chief of clinical chemistry at the National Institutes of Health Clinical Center. In fact, the guidance contains more than 80 recommendations.

There are a few areas that have changed significantly, Sacks said.

The most progress noted in the document has been in the area of continuous glucose monitors (CGM), devices that measure interstitial glucose, which correlates highly with blood glucose, every 5–15 minutes. CGMs—which consist of a glucose sensor placed under the skin, a transmitter worn on the skin, and a receiver for the data such as a smart watch—also inform users of trends in blood glucose over several hours and alert them to current or impending high or low glucose.

“The number of recommendations in this field has doubled because there’s so much more evidence to support the use of continuous glucose monitors and show that they are very effective in many patients with type 1 diabetes. They are being used much more widely now,” Sacks said.

The guidance strongly recommends that real-time CGM be used in conjunction with insulin to lower

HbA1c levels and/or reduce hypoglycemia in teens and adults with type 1 diabetes who are not meeting glycemic targets or have hypoglycemia unawareness and/or episodes of hypoglycemia. An associated good practice point suggests that for individuals using CGMs that require calibration, a blood glucose meter should be used to calibrate the device, and that calibration should be done during a time when glucose is not rising or falling rapidly. Another says that CGM data reports should be available in consistent formats that include standard metrics such as time in range versus in hyperglycemia or hypoglycemia.

In another new point, the authors recommend that to minimize glycolysis, healthcare workers use blood-collection tubes that contain a rapidly effective glycolytic inhibitor such as a citrate buffer for collecting blood glucose samples.

Unfortunately, Sacks said, these types of tubes are not available in the United States. “We are trying with this recommendation to encourage manufacturers to make these available in the U.S. because the evidence clearly shows they are much more effective than any other way,” he said.

Historically, sodium fluoride has been used to minimize glycolysis, but the process still can continue for up to 4 hours in test tubes. An alternative method recommended by the guidance to minimize glucose breakdown is to immediately place the sample tubes in an ice-water slurry and subject them to centrifugation within 30 minutes to remove cells. “This approach is very difficult in routine clinical practice,” Sacks acknowledged.

Two important updates have been added to recommendations regarding gestational diabetes, Sacks



said. First, all pregnant women with risk factors for diabetes should be tested for undiagnosed prediabetes and diabetes during their first prenatal visit using standard diagnostic criteria. Typically, pregnant women are not screened for gestational diabetes until 24 weeks' gestation. This recommendation could allow for earlier treatment to prevent deleterious effects to the woman and fetus, Sacks said.

Women who have gestational diabetes are at higher risk of developing type 2 diabetes years later, he said. As such, the guidance recommends that after delivery, women who had gestational diabetes receive lifelong screening for diabetes, at least every 3 years.

NONINVASIVE GLUCOSE MEASUREMENTS NOT READY FOR PRIMETIME

Some recommendations advise against testing and indicate areas in which there is a lack of evidence for use of tests. One is handheld glucose meters for patients with diabetes who do not use insulin. The recommendation is that they should not do any self-monitoring of glucose with fingersticks because the evidence doesn't support it.

Another area the guidance does not recommend at this time is noninvasive glucose measurements. The guidance states these systems cannot be recommended as replacements either for blood glucose meters or CGM technologies. Noninvasive systems are designed to measure blood glucose concentration in a painless manner that avoids puncturing the skin and they have gotten a lot of hype. To date, however, none have been approved by the Food and Drug Administration for clinical use in the United States, said guideline coauthor Mark Arnold, PhD, the

Edwin B. Green chair professor in laser chemistry and director of the Center for Biocatalysis and Bioprocessing at the University of Iowa, who worked on this section.

"A lot of people think that the technology is right there, like it's going to come out next year when in fact, it's not," Arnold said. "I think that's important for the clinicians, who are going to give this information to patients, to put in perspective."

There are two approaches to noninvasive measurements, he said: noninvasive fluid sampling and spectroscopy. Considerable attention has been given to noninvasive glucose measurements in tear fluid, in particular from a type of contact lens researched by Google that contained an electrochemical sensor to measure glucose. Ultimately it was determined that the concentration of glucose could be measured in tear fluid but didn't correlate well to glucose in the blood, so the project was dropped. Some scientists have now been looking at the potential of glucose measurements from saliva, although Arnold said he expects the results to be similar.

"It's really easy in this day and age to lock in on something that you want to be true, but it doesn't necessarily mean that it's going to be true," he said. With that said, Arnold added that there have been some advances in the use of Raman and near infrared spectroscopy for noninvasive glucose measurements since this portion of the guidance was written. "The promise is there; we just don't want to hype it."

OTHER RECOMMENDATIONS ON TESTING FOR DIABETES

In other areas of note, the guidance:

- Supports measuring fasting glucose in venous plasma to establish the diagnosis of

diabetes, with a value of >7.0 mmol/L (>126 mg/dL) diagnostic of diabetes.

- States that frequent self-monitoring of blood glucose is recommended for all insulin-treated patients with diabetes who use intensive insulin regimens (with multiple daily injections or insulin pump therapy) and who are not using CGMs.
- Gives a very high recommendation that annual testing for albuminuria should begin in pubertal or postpubertal individuals 5 years after the diagnosis of type 1 diabetes and at the time of diagnosis of type 2 diabetes, regardless of treatment.
- States urine albumin should be measured annually in adults with diabetes using morning spot urine albumin to creatinine ratio.
- Notes that there is no published evidence to support the use of insulin antibody testing for routine care of patients with diabetes.

The guidance already has generated a lot of interest, Sacks said. During a meeting of the *Clinical Chemistry* editorial board at the 2023 AACC Annual Scientific Meeting, the editor shared metrics demonstrating that within just a few days of the guidance's release, it already had been mentioned by more than 75 news outlets and was generating a lot of interest on social media. Sacks later heard from a laboratory professional who had shared the guidance with a clinician who said he was going to use it in teaching trainees.

"Clearly, people are aware of it and seem very receptive," he said. "Four years of hard work, I think, is paying dividends." 🍌

Karen Blum is a freelance medical/science writer in Owings Mills, Maryland.

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DECODING

TO DISRUPT THE

Increasingly, infections pose complex problems for clinicians, especially those treating patients in the ICU. While they want to treat patients with pneumonia or bacteremia with the right antibiotic—and not contribute to growing antibiotic resistance—often they must wait days before they’ll know which pathogen patients have and the right drug to use. For patients who are very ill, empiric therapy has serious risks.

Pattern Bioscience is tackling this problem with technology that enables single-cell microbiology that both detects a pathogen and determines antibiotic susceptibility in as little as 4 hours, instead of the 2–4 days typically required. For this, they won the 2023 Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC) Disruptive Technology Award competition, the result of which was announced in July at the 2023 AACC Annual Scientific Meeting.

“It reduces the interval of diagnostic uncertainty for patients who have an infection, so clinicians can get them on the correct treatment, if treatment is even needed” by the time a second dose of antibiotics would be administered, said Carey-Ann Burnham, PhD, Pattern Bioscience chief clinical officer. That’s because antibiotics are typically dosed about every 8 hours. If a patient receives broad-spectrum antibiotics upon admission, the company’s device can identify the pathogen and the right antibiotic before the time comes up for the second dose. “That’s why it’s so important in a hospital setting. We’re targeting critically ill patients initially,” Burnham said.

The testing platform uses precise microfluidics. A sample is divided into tiny droplets, which contain either a single bacterium or none. Those droplets then flow into “zones” and interact with zone-specific reagents. Every zone also has two metabolic dyes. Together, this creates a metabolic signature.

Instead of measuring genetic targets associated with resistance, Pattern uses artificial intelligence (AI) to measure the response of bacteria cells to antibiotics. The system can both identify what pathogen is present and rule-in specific antibiotics — if antibiotics are appropriate at all.

The instrument is the size of a breadbox, with each cartridge about the size of a thick sandwich. Fully loaded, the system can process 22 samples simultaneously. The configuration of the

The winner of the 2023 Disruptive Technology Award combines AI and novel microfluidics for single-cell microbiology.

BY
JEN A.
MILLER



BACTERIA

PRACTICE OF MICROBIOLOGY

testing mechanism means the test is not limited to monomicrobial samples. It can also analyze samples from complex clinical specimens, including nonsterile body sites where pathogens often mix with normal microbiota. “Because we put them into droplets and measure different droplets, they become their own incubation chamber, and we can look at polymicrobial samples,” she said.

