As blood supply tightens, so too does mitigation

Anne Paxton

September 2022—Picture a performer juggling tenpins while walking a high wire, knowing that a hurricane looms. Add a safety net that could disappear at any time. That's a sense of what hospital transfusion services experience in maintaining enough blood products to meet patients' needs.

The challenges that the pandemic threw into the mix have made the balancing act even trickier. While the extreme shortages hospitals experienced last December and January are gone, many report they have had to adjust from a typical five-day supply pre-pandemic to a two- or three-day supply of blood units, so they've become far more vulnerable to emergency surges in blood needs.

But hospitals are deploying an array of tactics to contain blood shortages and to mitigate their effects when they do occur, transfusion medicine experts report. Alyssa Ziman, MD, medical director for Ronald Reagan UCLA Medical Center clinical laboratories and medical director of transfusion medicine and professor of pathology and laboratory medicine at UCLA, sees the strategies or action plans of most hospitals as having three main components: following data-driven guidelines, ensuring the right product goes to the right patient, and ensuring that patients are not unnecessarily transfused. "It's looking at addressing blood shortages with a patient-centered focus," she says.

At the University of California San Diego Medical Center, advance planning and communication about transfusion practices, aided by a strong working relationship with the chief medical officer's office, have helped stave off the worst effects of blood shortages, says Patricia Kopko, MD, professor of pathology and director of transfusion medicine. When the recent shortages took on alarming proportions, the hospital responded by organizing a group of ICU physicians, hospitalists, and the chair of the transfusion committee (and including Dr. Kopko) with a mission to address fundamental questions like "What do we do when we have *x* units on the shelf and somebody is going to use 3*x*?"

The team agreed on procedures to fend off shortages by making some transfusions avoidable. "We developed a system where, when we sent blood out for a massive transfusion protocol, as soon as the second refrigerator of units went out, the blood bank alerted one of the surgeons to come up with plans" to control the need for transfusions, such as by encouraging early sending of people to interventional radiology to embolize vessels.

Dr. Kopko

Dr. Kopko also set limits on certain orders. "If you want more than one red cell for an outpatient, you're going to have to talk to one of the blood bank physicians. If you want more than one for an inpatient, you're going to have to repeat a hemoglobin and hematocrit if they're not bleeding, and you're going to have to prove to us they need it."

Communications with the medical staff remind clinicians about such rules. "The CMO's office issues a weekly electronic newsletter for physicians and advanced practice providers, which reported the state of the blood supply during the worst of the blood shortages," Dr. Kopko says.

These limits have not drawn a single complaint from clinicians, she reports, and they align with the alerts in the

medical center's Epic system, which has set the default order for red cells at one unit. "If you try to order red cells for somebody with a hemoglobin greater than 7 g/dL, a best-practice alert pops up with the message, 'This is your patient's most recent hemoglobin; do you really need this? And if so, what do you need it for?'" Surgery would be a valid reason.

For large cases, they send portable refrigerators. "We had a case where they said they needed two units of group O negative issued at the same time, and we said the only way we can give you two is if you will take them in a refrigerator. Because we did not want to lose a single unit," Dr. Kopko explains.

From its audits, the transfusion service knew that inpatient transfusions were not the source of overuse, she notes. But as part of the response to the serious shortages, it became urgent to curb outpatient unit orders. "Where the transfusion service had to get creative was when somebody comes in and we've got to get them to stop bleeding quickly. We knew that two-unit outpatient transfusions were the norm here," and it was important to reduce that usage level.

However, for some patients that rule can be bent. "If you've got a hematologic malignancy, having to come to the cancer center two times a week can be inconvenient. It's okay to give two units to somebody with a hemoglobin of 6.9 g/dL who's had chemotherapy and is not going to come back for two weeks. In times of significant shortage, if they came back a week later, they might not need to get a unit."

Some hospital-based blood centers are using cold storage of platelets to be administered to bleeding patients, but Dr. Kopko says this doesn't solve the problem of wastage. "They lose a lot of those units because they're not good for the oncology patients. The cold storage activates the platelets, and that's good if you are bleeding but not if you don't have platelets because you had chemotherapy."

Blood shortages can create painful dilemmas that may require setting priorities among some patients in line for transfusions, says Ralph Vassallo, MD, chief medical and scientific officer of blood supplier Vitalant, Scottsdale, Ariz. He says he is thankful he doesn't have to conduct this kind of case-by-case triage, but "Vitalant physicians are involved in the discussions because we're the stewards" of blood products that can be in short supply.

Dr. Vassallo

Surgery schedules usually ensure that four O-negative individuals won't be requiring transfusion at the same time, particularly since many of the surgeries are elective and surgeons are good at juggling, Dr. Vassallo says. "But sometimes the dice roll against you and four patients who are all O-negative come in bleeding. Then you have to scramble to figure out what you can do." That may include transfusing a partial unit to somebody else on the floor who also needs O-negative, he notes. "And there are many hospitals getting quite good at doing this. But unfortunately, they're getting too good—because it's happening too often."

