CE CONTINUING EDUCATION

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LEARNING OBJECTIVES

After studying this article, the reader should be able to:

Microbiology:
1. Recognize negative outcomes from improper specimen collection for culture and sensitivity.
2. Recognize circumstances where molecular testing is preferred.
3. Describe how Gram stains are used to maximize patient outcomes.

Chemistry:
4. State the rationale behind the use of the calculated glomerular filtration rate.
5. Describe the use of cystatin-C in the evaluation of renal function.
6. List two uses for B-type natriuretic peptide testing.
7. Differentiate between guaiac-based occult blood testing and immunochemical fecal occult blood testing.

Hematology:
8. Identify new platelet parameters offered by the ADVIA analyzer.
9. Identify the classification system of malignancies developed by WHO.

Phlebotomy:
10. Explain why phlebotomy competency should be assessed.
11. With regard to CLIA surveyor guidelines, know the questions to ask in assessing phlebotomy policies and procedures.
12. List and describe the four phlebotomy competency assessment tools.
13. Describe the appropriate actions that need to be taken once the evaluation of the phlebotomy assessment is completed.

Back to basics for microbiology is spotlighting specimen collection; a high-quality specimen leads to high-quality results and better patient care. Whether the laboratory has rapid antigen testing that identifies an influenza virus, polymerase chain reaction (PCR) technology, the luxury of an automated plate streaker, or equipment for fully automated infectious-disease antibiotic susceptibility testing, or ID/AST, results, and whether its processes are designed with high efficiency and less manual labor, the microbiology culture result will always be dependent on specimen collection.

Most microbiology quality indicators center on basic specimen collection, and the age-old saying “garbage in equals garbage out” is the basis for good microbiology practice. For a microbiologist, it is imperative to educate and train nurses on collecting proper specimens. Those who collect samples for the microbiology laboratory need to be monitored and also need to receive feedback so that they become acutely aware of how they affect patient care.

A poorly collected specimen can lead to many scenarios — from inappropriate antibiotics given to patients (which leads to organism resistance), to patients being treated for infections they do not have (as in the case of a contaminated blood culture).

Spending just a few hours each month training nurses and phlebotomists on the proper technique for collecting blood cultures is justifiable and warranted. Concentrating on specimen collection can save a laboratory and an institution thousands of dollars in costs associated with antibiotics, labor, and length of hospital stays. Consider that a contaminated blood culture costs an average of $4,500 per incident, then consider that the national average for blood-culture contamination is 3%. An institution collecting 1,000 blood cultures monthly would spend an average of $135,000 monthly for those contaminated blood cultures (1,000 x .03 x $4,500 = $135,000). Microbiology’s specimen-collection goals combined with the technology available today means that it is absolutely possible to have rapid resulting or a decrease in the turnaround time (TAT) from collection to actionable results.

Swabs and Gram stains

Many microbiology laboratories calculate monthly blood-culture contamination rates and the number of contaminated urines, and then review corrected report rates. The CAP Checklist has a standard, MIC.22100, to determine acceptability of all expectorated sputa specimen for bacterial culture or the extent

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of culture work-up. Urine samples are frequently resulted as “contaminated” when three or more organisms are cultured out. Other specimens that need to be monitored for quality are sputum and wound cultures. **Swabs:** Swab specimens present another debate. The swab was developed for the sheer convenience of collecting certain types of specimens. A good microbiologist should remember that there are instances where using a swab to collect specimens is appropriate and, sometimes, the only choice (i.e., throat swabs). Many physicians currently collect synovial fluids, surgical tissue, and many other specimens on swabs, and many microbiologists take those swabs and proceed with culture. It is the responsibility of the microbiology lab to do more to educate physicians, specifically surgeons, to collect “quality” microbiology specimens by giving the lab actual tissue and/or fluids in syringes instead of on a swab. **Gram stains:** With so much attention on rapid culture results, do not be quick to put the Gram-stain results on the back burner. The Gram stain is still the third most important result in microbiology behind specimen collection and rapid results. It is imperative that Gram stains not only are performed properly but also on appropriate specimens and read in a timely fashion to provide preliminary results on which a physician can act. Gram stains conducted on an inappropriate specimen, such as stools, give results just as misleading to a physician as those from a poorly collected specimen. (A great resource for performing on appropriate specimens is the *Clinical Microbiology Procedures Handbook* from ASM Press.)