Pattern Bioscience’s platform depends on advances in both material and computer science. “A big part of it is the ability to make the droplets,” Burnham said, made

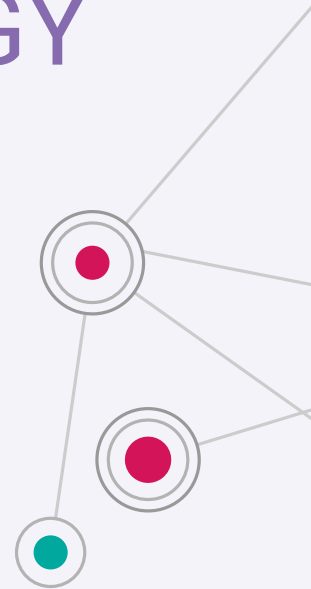
possible in part because of new kinds of plastics. Better and faster machine learning is also key because it can assess reactions much faster. “The algorithm takes into account where and how a microbe is growing, in addition to the metabolic pattern,” she said. “It’s very similar to what microbiologists do today when they look at agar plates.”

But Pattern has strict controls on how the AI works. The company limits what pathogens it looks for to what is most likely to be present in the patient. “The cartridge doesn’t ID every microorganism under the sun,” Burnham said. If it’s beyond

the scope of what the technology looks for, it’s tagged as an “unidentified organism,” which means additional testing is needed.

In 2021, the company’s Pneumonia Action Panel received a Food and Drug Administration breakthrough device designation to be used for hospitalized patients with pneumonia. It’s the first and only emerging technology that can comprehensively diagnose pneumonia directly from a clinical specimen.

Pattern chose to focus on pneumonia and bacteremia first because of the platform’s ability to detect the range of pathogens and





a point-of-care test used by almost anyone.

Burnham came to Pattern Bioscience in 2022, after working as professor of pathology and immunology, molecular microbiology, pediatrics, and medicine at Washington University School of Medicine in St. Louis, and as the medical director of clinical microbiology at Barnes-Jewish Hospital. Over 15 years in academia, she saw how innovations continually changed laboratory medicine, especially MALDI-TOF mass spectrometry. A desire to see even greater advances in her field led her to Pattern Bioscience.

Ultimately, Burnham believes that their work will “change the way clinical microbiology is practiced. It gives results comparable to the gold standard,” she said. She also believes that the company can engineer the system to produce results even faster. 🍷

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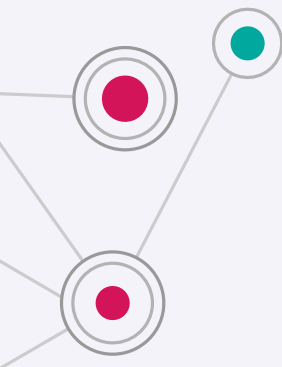
+TWITTER: @byJenAMiller

normal microbiome in the respiratory tract. They felt this was where they could make an immediate and impactful difference. Pneumonia complicated by septic shock is a leading cause of morbidity and mortality, and 51% of patients with pneumonia complicated by septic shock die in the U.S.

For antimicrobial stewardship, it could be a game changer, Burnham said. “The longer a patient stays on the wrong antibiotic, the higher the chance of mortality,” she said. “This gives definitive information to help people get onto the most appropriate antibiotic. In a lot of cases, it means no antibiotic.”

She sees this as a benefit to patient outcomes and patient experience. “People are eager to have an answer,” she said. “It’s a good patient satisfier to be able to move more quickly and say, ‘You have this, you don’t have this...treatment.’”

Right now, the Pattern platform is a moderately complex test under CLIA rules and must be performed in a CLIA-certified laboratory. But the company also sees a much wider range of potential uses, and it plans to follow this panel with those that look at blood cultures, then urine. The goal is for their device to become even more simple and reliable, so that it can become



ADLM considered many innovative and cutting edge technologies for its Disruptive Technology Award competition. Here are the two other finalists.

MS PEN TECHNOLOGIES

This medical technology company is working to bring the power of mass spectrometry to a broader base of users, in a smaller and more manageable form. They’re doing so through Ultiss (short for ultimate surgical sensing system), a medical platform that uses their MasSpec Pen to directly analyze tissue and other samples in seconds. The device itself is designed as a handheld or minimally invasive probe, and acts as

an interface between a nonexpert user and mass spectrometer. The company said it hopes that their device and platform will bring the power of mass spectrometry to more people.

VITAL BIOSCIENCE

VitalOne is a platform that, with 600 uL of blood, quantifies more than 50 of the most ordered biomarkers in primary care—and does it in only 20 minutes. The system does so using an automated

microfluid workflow, with the instrument running on three subsystems at the same time: hematology, clinical chemistry, and immunoassays. In its current form, VitalOne spans a wide range of potential use cases for the general population, including inflammation, cardiac markers, diabetes, and liver disorders. The company is currently building a menu that they say will cover 100% of the tests needed for at least 90% of patients.



Today's Critical Care Test Menu Must Include

iMg ePV BUN Creat/eGFR

Prime Plus provides the most clinical value of any blood gas/critical care analyzer profile by adding essential tests for electrolyte balance (iMg), plasma volume (ePV), and kidney function (BUN, Creatinine, eGFR).

Ionized Magnesium (iMg)

Hypomagnesemia is a frequent finding in critically ill patients.¹ Magnesium therapy guided by real time ionized magnesium monitoring has been shown to improve outcome in these patients.²

Estimated Plasma Volume (ePV)

The plasma volume status of a patient is one of the top priorities in evaluating and treating critical illness including CHF, ARDS, AKI, Surgery, and Sepsis.³⁻⁵

BUN, Creatinine and eGFR

Over 50% of patients admitted to the ICU develop some degree of acute kidney injury.⁶ Creatinine, eGFR, and BUN monitoring provides early indication of changes in kidney function and helps guide therapy to prevent AKI.



Test Menu

pH PCO₂ PO₂ SO₂% Hct Hb iMg Na K Cl TCO₂
iCa ePV GLU Lac BUN Creat/eGFR CO-Ox MCHC

NOVA
biomedical
novabiomedical.com



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SOFTWARE CONTAINERIZATION IN THE CLINICAL LABORATORY

As data science explodes worldwide, laboratory medicine is well positioned to frame discussions about data maintenance and access. After all, within the healthcare sector, clinical laboratories produce the most numeric data to manage and diagnose diseases.

That said, healthcare is rightfully conservative based on the “do no harm” maxim, so it’s important to incorporate data science into routine workflows carefully. This involves developing and supporting a data-science infrastructure through which data can flow—or data pipelines—and lab professionals have an important role to play in making this happen. Because much of the software used for these data pipelines is open source rather than commercial, the onus for maintenance and troubleshooting falls to the local data-science team.



When it comes to managing data in clinical workflows, could a tool for packaging software applications “contain” the future?

**BY DUSTIN R. BUNCH AND
SRINIVASA CHEKURI**

This can be a challenge for clinical labs because current laboratory information systems (LIS) are structured based on commercial-application-specific software, which typically has maintenance workflows that require specific servers, interfaces, and test systems. In addition, the typical LIS includes multiple interfaced software components. That means that upgrading one software application can affect many other systems, leading to implementation delays and the need for significant additional testing.

In recent years, a new tool has been created for data pipelines that offers flexibility, reproducibility, and maintainability and may improve other areas of the LIS as well: the virtual container.

WHAT IS A VIRTUAL CONTAINER?

A virtual container is a unit of software that includes application-specific information, including

software versions, libraries, and operating system modifications. (See Figure 1.) Unlike a virtual machine (VM), which emulates a physical computer by including a complete operating system, a container includes only the software layers above the operating system level. Many institutions deploy virtual containers within a VM server.

Containers often are used within areas of the laboratory that require bioinformatics applications, such as whole-genome or exome sequencing, molecular cancer, and molecular microbiology workflows. An excellent example of containerization in clinical workflows outside the clinical laboratory is in areas adjacent to clinical pathology, including molecular pathology (1) and digital pathology (2).

As data science continues to expand into the laboratory workspace, there has been an increase in the deployment of containers for

improved workflows. In this article, we review how virtual containers are being applied to help solve clinical laboratory problems (see Table 1) and highlight our experience using them for clinical applications.

ADVANTAGES PORTABILITY

A major bottleneck to adopting advanced data-science applications in clinical laboratories is that doing so requires data expertise. A data-analytics ecosystem must span the application's coding, testing, validation, and deployment. But the issues don't end there. Suppose a great data-science tool is presented at a conference or within a journal article. How do we incorporate this new application into our ecosystem to test, validate, and possibly deploy? This is a complex problem if you don't have access to the original creator's data streams, libraries, and operating systems, even if the code is available for use on an open-source platform such as GitHub.

Containers can partially solve these issues, because they include the correct software and library versions required to deploy the container. Bioanalytical-specific containers are available through BioContainers, an open-source and community-based repository (3). Such container repositories foster standardization and shareability and enhance code review, which improves consistency within the laboratory.

