

With hemolysis, tackling the rush with the reasoning

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May 2018—First a journey. Then sometimes a vigorous shake. Little wonder that red blood cells hemolyze.



Finnegan

“Red blood cells don’t like to be stressed,” says Kathleen Finnegan, MT(ASCP)SH, phlebotomy training program director at Stony Brook University School of Technology and Management, New York. She instructs her students to avoid stressing the RBCs by skipping what she calls the “martini shake” (CLSI recommends five to 10 tube inversions), using a needle that is the right size, and not using a syringe for transfer but instead a transfer device. “So it’s gentle,” she says.

Finnegan and others know all too well what causes hemolysis and the work it takes to lower high rates—and keep them low.

When Finnegan observes problems in phlebotomy centers, they appear to be less a matter of inadequate education and more shortcut related, such as leaving the tourniquet on too long, not filling collection tubes properly, or not taking the time to find and palpate the vein to determine the optimal insertion point. During a recent phlebotomy visit with her mother, Finnegan had to ask the phlebotomist to stop patting her mother’s arm. “I said, ‘Can you stop that?’ It inflames all the surrounding tissue and it could increase the chances of hemolysis,” explains Finnegan, who is also an associate clinical professor and chair of Stony Brook’s clinical laboratory sciences program. As for the order of draw, “whatever tubes are in their hands, they grab them and just insert them into the holder.” It’s not that they are unaware of the importance of order, she says. “It’s a busy profession,” or it may be that they’re just not thinking about it.

A 21-gauge needle is standard for blood collection, but butterfly needles are used often, especially for anxious patients or for those whose veins are difficult to access. Specimen collection with a butterfly needle forces the blood to go through tubing attached to the needle. “You’ve got to think of the journey those red blood cells are taking,” Finnegan says.

While a 21- or 23-gauge butterfly needle is “probably OK,” she says an additional hemolysis risk appears when the phlebotomist pulls on the syringe attached to the tubing because the shear force of the pull can cause fragile red blood cells to rupture.

Finnegan, who was a presenter at the 2017 Global Summit on Best Practices in Preanalytics, organized by Greiner Bio-One North America, says hemolysis can occur at any point during the red blood cells’ journey from the patient to the laboratory. Stony Brook’s clinical laboratory addressed one particular problem—hemolysis from clot activation—several years ago by switching from red-top and serum separator tubes to heparinized green-top tubes for blood collection. Finnegan estimates that 90 percent of clinical laboratory tests performed on-site at Stony Brook are from specimens collected in green-top tubes, which stop the clotting process (another stressor for the RBCs) and maintain the osmotic balance of red blood cells, preventing the cells from releasing their hemoglobin.

Lowering the hemolysis rate is one thing, sustaining it is another.

The clinical laboratory at Sarasota (Fla.) Memorial Health Care System has maintained its hemolysis rate reduction with preanalytical instruction for nonlaboratory personnel. It put in place in 2009 a Lean process improvement program to lower hemolysis rates on nursing units, with a focus on the Emergency Care Center (“Hemolysis—can better processes add up to millions?” CAP TODAY, February 2013). Extensive phlebotomy education for the ECC nursing staff, including the reasoning behind best practices—such as why blood draws should not be performed from patient IV lines—helped bring the ECC hemolysis rate down by 2012, from about eight percent to an average of 0.88 percent, and the hospitalwide rate from three percent to an average of 0.86 percent.

Sarasota’s hemolysis rates continued to decline in subsequent years, reaching 0.10 percent in the ECC, despite rising patient volume and acuity after a level two trauma center and freestanding ECC opened. Hospitalwide, the rate is now 0.16 percent and in phlebotomy, 0.01 percent. Rates are so consistently low that the health system has been able to prioritize other issues, says Dana J. Rickard, BS, MT(ASCP), laboratory operations manager. “We’ve been able to sustain a significant, long-term rate reduction, so we can focus on other opportunities for improvement.”

“Our concentration right now has been on blood culture contamination and making sure staff follow all the stringent rules of collecting blood cultures.”

Ongoing education in how—and why—to avoid blood collection practices that result in hemolysis remains the cornerstone of the laboratory’s success. “We have a staff of nurse educators who collaborate with the lab to provide ongoing education,” says Charlotte Damato, a Six Sigma/Lean quality coach.

Blood collection obtained from patient IV lines, which the laboratory identified as a significant area for improvement in the ECC in 2009, “will continue to be a challenge,” Rickard says, especially with patient acuity at a higher level. “We drill down when specimens have to be recollected. Most of the time, it’s due to a short sample coagulation tube.”



Rickard

All Sarasota Memorial staff members who perform blood collection have access to phlebotomy education, including the multiskilled technicians who report to nursing units. “Most nursing units request the lab’s phlebotomists,” Rickard says. Units that do not use phlebotomists from the lab can send their own multiskilled technicians to the laboratory, where educators assess their preanalytical skills and help ensure they are forming good habits when performing blood draws so specimens will not be rejected.

A hemolysis prevention tip sheet displayed on all nursing units has also been key. The tip sheet (developed in collaboration with Becton Dickinson) warns against, for example, pulling back on the syringe too far during the blood draw or with too much force while transferring the blood to a collection tube. It warns, too, against underfilling the tubes. “We remind nursing staff that all tubes, not just the coagulation tubes, must be full,” Rickard says.

Explaining the significance of the order of the draw has also been of help, Damato says. While nurses receive training on phlebotomy procedures, “we continue to reinforce exactly why the draw should be carried out in a particular order, and they are very receptive.”



Damato

Sarasota Memorial acquired and went live on Jan. 2 with the Siemens 5100 coagulation analyzer, which has automated checks for hemolysis, icterus, and lipemia, as well as for volume, Rickard says. For a time, she expects the hemolysis rates to rise because the laboratory no longer relies on technicians to determine visually whether specimens are hemolyzed or improperly filled. “You can miss some when you’re looking at it,” Rickard says. “Now we have an actual measurement so we’ll catch more.”

“Rates will increase a bit and then we will educate and reduce them again. It’s continuous improvement.”

Best practices, new instruments—one thing trumps all in blood collection: proper patient identification. “That’s God-given, of course,” says Stony Brook’s Finnegan. “It’s the most important step in phlebotomy.”

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Amy Carpenter Aquino is CAP TODAY senior editor. To order the CAP’s So You’re Going to Collect a Blood Specimen (PUB225), call the CAP at 800-323-4040 option 1.