Additionally, Gram stains read after the preliminary result of the culture are worthless, but do not forget that much information can be gathered from the appearance of bacteria on a Gram stain. Many bacteria can be preliminarily identified from Gram stain when we know the specific source, such as *Staphylococcus, Bacillus, Streptomyces, Gardnerella*, and many others. **Rapid test technology**

Physicians want results now, not three or four days from now. Automation has also allowed the microbiology laboratory to take part in more rapid results. Newly developed technology being used today in laboratories means physicians can get more rapid results. Rapid antigen testing for influenza, *Streptococcus pyogenes, Clostridium difficile*, and others are available with fairly good sensitivity and specificity. Results from these tests can be delivered to physicians the same day they are ordered, or even on a STAT basis. Microbiology has lagged behind hematology and chemistry in becoming more automated; routinely, it is still the most manual and most labor-intensive laboratory department. Over the last several years, however, many developments in automated systems enable microbiology labs to work more efficiently. These systems have made it possible for the microbiology lab to re-target its labor resources to other more manual, less automated tasks like specimen plating, plate reading, spot testing, Gram stains, and quality-control procedures.

Instruments that monitor blood cultures 24 hours a day allow for more rapid results. Previously, blood cultures were looked at once a day; today, actionable results can be given around the clock when positive blood cultures are detected — and this remains the most critical, high-volume test in the microbiology lab. ID/AST systems allow for most identification and susceptibility tests to be reported the same day they are set up on the system. Some of these systems have sophisticated software (i.e., using advanced encryption standard, or AES) that reviews and automatically detects all results for technical errors, result anomalies, and natural resistance patterns in organisms. This frees up microbiology lab staffers to use their technical expertise only on those results that require manual review. Since approximately 80% of ID/AST results are generally expected or normal, many laboratory information systems allow for auto-verification as well. When results are verified by an automated system, they are released without manual intervention to a patient’s chart.

Other types of automation contributing more efficiency to the large microbiology laboratories are automated plate streakers. Most microbiology technologists would rather read plates than plate specimens, and many laboratories employ less-skilled labor to handle the plating task. Specimens must still be plated, however; therefore, the idea of automating this front-end process is innovative. Today’s automated plate streakers offer limited benefits to small and medium-size laboratories due to the cost and limitations of the existing technology.

Then, there is the automated Gram stain. Some developments have been made but present fluctuating results. Although the technology has been borrowed from hematology and works for the most part, microbiology specimens offer quite a few more variables than hematology’s blood samples. The variety of specimens in microbiology offer many incongruities such as sputum samples which are often thick and which stain unevenly; the old swab specimen often with little material to Gram stain after plating of several plates; fluids often need to be spun, and so on. This can be quite challenging for performing consistent, evenly stained specimens. Therefore, for those high-volume laboratories where hundreds of Gram stains are performed daily, automated Gram stainers are probably wonderful tools, but most microbiology labs have been slow to adopt and are waiting for improved technology to replace the manual technique.

Rapid result technology cannot be discussed without mentioning the world of molecular microbiology. Not long ago, PCR was only for the reference laboratory, the university hospital laboratory, or the specialty laboratory. Today, many developments have been made in molecular microbiology that have simplified the methods, generated easy-to-use assays in kit formats, and improved the containment of the amplified materials to minimize contamination so that this technology can be performed in most microbiology laboratories. Before jumping into the world of molecular, a medical laboratory needs to answer several questions:

1) Is this test result going to improve service and patient care?
2) Will this test result change or improve therapeutic choices?
3) Is this a high-volume test that makes it budget neutral?

Additionally, there are a few instances where a laboratory requires molecular testing:

- where sensitivity of the test is critical (i.e., HSV-1);
- encephalitis where culture is dangerous (i.e., small pox, SARS);
- where quantitative analysis is necessary (i.e., HIV viral load); and
- when your staff is ready and willing.

The bottom line on molecular testing is that it is not for every lab and not every lab has the same needs. □

Anne R. Beall, BS, MT, is the U.S. Clinical Marketing Manager for Microbiology at bioMérieux Inc. in Durham, NC, and is well acquainted with its ID/AST Vitrek 2 system with AES software.