SOFTWARE MAINTENANCE

Software maintenance becomes a major consideration any time one embarks on in-house data science. Developing a data-science application should mirror any other software-development process,

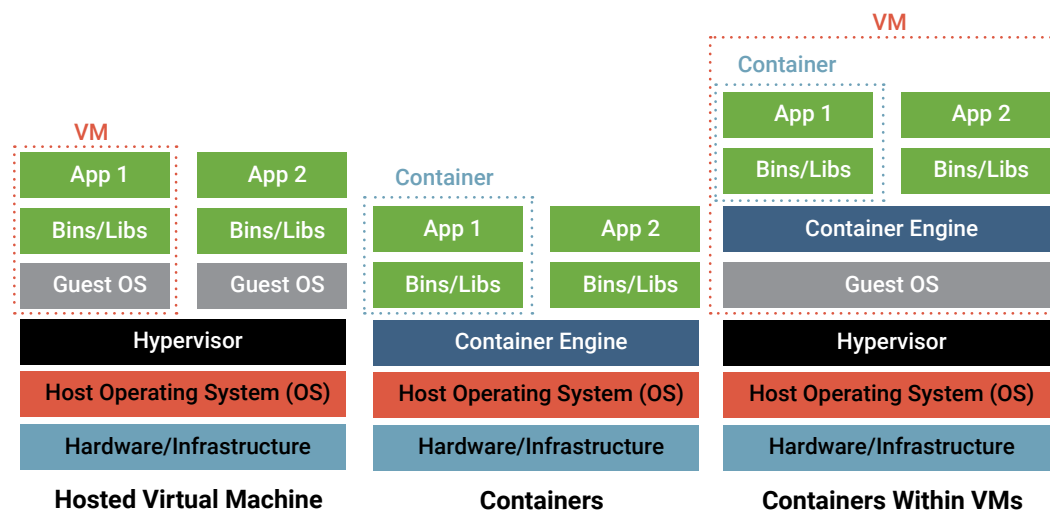


Figure 1. Component of virtual machines (VM) and containers. A major difference between a VM and a virtual container is the integration of the entire guest operating system (OS). A virtual container relies on components of the host OS and only changes bins and libraries related to the application. In contrast, a virtual machine brings the complete guest OS with bins and libraries not completely specific to the applications. The final image is the use of containers within a VM environment, a typical deployment of containers.

which includes research and development, application testing, and placement on an active production server. Each application progresses from development to testing and finally to validation before being put into production.

However, even after this process is complete, application maintenance must continue. For example, someone will request feature improvements to applications that are already live on the production server, or the software will break and need to be fixed, or version updates will be needed to the underlying software to address security problems or known bugs.

By virtue of their portability, virtual containers can aid with application improvements, breaks, and version updates. If a test server is unavailable, testing can be performed with an appropriately changed new container without affecting the production server. Ideally, any software change can be tested before going into production.

Server upgrades and migrations are another common occurrence. Often, security patches to a server do not test all the software on the server, which can break software. Or, when a new server is created, even as a VM, it often has the latest software

versions, which may not be compatible with the migrated applications.

Virtual containers can be migrated and placed into production without significant changes. They would need minimal validation, a major time saver, especially if hundreds of applications are being relocated.

QUALITY METRIC MONITORING

The data needed to generate a laboratory's quality metrics are predominantly obtained manually and used to create regular reports. This information is gathered at different stages of specimen processing and is error-prone due to time pressure and cognitive burden.

To reduce these problems, we are developing readily available, usable, location- and role-based containerized web applications to populate the centralized database. These applications will help monitor workflow and improve resource allocation. We can gather quality metrics data in real time, allowing any clinical issues they reveal to be rectified as soon as possible.

This system also helps improve laboratories' communication and transparency. The electronic data repository provides lab-, division-,

assay-, and user-level metric dashboards for different user roles and locations. The containerized workflow offers flexible building blocks for adapting to ever-expanding and changing laboratory workflows. At the same time, it takes advantage of rapid advances in web technologies and data-science fields to quickly improve the lab's efficiency, scale for a rapid increase in demands, and improve the quality of diagnostic services.

PROSPECTS FOR DIGITAL PATHOLOGY

Digital anatomic pathology systems are in the early stages of development, but the recent pandemic has accelerated their adoption at many hospitals for primary diagnosis. Scanning, compression, storage standards, and image-analysis methods are rapidly changing for digital pathology (4). Evolving systems have led to the accumulation of more image data and the integration of other relevant clinical, laboratory, and molecular data.

Providing a more comprehensive anatomic pathology report requires a robust informatics infrastructure that can quickly adapt, validate, and integrate the latest developments. Digital pathology processing has benefited from virtual containers and containerized infrastructure for applications in research (2) and artificial intelligence systems (5).

HARNESSING MACHINE LEARNING

Machine learning, another emerging area of data science impacting the clinical laboratory, will also benefit from containerization (6).

Most current LIS and electronic health record products do not have a simple way to integrate machine learning into data pipelines. Additionally, machine learning

Table 1. Containerization Advantages and Disadvantages

Advantages	Disadvantages
Portability, which improves software/server maintenance and software shareability and standardization	An additional layer of complexity creates new service breakpoints
Easier to validate software	Additional knowledge of the containerization software and server
More accessible version and software maintenance because of encapsulation	Additional cost
Increased uptime	

shows the most benefit when it is integrated into real-time applications. For these reasons, machine learning exists outside commercially established workflows in most LIS departments. Containers could provide a method for integrating machine learning into the clinical workflow to provide real-time feedback.

DISADVANTAGES CHALLENGES TO IMPLEMENTATION

We would be remiss if we did not address some of the implementation challenges associated with virtual containers. First, there are always security concerns. It's important to involve hospital IT security professionals from the beginning. They will help guide any decisions

A DATA ANALYTICS TEAM EMBEDDED IN THE LAB IS KEY TO ACHIEVING MOMENTUM ON PROJECTS OF THIS SCALE.

affecting data security. In our case, hospital IT, including architecture and security, was involved early in the process and interfaced with our data-analytics team.

Regulatory issues also pose a challenge. These are not specific to containers but apply to any data pipeline. Establishing data provenance and validating data accuracy are vital to the acceptance of results of all types of data pipelines (7). Artificial intelligence, another regulatory concern, requires validation of the data pipeline and the algorithm used for clinical purposes (8).

Finally, a data analytics team embedded in the laboratory is key to achieving momentum on projects of this scale. It took us about three years to implement our container pipeline, and it was only possible with the help of our data-analytics team, even with the hospital IT groups who worked with us.

Although it's necessary to draw on hospital IT, they have too many diverse priorities to push forward projects relevant to only a small portion of the hospital. That's why having a department-based team is critical. But adding staff requires justification within the pathology and laboratory departments. That can be tricky because this new data team is a resource to which only some will have access.

These are undoubtedly challenges, but we believe they are manageable if you have the vision and tenacity of your department behind you.

SUMMARY

Containerization addresses the growing necessity of integrating information from multiple data types into pathology reports. Containers represent a modularized model for information flow that will help laboratories to rapidly

adapt to the changing disease classification systems and provide reports that present all relevant information for clinicians.

Recent technological trends—including increases in electronic data, computing power, and machine learning—provide opportunities to reduce monotonous work for healthcare providers. They also offer new tools for serving the increasing healthcare demands posed by an aging population and higher life expectancy. Containers offer a promising framework for harnessing these advances to address modern challenges.

Container encapsulation leads to easier installation, evaluation, and clinical implementation of software applications and machine-learning technology. Hence, we propose a container repository system similar to BioContainer to benefit the laboratory medicine community. As with other new system implementations, collaboration is critical to success. Those working on data science for the clinical laboratory can be partners who produce flexible and durable applications to be shared with all. 🍀

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BY JANE DICKERSON, PHD, DABCC, AND DARCI STERNEN

Fifty Ways to Order Albumin? A National Initiative Towards Uniform Lab Test Names

An interview with Ila Singh, MD, PhD

Jane Dickerson, PhD, DABCC, and Darci Stern of Laboratory Stewardship Focus recently interviewed pathologist and informaticist, Ila Singh, MD, PhD, about the national effort to standardize lab test naming through TRUU-Lab. Singh is the chief of laboratory medicine and pathology informatics at Texas Children's Hospital and professor at Baylor College of Medicine.

What is TRUU-Lab?

TRUU-Lab or Test Renaming for Understanding and Utilization-Lab, is an initiative that unites people who are involved in ensuring that laboratory testing is done correctly. TRUU-Lab stakeholders include clinicians; electronic medical record (EMR), laboratory information system, and instrumentation vendors; representatives of professional societies such as the Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC); and even federal agencies, like the Centers for Disease Control and Prevention (CDC), Food and Drug Administration (FDA), and Centers for Medicare & Medicaid Services (CMS). The stakeholders consistently attend meetings and are invested in trying to get some standardization in laboratory test names.

There is a common realization that many errors happen because clinicians don't necessarily understand what test to order. There's very little standardization around selecting names for tests—in fact, most of the time, people are choosing lab test names in silos, often without consultation even within their own institution.

For example, there's a paper from the Department of Veterans Affairs (VA) that shows there are more than 50 names for albumin just within the VA system (Med Care 2019;57:e22-7).

Can you tell us the story of how you got the idea for TRUU-Lab, and how it came to be?

Well, Patient-centered Laboratory Utilization Guidance Services

(PLUGS) was indirectly involved in this because I was thinking about stewardship around 2018–2019 when I was on the National Committee for Laboratory Stewardship with PLUGS. And I was thinking about how each of us is sitting in our own hospital or lab stewardship test committees and having the same conversation about confusing vitamin D test names. It just struck me that there needs to be something more united. Additionally, it took me more than 6 months to unify vitamin D test names at my own institution. It's just one test, and to think that to change the names—to put in a clinical decision tool that would guide people away from



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the 1,25 dihydroxyvitamin D test—it took that long! It just felt like an enormous waste of time for everyone. There should be something better, more unified, that would save all of us a lot of time.

And that's when I thought we need to be working toward standardization. Around the same time, we also had a case of measles, and nobody could find the name of the test because it was classified in the system as "rubeola." That also made me think that when the clinician is ordering a test, their only window into the test is that test name in the EMR.

It's almost unbelievable that there's more information available about a \$5 item on Amazon than the most expensive test in an EMR.

The EMR makes no attempt to tell you that you may need a more extensive algorithm when ordering a test. If clinicians need more information, they often need to leave the EMR and consult a test catalog or use a search engine. If a laboratory wants to provide more information, it is forced to develop soft alerts or other clinical decision tools that slow everything down with more clicks.

What are the most pressing goals for TRUU-Lab?

We have four major goals. The first is to find out what features of an individual lab test make it most comprehensible to the ordering providers. What parts of a test name are recognized as being helpful and which parts are unhelpful? Can we make some guidelines around test naming using our understanding of test names? That's one of our biggest goals because most names have been created without the input of the people who use them.

The second goal is to use that understanding of test features and build a list of test names.

“TRUU-Lab makes me feel that there's always this bigger purpose that we are all working towards, and if we do it right, we could impact a lot of people.”

The third goal is to test them in a mock EMR, to put these TRUU-Lab test names alongside other test names and see if people select the intended test.

The final goal is to have these test names as part of a foundation build of all EMR systems, so that we could say “these are carefully selected and vetted names, and we all should use them.”

What is the strategy for identifying tests that could inform naming conventions for a broad range of laboratory tests?

One of the first projects that we did in TRUU-Lab was surveying American Society for Clinical Pathology members on what they thought were problematic test names. These are all laboratory people who have their own experiences of observing care providers getting confused with certain tests. We received 200 different responses and organized them into 10 categories, like “easy to mix up,” “synonyms,” “convention,” etc. We then went about conducting more scientific surveys—first educating clinicians about a given test and then asking them what features in a test name might be helpful for understanding what the test is about.

What is one key element of success for TRUU-Lab?

Building a diverse team is very important. For what we're doing, I have found that it's essential to have the diversity of thought that comes from federal liaisons (CDC,

CMS) working together with people from all walks of pathology, geneticists, family practice clinicians, and obstetrician-gynecologists.

As an example of this, one team member had experience working in FDA and helped us design a failure modes and effects analysis to analyze potential errors in lab testing. That idea and process was not something I would have come up with on my own and highlights the value of different perspectives.

Do you have any high-level lessons from developing and analyzing surveys to share with readers?

We have learned a lot by working with the Brand Institute for survey formatting and development. The Brand Institute runs surveys for the pharmaceutical industry and has a large registry of providers who they reach out to and ask to take our surveys. We identify the types of providers we want to include (e.g., pediatricians, family medicine), and the survey is distributed with a specific ratio of providers. Through this process, we have learned that providers want more information included in the test name and fewer abbreviations. We've learned iteratively through the survey process and have taken great care to reduce bias to get the best information, for example, asking a question on the “best name” without using any names of the test in the question.

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Regulatory Roundup



FDA Clears MeMed BV Direct Test for Infections

MeMed, a company focused on advanced host response technologies, recently announced Food and Drug Administration (FDA) 510(k) clearance for the MeMed BV test on whole blood samples. Designed for use on the point-of-care MeMed Key analyzer, the test helps healthcare providers distinguish between bacterial and viral infections in 15 minutes. MeMed BV does this by measuring multiple proteins present in low concentrations in a small volume of whole blood.

An earlier version of the test conducted on serum—cleared by FDA in 2021—is being rolled out in medical centers on the MeMed Key platform and on high throughput analyzers via partnerships with other diagnostic companies.

This newer version of MeMed BV eliminates the need for clotting and spinning and requires minimal handling and maintenance. This ease of use makes it appropriate for decentralized U.S. settings, including urgent care centers, according to the company.

MeMed officials believe the test's FDA clearance will help more physicians accurately distinguish bacterial and viral infections, reducing unnecessary antibiotics use, a key driver of antibiotic resistance.

● T2 BIOSYSTEMS EARNS FDA BREAKTHROUGH DEVICE DESIGNATION FOR CANDIDA AURIS TEST

T2 Biosystems, which specializes in rapid detection of sepsis-causing pathogens and antibiotic resistance genes, has announced Food and Drug Administration (FDA) Breakthrough Device designation for the company's *Candida auris* (*C. auris*) molecular diagnostic test. The test detects *C. auris* directly from blood in 3-5 hours, eliminating the need to wait days for a positive blood culture. Once the test receives FDA authorization, T2 Biosystems plans to add it to the menu of its FDA-cleared T2Dx Instrument.

C. auris is an often deadly, multidrug-resistant fungal pathogen that poses a serious threat to global health. Because standard

laboratory methods do not always correctly identify it, affected patients may get inappropriate treatment.

The recent approval marks the third T2 Biosystems product to receive FDA Breakthrough Device designation. The company was previously granted FDA Breakthrough Device designation for its T2Resistance panel and T2Lyme panel.

● FDA APPROVES GASTROINTESTINAL STROMAL TUMOR COMPANION DIAGNOSTIC

The Food and Drug Administration (FDA) has granted approval to Qiagen for its theascreen PDGFRA RGQ PCR kit (theascreen PDGFRA kit) as a companion diagnostic (CDx) to Avyakit (avapritinib) in patients with gastrointestinal stromal tumors (GIST).

Avyakit is a tyrosine kinase inhibitor (TKI) approved by FDA in 2020 for adults with unresectable or metastatic GIST who harbor a platelet-derived growth factor receptor alpha (*PDGFRA*) exon 18 mutation, including *PDGFRA* D842V mutations. GIST patients with D842V mutations show primary resistance to most TKIs. By detecting these mutations, Qiagen's test will help clinicians identify GIST patients who might not respond to other TKIs but who could receive Avyakit.

The theascreen *PDGFRA* kit uses real-time qualitative PCR and is the first platelet-derived *PDGFRA* assay to receive FDA approval as a CDx. Qiagen officials hope that the kit's quick turnaround time will speed treatment decisions for GIST patients. Additionally, the approval expands Qiagen's

already extensive list of FDA-approved companion diagnostics.

● COMPANION DIAGNOSTIC FOR TWO CANCER DRUGS RECEIVES EUROPEAN IVDR CERTIFICATION

Agilent Technologies recently announced that its PD-L1 IHC 22C3 pharmDx, Code SK006 assay received companion diagnostic (CDx) Class C IVDR certification. This assay had previously been CE-IVD-marked for sale in the European Union. It is now certified in accordance with the new European Union regulation for in vitro diagnostic medical devices (IVDR).

The test is indicated as an aid in identifying certain cancer patients for treatment with Keytruda (pembrolizumab), Merck's anti-programmed death-ligand 1 (PD-L1) therapy, and Regeneron's anti-PD-L1 therapy Libtayo (cemiplimab). The IVDR certification covers five CDx cancer indications for Keytruda. These are non-small cell lung cancer (NSCLC), urothelial carcinoma, head and neck squamous cell carcinoma, esophageal cancer, and triple-negative breast cancer. The IVDR certification also covers NSCLC for Libtayo.

PD-L1 is a critical biomarker for response to anti-PD-L1 therapy, the company said, and its PD-L1 IHC 22C3 pharmDx is already widely used by pathology laboratories to identify cancer patients eligible for treatment. At the same time, oncologists are increasingly selecting patients for treatment with anti-PD-L1 therapies in indications across a growing range of cancer types.

This IVDR certification allows healthcare professionals and

Designed for use on the point-of-care MeMed Key analyzer, the test helps healthcare providers distinguish between bacterial and viral infections in 15 minutes.

patients to continue to benefit from the assay without disruption to critical diagnostic capabilities in established indications, the company added.

● NEXT-GENERATION CANCER TESTS GET CE MARK


Three next-generation sequencing-based cancer kits marketed by Toronto, Canada-based Geneseeq Technology have received the European Union's CE mark.