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I n the realm of clinical chemistry, Sir Francis Bacon’s quotation, “He that will not apply new remedies must expect new evils; for time is the greatest innovator,” is most certainly true. The laboratory section most heavily devoted to automation — clinical chemistry — continues to evolve. Its use of automation seeks to yield error-free information requested by physicians while, at the same time, maximizing the skills of workers in the shrinking pool of qualified lab personnel. For example, auto-verification or auto-release of results serves patient safety yet has the potential to ease the time crunch on staff.

Although the introduction of automation into the laboratory has generated questions regarding job security among some workers, others have recognized that the sheer volume of numerical data must be reviewed by human eyes has a finite limit. Auto-verification algorithms must be constructed to deal with all the variables that can impact the production of analytically correct results: instrument calibration, quality control, instrument error codes, delta checks, and alert- or panic-level results. The College of American Pathologists (CAP) Laboratory General Inspection Checklists furnish guidelines to laboratories interested in beginning auto-verification.

**eGFR use**

Within this clinical chemistry sphere of equipment-related change is the use of the calculated glomerular filtration rate (also known as electronic glomerular filtration rate or eGFR) as an adjunct to or replacement for the 24-hour urine creatinine clearance test. Using the serum creatinine, gender, age, and race, it is possible to calculate the glomerular filtration rate — the basis of the traditional creatinine clearance test — but without the usual problems associated with 24-hour urine collection.

The impetus to performing this calculation stems from the National Kidney Disease Education Program, whose primary goal is to improve the detection and treatment of early kidney disease. Currently, many labs are struggling with the mechanics of providing this calculation to their physicians. Issues include which calculation to use (MDRD or Cockcroft-Gault), whether or not the laboratory information system in use can support the calculation and the absence of standardization among creatinine methods, and whether or not to give the calculation on all creatinine tests performed by the laboratory.

**Cystatin C alternative testing and BNP levels measured**

Cystatin C is another alternative to creatinine clearance testing. A low-molecular-weight protein that is produced by all nucleated cells, cystatin C is freely filtered by the glomerulus and almost completely reabsorbed and broken down by the proximal tubular cells. Cystatin C has been proposed as a sensitive endogenous serum marker for the early assessment of changes in the glomerular filtration rate. Unlike creatinine, cystatin C is independent of height, weight, muscle mass, age, and gender. It can also be utilized as an early indicator of organ rejection in renal-transplant patients and is showing promising signs of being a predictor of mortality risk associated with myocardial infarction or stroke.

B-type natriuretic peptide, or BNP, testing now affords physicians an objective measure in the diagnosis and treatment of heart failure. Patients with symptoms of heart failure (shortness of breath, difficulty breathing, or edema of the legs) can be classified and treated more appropriately using BNP levels. BNP is produced by the heart in response to the stretch or pumping load placed upon the ventricles. As the heart muscle begins to fail, additional BNP is produced and released into circulation. BNP levels will fall in response to treatment for congestive heart failure. Recent research involving risk stratification of myocardial infarction patients has demonstrated that increased levels of BNP in these patients is associated with higher mortality rates.

**FOBT and iFOBT**

Excluding deaths from lung cancer, colorectal cancer is the most common cause of cancer death for men and women. Both the American Cancer Society and Centers for Disease Control and Prevention recommend the fecal occult blood test (FOBT) annually for all individuals age 50 and older to aid in the early detection of colorectal cancer. Historically, guaiac-based tests have been performed either at the point of care or in the central laboratory. These methods are based on the peroxidase activity of hemoglobin, but can produce false-positive results in the presence of meat, uncooked fruits and vegetables, as well as common drugs or vitamin supplements.

Patient compliance with restrictions prior to testing has typically been quite low. The new immunologic fecal occult blood tests (iFOBT) use either monoclonal or polyclonal antibodies directed against the globin chain to provide better sensitivity and specificity without the need for dietary or drug restriction. Additionally, since hemoglobin from the upper gastrointestinal tract will be broken down by the digestive process, a positive iFOBT is specific for bleeding in the lower gastrointestinal tract. 

Debbi Tiffany, MSEd, MT(ASCP)SC,SLS, is the CLS program director/POCT/QQI/Safety, at Swedish American Hospital in Rockford, IL.

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Hematology: Instrumentation advances bring slide-review protocols

By Jeanne M. Isabel, MSEd, CLSpH(NCA)

Like other laboratory departments, hematology and hemostasis have experienced new and improved techniques, instrumentation, and disease classifications. Probably the greatest awareness has occurred in hemostasis as more and more patients are being tested for lupus anticoagulants Protein S and Protein C, to name a couple. The threat of thrombophilia is all too real, and better investigative protocols are being used. Also, the number of consumer questions related to coagulation testing is ever increasing.

Platelet indices

A number of hematology topics at the 2006 International Federation of Biomedical Laboratory Sciences 27th World Congress in Seoul, Korea, centered on platelets. A presentation on the ADVIA hematology cell counter compared platelet indice findings with prognostic information for patients suspected of having disseminated intravascular coagulation (DIC). The ADVIA measures common platelet indices (e.g., mean platelet volume, or MPV, and platelet distribution width, or PDW), as well as some new parameters (e.g., percent of blood volume occupied by platelets, or PCT; mean platelet component as a measure of platelet density, or MPC; platelet component distribution width as a measure of shape variation, or PCDW; mean platelet dry mass, or MMP; and platelet dry mass distribution width, or PMDW). The study indicated that the platelet indices were predictive of hospital mortality and warranted the attention of physicians with DIC patients.

Anemia and inherited congenital disorders

Anemia is still one of the most common hematologic conditions, with classification of anemia facilitated by red blood cell indices. Molecular genetic analysis of inherited or congenital disorders (e.g., sickle-cell anemia, chronic granulomatous disease, paroxysmal nocturnal hemoglobinuria, and Factor V Leiden, to name a few) has improved identification of the disorder based on specific gene locus on the chromosome causing the defect. Hereditary hemochromatosis, or HHI, the iron-overload disease and a mutation of the HFE gene, has seen improved patient treatment and management measures due to early identification through genetic testing.

Malignancies

The other major concern of the hematologist is identification of cells related to malignancies. A 2001 revision of the classification system for malignancies by the World Health Organization (WHO) is becoming more widely used. By utilizing a combination of morphology, immunophenotype, genetic features, and clinical features, this system improves clinical prognosis based on available treatments. The first significant change is the finding of 20% blasts in the bone marrow or peripheral blood to diagnose leukemia (instead of 30% FAB [French American British]). The second notable difference is the diagnosis of leukemia when recurrent genetic abnormalities are found. The new categories are:

- acute myelogenous leukemia, or AML, with recurrent genetic abnormalities;
- AML with multilineage dysplasia;
- AML and therapy-related myelodysplastic syndrome (tMDS); and
- AML not otherwise categorized.

The myeloproliferative disorders are another group of conditions that have overlapping clinical and morphologic findings. Cytogenetic and fluorescence in situ hybridization (FISH) studies help establish evidence of abnormal clones, classify the disease, and assist with prognosis. WHO has classified the myeloproliferative disorders into chronic myelogenous leukemia, or CML; chronic neutrophilic leukemia, or CNL; chronic eosinophilic leukemia/hypereosinophilic syndrome, or CEL/HES; polycythemia vera, or PV; chronic idiopathic myelofibrosis, or CIBM; essential thrombocythemia, or ET; and unclassifiable chronic myeloproliferative disease (MPD), or MPD-U. The use of cytogenetics in identifying molecular changes in hematologic malignancies is an exciting tool, benefiting decision-making for treatment strategies.

Instrumentation advances

Instrumentation advances in the hematology department have resulted in slide-review protocols that promote better workflow and efficiency. Abnormal red-blood-cell morphology, immaturity, and abnormal white blood cells — not to mention blood parasites — contribute to interesting department findings. Many parasitologists will agree that the hematologist first discovers malaria and other blood parasites. Difficulties in differentiating some species like Babesia and Plasmodium is now facilitated with PCR techniques.