The tests with new CE mark designation are GeneseeqPrime NGS Tumor Gene Detection kit (GeneseeqPrime), Geneseeq Homologous Recombination Deficiency Detection kit (GeneseeqPrime HRD), and Geneseeq Blood Cancer Gene Detection kit (Hemasalus DNA/Hemarna RNA).

The GeneseeqPrime kit uses a set of 437 genes linked to solid tumors. The reportable range includes single nucleotide variants, indels, copy number variants, gene translocations and large genomic rearrangements, as well as tumor mutational burden, microsatellite instability, and DNA mismatch repair genes. Test data informs and guides therapeutic decisions and offers crucial insights into pivotal oncogenic genes and possible mechanisms of drug resistance.

Apart from the data provided by GeneseeqPrime, the GeneseeqPrime HRD report also incorporates the homologous recombination deficiency status that can be used for recommendations in PARP inhibitor

treatments. The Hemasalus DNA/Hemarna RNA investigates genetic variations and translocations in 475 genes at the DNA level, while also identifying translocations in 232 genes at the RNA level. This kit aids clinical diagnosis and facilitates treatment planning for individuals afflicted by hematological malignancies.




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Quest Launches Actionable Health Risk Insights Test

Quest Diagnostics recently announced the launch of its first consumer-initiated genetic test intended to help people understand their risk of developing certain inheritable health conditions.

Based on advanced next-generation sequencing (NGS) technologies, the Genetic Insights test analyzes 36 genes to identify potential risks of nearly two dozen diseases, including breast and colon cancer, and heart and blood disorders. The test also reports carrier status for cystic fibrosis, sickle cell anemia, and Tay-Sachs disease. Quest noted that Genetic Insights is an elective screen and is not as sensitive as other NGS-based diagnostic genetic test services.

Individuals who purchase Genetic Insights will receive an at-home saliva-collection kit and will then ship their sample back to Quest Diagnostics for analysis in one of the company's state-of-the-art laboratories. An independent physician orders the test for the patient, provides personalized information about the link between the genetic findings and the patient's health status, and is available to discuss the patient's questions. Test results will be available within 3–5 weeks.

Users can go online to access educational materials, provide relevant personal and family health history, track the status of each test kit, access personalized genetic health, and schedule a session with a genetic counselor at no extra charge.

● RESEARCHERS AIM FOR RAPID BIOMARKER DIAGNOSTIC TEST FOR STROKE

A forthcoming study aims to develop a rapid noninvasive test for quick, accurate stroke diagnosis, potentially flagging patients for treatment before irreversible brain damage occurs.

Golden Hour for Stroke (GHOST) researchers in the United Kingdom hope to identify stroke biomarkers in blood, urine, or saliva. The study involves paramedics who will collect saliva, blood, and urine samples from patients with suspected stroke within the first hour after symptom onset. Further sampling of blood, saliva, and urine will continue in the hospital, while patients receive standard clinical care.

The research team will pay particular attention to salivary small noncoding RNAs (sncRNAs). Previous research has shown that they could be used in tests to differentiate between concussed and non-concussed patients. Although the GHOST study will be the first to investigate whether there are sncRNAs that are specific to stroke, previous studies have confirmed stroke-specific RNA biomarkers in the blood. Researchers will also investigate whether biomarkers can differentiate between ischemic and hemorrhagic stroke, which need diametrically different treatment.

The study will run for 3 years, with results expected in late 2026.

● EPIGENOMICS ANNOUNCES ACQUISITION BY NEW DAY DIAGNOSTICS

Epigenomics and New Day Diagnostics have entered into an agreement where New Day will acquire most Epigenomics assets.

Under the terms of the agreement, Epigenomics will transfer all patents as well as its entire biobank to New Day.

Epigenomics officials noted that their company can no longer provide resources needed for further development and commercialization of next-generation testing. They expect the sale of their company's assets to New Day will enable commercialization of the Epi proColon next-generation test and secure future cash flows for Epigenomics.

The sale also increases the likelihood of the test's coverage by the Centers for Medicare & Medicaid Services due to the combination of Epigenomics and New Day biomarkers, Epigenomics officials added.

● **SUNBIRD, GLYMPSE MERGER TO ACCELERATE DEVELOPMENT OF DIAGNOSTIC TECHNOLOGIES**

Sunbird Bio has acquired Glympse Bio to accelerate development of Glympse's protein-based diagnostic platforms.

The platform has a clinical-stage pipeline of diagnostic tests based on two innovative, validated technology platforms, APEX and Glympse. They detect properties and activity of circulating proteins to give researchers and clinicians insights not available or accessible from current tests. APEX is a proprietary diagnostic platform that identifies from a blood draw aggregated amyloid-β in circulation. Peptide aggregation is pivotal in the pathogenesis of Alzheimer's disease. APEX identifies it accurately, with a very high correlation to gold standard PET scans. The Glympse diagnostic platform is the first to have demonstrated the capability to measure and analyze protease activity in the blood.

Sunbird Bio officials noted that the combined diagnostic offerings accomplished via the merger may accelerate clinical research and the availability of new treatments for patients suffering from Alzheimer's disease and other serious conditions.

Sunbird Bio will have U.S. headquarters in Cambridge, Massachusetts, with operational headquarters in Singapore, where Glympse Bio was based.

● **NEBRASKA MEDICINE AND HELIX PARTNER TO PROVIDE PRECISION CARE**

Helix and Nebraska Medicine recently announced a partnership to launch a population genomics program to drive precision medicine for all individuals in Nebraska.

The Genetic Insights Project will identify participants' risk for a variety of cancers and other potentially life-threatening diseases with a single test. The project will provide important information about serious health conditions by testing for mutations in genes connected to a higher risk of breast and ovarian cancer, Lynch syndrome, and high cholesterol. The research program may also expand its panel of genetic markers in the future, potentially providing information about other conditions.

The program plans to enroll 100,000 people, which would make it the largest population health program in Nebraska.

Nebraska Medicine joins other health systems nationwide in partnering with Helix to launch this program. Nebraska Medicine and Helix plan to officially launch the program on a limited basis in late 2023.

● **PROTEOMICS FIRM LAUNCHES IN THE U.S.**

The South Korea-based proteomics firm Bertis recently launched its Pan-omics Analysis Solution (PASS) in the United States through its wholly owned U.S. subsidiary, Bertis Bioscience.

Bertis Bioscience has signed its first agreement with the Salk Institute for Biological Studies to provide a PASS service using its CLIA lab and proteomics experts in San Diego. As part of the U.S. PASS

offerings, Bertis Bioscience will initially offer proof-of-principle studies for protein biomarker discovery using Seer's proteograph and nanoparticle kits.

Bertis previously launched PASS in South Korea in May 2022. PASS includes a robust suite of analytical services including protein identifications, biomarker discovery, and drug target discovery analytical services, the company said.

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The Power of Avidity Testing

What is avidity?

A: Whereas affinity measures the strength of a single binding site of an antibody to its antigen, avidity takes into account the cumulative strength of multiple bindings when multivalent antibodies bind to multivalent antigens. When an immune response is elicited, the IgG antibodies that are initially produced tend to have lower avidity. Over time, these antibodies undergo affinity maturation, and higher avidity antibodies are produced. Avidity assays measure the overall stability of the antibody-antigen complex.

How can avidity testing improve the differentiation of acute from chronic infections?

IgM and IgG tests are often used to gauge infection status. Typically, IgM-positive indicates an early-stage, acute infection, while IgG-positive only suggests a later-stage or past infection. However, relying solely on IgM and IgG can be misleading due to issues like false positives and IgM's cross-reactivity with other antigens. Moreover, IgM might persist long after an infection or might be absent in early stages or immunosuppressed patients. As such, avidity testing has become indispensable in clinical diagnostics. It differentiates between acute and chronic infections by assessing the strength of antibody binding to antigens, reflecting the immune response's maturity.

What methodologies are currently available for avidity testing?

Various commercial methods for measuring IgG avidity in clinical diagnostics have been developed, commonly employing protein dissociation agents such as urea or utilizing

recombinant antigens.

Assays that use dissociation agents like urea disrupt non-covalent interactions — specifically, hydrogen bonding and hydrophobic interactions — subsequently influencing the binding between antibodies and antigens. Low avidity antibodies, which are weakly bound or recently formed, are more susceptible to this disruption, leading to the detachment of the antibody-antigen complex. In contrast, high-avidity antibodies are less affected and remain bound to their antigens.

Alternatively, other assays deploy recombinant proteins as blocking agents. In these assays, recombinant proteins initially block the antibodies, followed by incubation with tagged specific antigens to replace the recombinant proteins. Low-avidity antibodies will bind with tagged antigens, triggering a signal that determines the avidity. Notably, assays involving blocking agents, without the influence of chaotropic agents, potentially demonstrate reduced variability and enhanced accuracy.