A product of interest discovered at the IFBLS Congress in Seoul was the Cellavision Diff IQ, a digital proficiency-testing and educational software tool for manual blood cell differential counting. A CD with digital images and data-analysis tools can be installed on a PC in the laboratory. This product can be obtained for free evaluation from the world headquarters in Sweden (www.cellavision.com) or from the U.S. office in Florida (us.info@cellavision.com). This product provides a proficient means of bringing technologist standardization to manual differential counting.

References


Jeanne M. Isabel, MSEd, CLSpH(NCA), is an associate professor at the School of Allied Health Professions in the College of Health and Human Sciences at Northern Illinois University, DeKalb, IL.
As the specimen-collection pendulum swings from phlebotomy centralization to decentralization and back again in a highly unregulated field, laboratories and hospitals are striving to find just the right balance. Regardless of an institution’s view of the traditional phlebotomist’s role in healthcare, one constant remains: Anyone who draws blood must be competent.

Why assess phlebotomy?
In terms of specimen quality and patient safety, obtaining the correct specimen from the correct patient in the correct manner is paramount. Introduce error along this path, and an injury or cascading failure can prove catastrophic to the patient. A cascading failure is failure in a system of interconnected parts. Any failure in collection can trigger the failure of successive activities, like obtaining an accurate result. Such domino-effect failures may go undetected, subjecting the patient to varying degrees of harm, including the reporting of erroneous test results and subsequent patient mismanagement. If the cascading failure leads to violations of Occupational Safety and Health Administration’s (OSHA’s) Bloodborne Pathogens Standard, the cost to the employer can be significant in terms of fines issued by OSHA inspectors. Therefore, from an agency perspective, regularly assessing the competence of all personnel assigned specimen-collection duties is simply good risk management. In the event of an employee and/or patient injury, such documented activities may reduce legal liability.

Regulatory and accrediting agencies require laboratories to establish and follow written policies and procedures that ensure positive identification and optimum integrity of a patient’s specimen. This requirement includes the steps beginning with the time of collection or receipt through completion of testing and reporting of results. In respect to specimen collection, consideration should be given to the following probes taken from Survey Procedures and Interpretative Guidelines for Laboratories and Laboratory Services, a document designed to provide guidance to CLIA surveyors:

- How does the laboratory ensure all staff members — including phlebotomists — give appropriate instructions for patient preparation when needed?
- Has the laboratory provided to its staff and/or individuals external to the laboratory who collect specimens written procedures to ensure that patient preparation requirements have been followed?

- Has the laboratory verified that procedures are available to the appropriate staff responsible for collecting the correct specimen, that personnel are using the appropriate collection technique (order and site of draw) and proper containers (e.g., acceptable anticoagulant)?
- If the laboratory uses non-testing personnel to perform pre-analytic functions, how does it ensure their competency?

Once trained always trained?
For facilities that collect clinical specimens, a phlebotomy competency-assessment program should be an essential component of the laboratory’s overarching quality-management system. Well-designed assessments measure the effectiveness of initial training of new or newly assigned collection staff, allowing training gaps to be identified and addressed. Competence should be documented prior to allowing individuals to draw blood without direct supervision, regardless of the employee’s previous training, experience, or work history. In addition, periodic evaluation of experienced collection staff is necessary to ensure long-term retention of key concepts. Once they are approved in phlebotomy procedures, it is recommended that all employees be re-evaluated within three to six months and annually thereafter to assure their technique is in accordance with the standard of care for phlebotomy and facility policy. Assessments should also be conducted when there is a change in procedure, when a problem is noted, or when a valid complaint is received.

Veteran collectors who hold the philosophy of “once trained, always trained” may take offense at the prospect of their knowledge and skills being assessed. In those situations, their acceptance of the process may be achieved when phlebotomy-competence assessment is presented as a form of “insurance” for the employee. In the event of litigation resulting from a patient’s claim of a phlebotomy-related injury, having on file well-documented assessments where competence has been consistently demonstrated can only help the collector in question when a breach in protocol is not clearly discernable.

Methods of evaluation
In general, competency assessment determines the employee’s ability to apply theoretical information, perform technical procedures, derive appropriate interpretations, and demonstrate problem solving. Effective phlebotomy competency-assessment tools evaluate an employee’s performance against current and reputable standards. Because no single method of evaluation can adequately address all parameters, using a combination of assessment tools provides a more comprehensive review. Four types of assessments can be easily adapted to phlebotomy:

- the written test;
- direct observation;
- case studies; and
- oral queries.