Emerging research methods include kinetic avidity assays. For example, our laboratory has crafted a “testing-on-a-probe” panel that leverages a biosensor platform that targets the receptor binding domain (RBD) of viruses, with a notable application for SARS-CoV-2. Furthermore, we have developed a chaotrope- and label-free biolayer interferometry technique for real-time, label-free interaction measurements. These assays evaluate the avidity of antibodies specific to RBD in both COVID-19 patients and healthy vaccinated individuals. Our findings suggest that these novel avidity assays could be useful in monitoring both SARS-CoV-2-infected patients and the vaccination response in individuals.



Yaxin Li, PhD

What are the challenges of avidity testing in clinical practice, and future directions for its application?

Commercial avidity tests have inherent limitations. Notably, there's significant variability in their methodologies and interpretation of results, making cross-laboratory or cross-study comparisons challenging. While a high avidity index generally rules out an acute infection, a low index complicates the diagnosis and often necessitates additional information for confirmation, depending on the specific IgG avidity test used.

Emerging research-driven avidity assays, especially label-free versions, show promise but require further refinement for clinical use. While label-free methods offer advantages, including speed, cost-effectiveness, and simplicity, their sensitivity and specificity currently lag behind, which is why they haven't yet been commercialized for clinical diagnostics. However, recent studies aiming to enhance the sensitivity and specificity of these label-free avidity tests are encouraging, suggesting potential for their routine clinical application in the foreseeable future.

Yaxin Li, PhD, is a postdoctoral research associate in the department of pathology and laboratory medicine at Weill Cornell Medicine in New York City.
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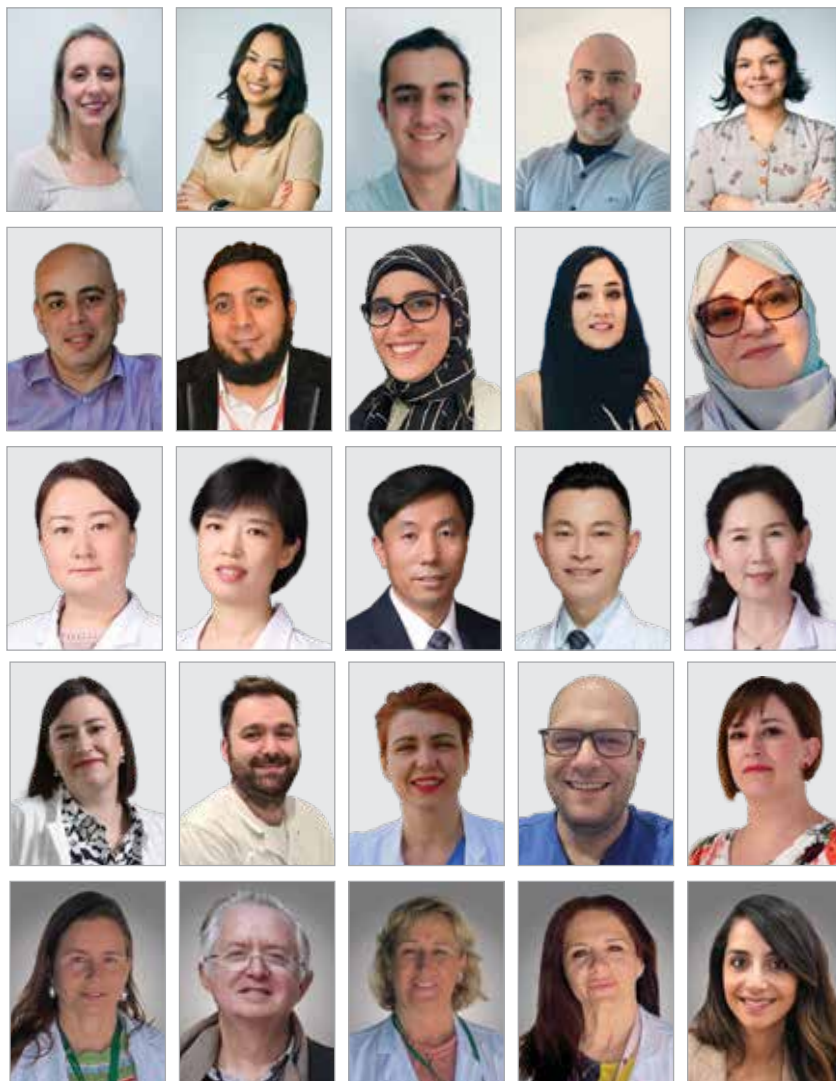
ENHANCED
COVID-19 TESTING
STRATEGY

81%

Test results returned
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UNIVANTS Teams of Achievement Demonstrate Excellence in Improving Patient Care

BY KIMBERLY SCOTT

Clinical laboratories across the globe are demonstrating the important role they play in helping improve patient care through streamlined and rapid testing, particularly in emergency departments, where efficient patient flow and quick diagnosis can be a matter of life and death. The five initiatives highlighted below have been recognized by the UNIVANTS of Healthcare Excellence Awards as the 2022 “Teams of Achievement.”

These prestigious awards were created by Abbott in partnership with the Association for Diagnostics & Laboratory Medicine (ADLM, formerly AACC) and other leading healthcare organizations to recognize teams that collaborate across disciplines to transform healthcare delivery. In addition to demonstrating the critical role of clinical laboratories, the winning teams

demonstrate how working together with other specialties as part of an interdisciplinary team can have a significant impact on improving patient outcomes.

This supplement explores the outstanding accomplishments of the Teams of Achievement, which include using a noninvasive serological model to diagnose liver cancer, optimizing direct quantitative PCR (qPCR) during the COVID-19 pandemic, accelerating a diagnostic pathway for patients with suspected mild traumatic brain injury, strategic laboratory stewardship in the emergency department (ED), and enhanced staff support and resource utilization during the pandemic.

USING A NONINVASIVE SEROLOGIC MODEL TO DIAGNOSE LIVER CANCER

Primary liver cancer, or hepatocellular carcinoma (HCC), is currently the fourth most common malignant tumor in China, with a 5-year survival rate of only 12.1%. The key means to improving the overall survival rate of HCC patients is the early identification and early diagnosis of high-risk groups of HCC.

Ideally, diagnosis of early HCC at an asymptomatic stage allows more patients to receive potentially curative treatments, such as lobectomy, interventional therapy, and liver transplantation to maximize patient outcomes and reduce mortality

associated with liver cancer, noted Yinlong Zhao, MD, professor and director of nuclear medicine at The Second Hospital of Jilin University in Changchun, China. Regular surveillance of patients with chronic liver disease to identify high-risk groups and the application of imaging tests to identify early HCC or precancerous lesions are effective means of detecting potential liver cancer, she said.

In terms of early diagnosis of liver cancer, ultrasound is currently recognized as an important screening method. However, ultrasound has limitations and is easily affected by the personal experience and skill of the operator. At the same time, patients with nodular cirrhosis are prone to misdiagnosis. Serum biomarkers such as alpha-fetoprotein (AFP) are commonly used, but AFP detection is insufficient in the diagnosis of liver cancer, Zhao said.

In clinical practice, more than 30% of patients with liver cancer have normal or only mildly elevated AFP levels, especially in patients with early or small liver cancer. Zhao believes that significant opportunities exist to ensure patient safety through routine and effective use of clinical risk models, which are also recommended by the latest clinical guidelines.

An integrated clinical care team at The Second Hospital of Jilin University recognized an opportunity to provide education to the population at risk and detect liver cancer through a new diagnostic pathway known as ASAP, which they believed could improve patient safety and reduce unnecessary invasive examinations. The hospital began experimenting with the new pathway on June 1, 2020.

ASAP is a risk-stratification model based on serological tests, developed by a Chinese multicenter,



Using a Noninvasive Serologic Model to Diagnose Liver Cancer

17.4% Increase in number of patients identified as having primary hepatocellular carcinoma using ASAP versus AFP alone.

8,000 Yuan (\$1,200) Average savings per patient due to reduction of the number of unnecessary imaging examinations.

19.3% Increase in added clinical confidence using ASAP model.

large-sample cohort study in 2019. The ASAP model is comprised of four key elements: age, sex, AFP, and PIVKA-II. It is convenient, relatively noninvasive, and easily available, and has been shown to accurately predict the presence of HCC, Zhao said.

For patients suspected of having HCC, use of ASAP versus AFP alone identified an additional 17.4% (from 54.4% –71.8%) of patients with liver cancer. Implementation of the ASAP model also resulted in a reduction in the number of unnecessary imaging examinations, invasive procedures, and surgeries for patients, saving approximately 8,000 yuan (\$1,200) per patient. A reduction of about 14,000 ultrasounds per year is equivalent to savings of 2.1 million yuan (\$290,000).