Written tests or quizzes provide a consistent means to cover a broad scope of information, including infrequently performed...
tasks. Although excellent in assessing cognitive ability, written tests fall short in that they do not evaluate actual work practices. In addition, written tests may be intimidating for some employees.

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Of the methods discussed, direct observation holds the distinct advantage of evaluating the employee’s technical skills in the work environment. Typically, a standardized checklist is developed to guide the assessor in conducting an objective, detailed review. Checklists may be divided by collection method, creating individual tools for venipuncture and skin-puncture collections, for example. Common elements to any direct observation, however, should include demonstrated knowledge, professionalism, patient identification and preparation, adherence to safety protocols, performance of procedural steps with additional space for comments, and assessor/employee review.

Case studies and scenarios provide an excellent challenge in addressing problem-prone tasks. Is the laboratory experiencing an increase in hemolyzed specimens or underfilled tubes? Then use the situation as a basis for a written scenario. Case studies that reflect actual problems or those likely to be encountered allow collectors to demonstrate and further refine the problem-solving skills required to prevent the problem’s occurrence (or recurrence). Case studies are an invaluable constituent in the arsenal of competency-assessment tools. The major drawback is a case study’s narrow focal point. For this reason, case studies should not be routinely used as a stand-alone method of evaluation.

Oral queries work particularly well when a reassessment is required. If an employee does not perform satisfactorily on a written test, it may be that the questions were not clearly worded or understood. A question-and-answer session can quickly reveal the employee’s thought processes in a more informal manner. Because this is an oral assessment, additional time is required on the part of the assessor to accurately document this activity.

Evaluating the results
It is not sufficient to merely document assessment activities; performance must be measured and timely feedback provided to the employee. Clearly communicate expectations for performance as well as consequences for policy violations. Employees should be given every opportunity to succeed, through adequate initial training followed by regular in-services and participation in phlebotomy-related continuing education. Acknowledge and reward model performers.

In the event of substandard performance, corrective action is required. Take an educational rather than a punitive approach.

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when possible. For the protection of all parties, responses to poor performance should include the suspension of specimen-collection duties until successful retraining of the employee is complete and verified through a satisfactory reassessment. If competence cannot be confirmed after remedial processes are exhausted, removal of the individual from the assigned task is necessary and constitutes good risk management.

Those who assess must lead by example and avoid the temptation to turn a blind eye to failures or wink at safety violations. Doing so undermines the integrity and validity of the assessment process and may place the employee, the employer, and the patients they serve at risk. Facilities that uphold an across-the-board phlebotomy competency-assessment program that stands up to scrutiny and promotes excellence can realize a highly desirable goal: a competent collection staff safely functioning in full swing. 

References


Lisa O. Ballance, BSMT(ASCP), is a regional laboratory improvement consultant with the North Carolina State Laboratory of Public Health in Raleigh, NC, and has served on CLSI working groups in the revision of specimen collection standards.

To scoop or not to scoop

By Del Williams

Despite advances in lab-test analysis, the results are only as good as the quality of the collected sample. The problem is that the quality of capillary-blood collection is often the weakest link in the sample-analysis chain, with scooping a common cause of poor sample quality. Fortunately, new anti-scooping-oriented containers are raising test quality and minimizing the need for re-tests.

The scoop on skin-puncture pitfalls

Normally, venous blood collection provides a better quality specimen because it minimizes the debris, micro-clots, and tissue fluid that can contaminate skin punctures. Skin punctures, however, are often preferred because they are less invasive, do not compromise fragile veins, and are appropriate when only a small volume of blood is needed. Such tests are common for pediatric and geriatric patients, who may have smaller veins, veins more subject to collapse, or more limited blood supplies.

While lab managers and hospital administrators are aware of how important the pre-analytical part of test quality assurance is, they face wide variation in the ability of clinical and lab staff to collect capillary-blood samples. Though sources of error such as squeezing too hard, failure to wipe away the first drop of blood, and shallow skin punctures causing slow blood flow are usually addressed, scooping blood along the skin as it dribbles from the puncture site often is not. This is a mistake.

Clinical Laboratory Standards Institute (CLSI) standard H4-A5 states, “a scooping motion to collect blood and strong repetitive pressure (milking) must be avoided, as both procedures may result in hemolysis or tissue fluid contamination of the specimen.”

Even typical open-ended containers without scoops can facilitate scooping if a thick rim serves as a barrier to proper blood flow.

Ironically, some common blood-collection containers can unintentionally aggravate the problem of scooping. At least one popular brand of capillary-collection container features an integrated scoop on one end. Though such scoops are undoubtedly supposed to be helpful, the unintended consequence is that healthcare professionals are encouraged to scoop capillary-blood droplets into sample test containers. “Capillary devices with a built-in scoop make the tendency to scoop more likely,” says Laura McLean, MT(ASCP), lab supervisor at a Holyoke, MA, pediatric medical facility. “Many professionals use the scoop to scrape the skin to get the drop in the tube in—

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stead of just letting a free-flowing drop fall into a tube.”

The problem, according to Helen Maxwell, MLT(ASCP), CPT(ASPT), executive director of a Hickory, NC, phlebotomy training and certification association, is that “any contact with the skin can cause contamination and micro-clots.”

Even typical open-ended containers without scoops can facilitate scooping if a thick rim serves as a barrier to proper blood flow. Since the blood droplets to be collected must pass over the lip of any thick rim to enter the container, healthcare professionals may try to scoop droplets near the puncture site to speed the collection process along. This not only may compromise results but also increase the need for re-tests with resulting higher costs and patient inconvenience. It can also slow optimum healthcare when, at times, speed and accuracy are critical.

**Anti-scoop-oriented containers**

To prevent scooping from affecting capillary-specimen quality, some manufacturers have developed anti-scooping-oriented containers designed to prevent or discourage scooping from occurring. These designs are raising test quality, minimizing the need for re-test, and thus holding down costs while improving patient care.

For instance, one manufacturer essentially prevents scooping by providing healthcare professionals with application-specific capillary devices that draw blood droplets away from the puncture site and directly into a treated tube using capillary action. Capillary action — the ability of a narrow tube to draw liquid upward against gravity — is the force that many plants use to draw water into their systems. Healthcare professionals merely touch the end of a capillary straw to a blood droplet without touching the skin. Since capillary action draws the blood droplets into an end-to-end capillary straw, there is no need or chance to scoop the skin’s surface. This minimizes the potential for hemolysis or tissue-fluid contamination due to scooping, and avoids any dirt, debris, or micro-clots on the skin’s surface.

“The capillary-tube design allows blood to wick from a droplet rather than depending upon the force of gravity, minimizing the temptation of scooping by the technician,” says Maxwell.

Collection is complete when the end-to-end capillary straw is entirely filled with blood. This simplifies measuring and makes overfilling or underfilling less likely, which further enhances sample quality and accuracy. The full capillary straw is then drained into the attached sample container by tipping it upright. The capillary straw is removed and discarded, and a twist cap is used for sample transport and storage.

“In my many years of working with and training in skin punctures, I have found the end-to-end capillary straw method to be a cleaner system with less hemolysis, and a need for less blood volume,” says Maxwell.

For healthcare professionals who prefer to use more traditional open-ended containers for capillary blood collection, “thin-rimmed” containers are on the market that overcome the scooping tendency inherent in thick-rimmed ones. The thin rim eases gravity-fed blood flow into the container by minimizing the barrier presented to blood droplets passing over the rim. Since any part of the rim can be used for collection with easier blood flow, healthcare professionals are less likely to feel the need to force or scoop blood droplets into the container.

As lab managers and hospital administrators search for ways to tighten quality, cost, and patient outcome all along the sample-analysis chain, the use of anti-scooping-oriented capillary-blood test containers will become an increasingly important tool. The fact is, to eliminate scooping-related errors or re-tests, there is nothing like removing the need for skin contact or the need to scoop.

Del Williams is a technical writer based in Torrance, CA. He writes about health, business, technology, and educational issues, and has an MA in English from CSU-Dominguez Hills. In this article, Williams alludes to Sarstedt Inc.’s (NC) plastic capillary-collection systems in a variety of designs and a choice of collection techniques. Visit [www.sarstedt.com](http://www.sarstedt.com).