With the support of a multidisciplinary team, high-risk patients underwent further examinations to confirm the diagnosis. Medium-risk patients were monitored while high-risk patients were regularly screened and followed to reduce unnecessary examinations and patient anxiety.

The use of biomarker panels for diagnosis is widely accepted, Zhao noted. However, in this case, the ASAP biomarker panel was specifically validated in a Chinese population. “Our multidisciplinary approach has enabled cross-functional utility, implementation, and endorsement of the risk model across specialties for liver cancer diagnosis and intervention,” she said.

Clinicians at the hospital also appreciated that the ASAP model was validated in the Chinese population. “In a field of evidence-driven medicine, where ethnic diversities can have an impact on patient care, I am pleased to have an actionable, real-time model that has not only been developed but also validated in the population I serve,” said Yongshen Yang, MD, director of

Optimizing Direct qPCR During COVID Pandemic

15 hours to 3 hours Average reduction in wait time for results for SARS-CoV-2 testing.

480,000 Euros (\$508,000) Savings from isolation reagents no longer required for PCR testing.

3% Identified false negative rate for rapid antigen testing identified by POC dqPCR testing.

the Hepatobiliary and Pancreatic Surgery Department.

Implementing the ASAP model can be straightforward and simple for most healthcare systems, Zhao said, provided they already have the main components of the model available, including a core laboratory that can run the AFP and PIVKA-II-biomarker panel and an intelligent information solution (such as AlinIQ AMS) for calculating the score.

OPTIMIZING DIRECT QPCR DURING THE COVID-19 PANDEMIC

During the COVID-19 public health emergency, rapid testing was key to minimizing the spread of SARS-CoV-2. However, many parts of the world struggled to achieve fast result turnaround. Clinical Hospital Center in Rijeka, Croatia, found that due to lack of supplies and the expense of patient testing, rapid testing for SARS-CoV-2 was seriously restricted early in the pandemic.

Although most hospitals have specialized laboratories capable of performing quantitative qPCR testing for SARS-CoV-2, the collection of samples at various sites within hospitals and their transport to dedicated laboratories increases the time from sample acquisition to result.

Given that several different commercially available qPCR reagents

demonstrated the feasibility of direct qPCR (dqPCR) detection without an RNA isolation phase, the hospital chose to adapt an existing assay into a point-of-care (POC)-style direct qPCR process and introduce it into the ED, explained Martina Pavletic, PhD, a specialist in intensive care medicine in the ED.

The Seegene Allplex SARS-CoV-2 diagnostic test was modified by the clinical laboratory team into a POC dqPCR test that could be performed by clinicians and technicians with little prior experience with qPCR testing and implemented in the hospital ED. The hospital partnered with the Center for Proteomics at the University of Rijeka in modifying the test.

“At that time, there were not any CE-IVD/Food and Drug Administration approved kits that we could use out of the box, so on top of organizing the logistics of setting up the lab, we needed to make sure the results were comparable to the classic test, which was a lot of work,” said Mate Lerga, MD, an emergency medicine specialist. “Besides validating the test, we also needed to validate our performance of the test since we are primarily clinicians and the other personnel we sourced later were from various fields—biochemistry, transfusion medicine,

biotechnology, and sanitary engineering.”

Emergency specialists and physicians were trained in PCR technique analysis during the POC-PCR laboratory implementation, noted Vanda Juranic Lisnic, PhD, a university professor and researcher in the Center for Proteomics. “The development and validation of direct qPCR was mainly performed by clinicians with no previous experience in techniques employed in a molecular biology lab in collaboration with the Center for Proteomics,” she said. “Over 10 clinicians, both experienced specialists and just-graduated MDs, successfully learned how to analyze and interpret qPCR data.”

Once they implemented the POC dqPCR method, the waiting period for the results decreased from an average of 15 hours (maximum of 44 hours) to 3 hours (maximum of 6 hours). What’s more, the POC dqPCR testing revealed a 3% false negative rate from rapid antigen testing. Hence, use of the POC dqPCR method for SARS-CoV-2 testing both increased patient safety and reduced intrahospital virus transmission, Pavletic said.

This approach also saved money, with the cost of testing for one patient declining from 30 euros to 20 euros as a result of isolation reagents that were not used. This saved an

average of 40,000 euros monthly (\$42,000), or 480,000 (\$508,000) euros per year. Altogether, the hospital’s molecular diagnostics expenses were reduced by 33%.

Clinical Hospital Center Rijeka was the first hospital in the region to create and implement direct quantitative PCR, significantly improving the flow of patients through the hospital system, Pavletic said. The design of the dqPCR test for SARS-CoV-2 is transferable to different molecular detection techniques, both established and emerging, she added.

“The Laboratory for Rapid Molecular Diagnostics in the Emergency Department at the Rijeka Clinical Hospital Center was established with the intention of continuing to develop molecular diagnostics methods based on the point-of-care principle for the purpose of rapid diagnosis and application of therapeutic agents in emergency procedures,” Pavletic said. “The automated transfer of PCR test results from the SARS-CoV-2 viewer software to the hospital information system allows for quicker results validation and increased lab processivity.”

Development of the Laboratory for Rapid Molecular Diagnostics and the dqPCR test has since led to development of other POC tests, including assays for respiratory

syncytial virus and other infectious diseases, Lerga said.

“When the European Centre for Disease Prevention and Control issued a Mpox advisory, we were ready in literally a few days, and for any future needs, we would need only a short amount of time to be ready to provide a huge number of tests per day,” he said. “At this point in time, we have unlimited options to provide patients with some sort of individually tailored tests any time we see fit.”

ACCELERATED DIAGNOSTIC PATHWAY FOR PATIENTS WITH SUSPECTED MILD TBI

Traumatic brain injury (TBI) is the greatest contributor to death and disability among all trauma-related injuries. TBI can also increase the risk of developing a neurodegenerative syndrome, like dementia, later in life. The gold standard to assess TBI in the ED is through the use of computed tomography (CT), a technology that uses radiation, which has been linked to increased risk of developing cancer over the long term. TBI has also been associated with high costs to individual patients and society at large.

Mild TBI (mTBI) can be difficult and costly to diagnose. An interdisciplinary team at Hospital Universitario Virgen de Las Nieves in Granada, Spain, implemented a new TBI panel in routine practice, which not only resulted in fewer CT scans, but also shorter waiting times in the ED, according to Gemma Álvarez Corral, a clinical laboratory specialist in laboratory medicine. The hospital uses the new panel in conjunction with other clinical information to aid in the evaluation of patients 18 years of age and older who present with suspected mTBI within 12 hours of injury. The panel assists in determining the need for

Accelerated Diagnostic Pathway for Patients with Suspected Mild TBI

10% Reduction in CT scans in first three months of implementation.

2-Fold Reduction in wait times for patients who have been ruled out for TBI, from 8.63 hours to 4.3 hours.

4,568 Euros (\$4,837) Total mitigated costs from not performing unnecessary CT scan in first nine months.

Strategic Laboratory Stewardship in the ED

15.2% Increase in patients who were low-risk for adverse events being confidently sent home, without the need for unnecessary serial lab testing.

12% Increase in workflow capacity in the ED, allowing more than 10,000 more patients to be seen each year.

270 EGP (\$13) Average savings per patient in reduction in unnecessary testing.

a CT scan of the head by enabling semiquantitative interpretations of GFAP (glial fibrillary acidic protein) and UCH-L1 (ubiquitin C-terminal hydrolase L1) as found in human plasma and serum.

Since implementing the TBI clinical care initiative, 33 patients who would previously have been unnecessarily exposed to radiation did not require a CT scan to rule out mild TBI. Overall, there was a 10% reduction in CT scans, enabling a reallocation of skilled resources to other functional areas. In addition, there has been a more than two-fold reduction in average wait times for patients who have been ruled out for TBI, from 8.63 hours to 4.3 hours, saving a total of 132 patient hours over 9 months, according to Corral.

Clinicians also found the panel useful. In a survey conducted among ED doctors and nurses, 77.8% indicated that the added insights from the panel helped reduce the uncertainty related to the absence of brain lesions, particularly in the elderly.

“Working in emergency departments involves high pressure. Equally high are the expectations of patients and their families,” commented Jose Franciso Vargas Rivas, MD, head of the ED. “By reducing patient wait times associated with diagnostic tests, we minimize the added pressures associated with unfortunate delays directly, or indirectly, related to emergency services.”

Use of the mTBI panel is estimated to have saved almost 250 euros (\$264) per patient with suspected mild TBI, according to Corral. Total mitigated costs through reduction in unnecessary CT scans has exceeded 4,568 euros (\$4,837) since the hospital implemented the initiative.

“The introduction of the TBI panel has made it possible to reduce the number of patients staying in the emergency room,” she explained.



“The price of a simple emergency consultation (medications and analytics) is 144.24 euros (\$152.75). The price of assistance if it requires more complex tests (such as the TAC) and longer waiting time, is 392.03 euros (\$415.15). Avoiding these costs can be significant.”

This clinical initiative is unique in that there are few hospitals in Europe that have begun using the mTBI marker panel. The Hospital Universitario Virgen de Las Nieves in Granada is the only hospital in Spain to have implemented this panel, according to Corral. The process is very easy and does not require any changes in the infrastructure, she added, noting the markers are as easy to measure as glucose.

STRATEGIC LABORATORY STEWARDSHIP IN THE EMERGENCY DEPARTMENT

ED overcrowding is a global challenge that can lead to delays in patient

management, increased patient length of stay, and increased healthcare costs. Key to patient triage is understanding the clinical conditions and need for hospital admissions. Laboratory tests have long played an essential role in those decisions. Increased testing can have a dramatic impact on already constrained human and economic resources, particularly if requests do not follow evidence-based criteria. By contrast, inappropriate laboratory testing could trigger additional, unnecessary, and even invasive investigations.

To reduce overcrowding in the ED, a team at Ain-Shams University Emergency Hospital in Cairo, Egypt, in 2021 designed a novel testing approach for optimization of urgent testing, according to Wessam ELSayed, MD, a professor of clinical pathology and emergency lab director at the hospital.

ED physicians now have the choice to order from a panel of

10 tests, with individual recommendations related to evidence-based ordering. Based on the results, ED physicians make the decision to admit for more testing. The test panel is based on a consensus between internal medicine, surgeons, and laboratory medicine professionals.

The test menu includes the most informative tests across the most common emergency conditions, with the ability to be performed within 1 hour. Selection is based on patients' clinical conditions. For example, amylase testing is ordered for patients with acute abdominal pain.

The 10-test-panel includes the following assays: arterial blood gas, complete blood count, prothrombin time, random blood glucose, creatinine, total bilirubin, direct bilirubin, amylase, high-sensitive (hs) troponin II, and beta human chorionic gonadotropin. A cardiologist must request the hs-troponin test.

If additional testing is needed, the patient is admitted to the hospital and further testing is selected from a 20-test panel. In addition to the tests included in the 10-test panel, the 20-test panel also includes the following: sodium, potassium, creatine kinase, CK-MB, albumin, alanine aminotransferase, aspartate aminotransferase, hepatitis B surface antigen, hepatitis C antibodies, and HIV Ag-Ab.

"The new process has substantially and positively improved workflow, as well as the patient experience, enabling expedited care and enhancing our hospital's ability to maximize the number of patients who are seen, admitted, or safely discharged home from the ED," ELSayed said.

As a result of the new testing initiative, 15.2% more patients who were low risk for adverse outcomes (from 49%–64.2% of ED patients) were confidently sent home, without the need for unnecessary serial lab testing. Test turnaround times improved in every testing category, with improvements of 21 minutes in chemistry, 6 minutes in hematology, 30 minutes in virology, and 14 minutes in hormone testing.

In addition, length-of-stay in the ED declined from 10 hours to 6 hours, thus accelerating ED patient flow to internal departments for earlier management and helping to decrease overcrowding.

"In an area where health resources are scarce and minimal alternatives exist, patients are at the mercy of the capacity of our emergency department," said Abdall Hamed Ibrahim, MD, deputy manager of the emergency hospital. "With our new process, we've witnessed a substantial reduction in patient wait times, saving up to

four hours from arrival to discharge or admission."

In addition, workflow capacity in the ED increased by 12%, enabling more than 10,000 more patients to be seen each year since (14,978 in 2020/2021 and 12,515 in 2021/2022). Admissions from the ED to internal medicine and surgery also increased by 14% and 19%, respectively, according to Essam Fakhery, MD, manager of the ED.

What's more, unnecessary lab tests performed in the ED are reduced from 20 tests to 10 tests per patient, leading to a savings of 270 EGP (about \$13) per patient.

"In our institute, the ED services are free of charge," ELSayed said. "That means poor patients can receive the healthcare services without paying. The university hospital offers the resources needed for care in the ED; thus, these resources should be optimized to help in patient management in the emergency setting."

The clinical care initiative is unique, ELSayed added, noting that the use of only 10 common tests with clinical evidence instead of ordering additional tests in the ED is challenging. The initiative is also highly scalable. "Any ED-setting or institute could implement the 10-lab-test panel in the ED," she noted. "However, the choice of tests should be of clinical significance according to each institute and the common patient clinical settings."

Enhanced Staff Support and Resource Utilization During COVID

6 Newly established sample collection points allowing collection of more than 3,500 specimens during peak time of COVID pandemic.

81% Test results returned within six hours of sample collection.

1,881 Number of staff who became aware of their COVID-19 status.

ENHANCED STAFF SUPPORT AND RESOURCE UTILIZATION DURING COVID

Early in the COVID-19 pandemic, a multidisciplinary team with the Associação Fundo de Incentivo a Pesquisa (AFIP) in Brazil convened to devise a strategy on how to deal with

COVID. AFIP is a private, non-profit, and philanthropic institution with a wide range of health services in eight Brazilian states. The AFIP has more than 3,000 employees and performs about 6 million laboratory tests monthly, of which about 80% are assigned to the Sistema Único de Saúde (SUS) in Brazil. The SUS is the largest public health system in the world, serving nearly 190 million people.

The Cuidando de Quem Cuida (CQC), a program that aims to promote employee healthcare, was used by the committee to implement a comprehensive COVID-19 testing strategy for employees and their families. The AFIP laboratory performed real-time PCR tests on more than 3,500 samples from employees and their families; tests were free for employees and provided at a cost for family members. Six new sample collection points were established, with two points with the highest number of collections located 1.2 miles from the facility to facilitate home pickups and drive-through services. These strategic collection points accounted for more than 3,500 samples during peak times of the COVID pandemic.

“With 81% of test results released within 6 hours and 19% released within 12 hours, we were able to provide early guidance to most employees in relation to symptom control, warning signs, and isolation procedures to reduce on-site transmission of work and in the family,” said Josue Augusto do Amaral Rocha, MD, a family physician with the CQC program. “As a result, we had excellent indicators regarding the number of serious cases (16 hospitalizations in 1,959 confirmed cases) and mortality (two deaths) among all healthcare workers with positive tests.”

What’s more, AI predictive data for human analytics enabled staff changes that equated to the savings of one full-time employee who was deployed in times of need to support areas of business need during different waves of the COVID-19 pandemic, said Gabriel Costa de Carvalho, PhD, a researcher with the AFIP.

The process is highly scalable, not only for viral pandemic outbreaks, but also for other testing situations that require some complexity and responsibility.

“Caring for employee fragility is a unique initiative in terms of quick turnaround times for laboratory results and family uncertainties,” said de Carvalho. “This specific look can be replicated and introduced to other organizations as new pandemic outbreaks occur.”

CLINICAL LABORATORIES HELP OPTIMIZE PATIENT CARE

The initiatives highlighted above are just a few of the many projects in which laboratories are playing a critical role in transforming health-care delivery.

Whether identifying liver cancer through noninvasive methods or diagnosing mild traumatic brain injury faster and more efficiently, clinical laboratories around the world are making a real difference in improving patient outcomes and quality of life. Beyond simply providing test results, these labs are actively improving care in emergency departments, reducing wait time for test results, and optimizing test ordering.

To learn more about UNIVANTS and past award recipients, go to www.univantshce.com.

UNIVANTS 2022 Teams Recognized in This Issue

A Noninvasive Serologic Model Using an Intelligent Informatic Solution to Enhance Clinical Decision-Making and Improve Patient Safety

The Second Norman Bethune Hospital of Jilin University

Yinlong Zhao, Zhenjing Jin, Yongsheng Yang, Chunmei Hu, Yan Zhao

Improving Emergency Department Flow and Decreasing Risk Through Development and Implementation of Molecular Diagnostics Guided Triage

Clinical Hospital Center Rijeka

Martina Pavletić, Vanda Juranic Lisnic, Mate Lerga, Mario Francic, Jennifer Babic

Improved and Accelerated Diagnostic Pathway for Patients That Present to the Emergency Department With Suspected Mild Traumatic Brain Injury

Hospital Universitario Virgen de las Nieves

Gemma Alvarez Corral, Maria Molina Zayas, Francisco Ruiz-Cabello Osuna, Maria Isabel Romero Manjon, Eva Gutierrez Pérez

Enhancing Resource Utilization and Improving Patient Experience Through Strategic Laboratory Stewardship

Ain-Shams University - Emergency Hospital

Wessam EL Sayed Saad, Esam Fakhery Ebied, Rawan Mahmoud Mohamed, Ashraf Hassan Abdelmobby, Nouran Mahmoud Bahig

Enhanced Staff Satisfaction and Resource Utilization During the Covid-19 Pandemic

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