"When a surgeon says, okay, I want 20 O-negative red cells because I might have someone who's bleeding on the table, and we have a 60-year-old gentleman who is the patient, we say you'll have to switch the patient to O-positive because you need to save those units for women of childbearing age." The risk posed by O-positive is that "there's an up to 40 percent chance he might form an antibody in the future, and if he needs an emergency transfusion it makes it a little more difficult."

Second of two parts

Last month: U.S. blood supply steadier but still short

Patient blood management is important to forestall those kinds of outcomes, Dr. Vassallo notes. A possible next

step is moving some units around to hospitals that are part of the same system. “Rather than let a unit expire on the shelf, send it to your sister hospital 40 miles away where you know they’re going to use it.” Those arrangements are on the increase, he says. “They are cutting down the safety stock, if you will, because when you have a lot of extra blood that lasts on your shelves for less than 40 days, if it sits there until the end and then expires, that’s a tragedy.” He says a 2019 CDC National Blood Collection and Utilization Survey found that such expirations were occurring with 20 percent of the distributed red cells.

Distributing units to other facilities, where possible, is one good way to keep the discard rate down, agrees Pampee Young, MD, PhD, chief medical officer, biomedical services, American Red Cross.

“The other way to conserve is to have a mechanism to communicate to your hospitals the different levels of utilization restriction, or varying levels of urgency. You may want to say, for example, when your inventory hits *x* level, that for massive transfusion protocols you don’t send a platelet out for every cycle, but every other cycle.” This kind of systematic, hospitalwide approach to managing shortages is more effective than jumping to diversion or canceling surgeries, she says.

The Red Cross works with its hospitals to be sure they are aware of these kinds of mitigations, Dr. Young notes. But sometimes triage can be needed; it was called for in some cases at the height of the shortage because of the flood of demands for blood. Unfortunately, sometimes a hospital will exaggerate a situation to try to get the blood it needs.

“Because we’re a blood center and we’re not at the bedside, it can be very, very difficult to know what the actual situation is,” Dr. Young says. During the recent shortages, “We were trying to manage very tight inventory and make sure it went to the patients most needing blood. In one case where a hospital said we have a trauma patient and we need red cells, we said, ‘What blood type do you need?’ And they said As and Os. Well, obviously a single bleeding patient can’t need two different blood types.”

“The system can be hampered by lack of transparency,” she says.

Meeting the needs of the ER and OR can require another tightrope walk, with one set of needs more unpredictable and urgent than the other. “But in the OR, a lot of transfusions happen because of unexpected bleeding and so on,” Dr. Young notes. A crisis is therefore “an opportunity for a closer collaboration with the blood bank and allowing our team to ensure that the right patient mix is scheduled to reflect the availability of products in the blood bank.”

Patient blood management (PBM) caught on in the late 1990s and early 2000s and has reduced over-transfusion, says Claudia Cohn, MD, PhD, chief medical officer of the Association for the Advancement of Blood and Biotherapies (AABB) and director of the blood bank laboratory, associate director of clinical laboratories, and professor of laboratory medicine and pathology, University of Minnesota. “The AABB and other societies came out with evidence-based guidelines for how to more intelligently and rationally use blood.” Using them, her hospital was able to reduce red blood cell use by 15 percent and platelet use by 25 percent, “simply by auditing all of our transfusions, and saying, ‘That wasn’t necessary,’ and sending out a gentle nudge to certain doctors asking, why are you using so much?”

Dr. Cohn

In response to the COVID-19-related blood shortage, her hospital developed a three-tiered plan for dealing with chronic shortages. The first part of the plan would be triggered when they fell below their par levels. “We would

institute regular communications with big blood users. For example, every time there was a liver transplant, which is a very heavy blood-use operation, the surgeon would call me and say, 'I think I need 40 units.' I would turn to our blood supplier, which almost always said yes," Dr. Cohn recalls.

"But there were some cases where, after a long discussion with the anesthesiologist, the surgeon, we'd say, this patient is so sick—what is the likelihood that he or she will make it through the liver transplant and survive? Because if not, that's a double waste of all the blood as well as the liver, which could have gone to a different patient. So there were a couple of hard decisions that were being made as part of our policy."

The AABB began offering a fairly extensive accreditation program for PBM a few years ago, including online training materials and consultants who can go to a hospital and help the transfusion service implement it, Dr. Cohn notes. The accreditation standards are numerous and even her own hospital is not quite ready to apply. But hospitals should be aware of PBM, she says, and a number of smaller hospitals are not.

Hospitals of all sizes should also give more attention to donor recruitment and collections, in her view. If a blood collection center isn't a possibility, "simply working with their blood centers to host a blood drive once a quarter could be huge."

Very few hospitals in the country have blood centers to collect blood, she points out. "It's considered a financial drain and so a lot of hospitals don't want it. But sometimes hospitals have to lose money in order to have what's needed." During the pandemic-related shortages, "those hospitals that operated a blood center weathered the storm much better than other places."

Data-driven guidelines for transfusion practice are a good starting point for hospitals facing shortages, says UCLA's Dr. Ziman. "We work closely with our clinical colleagues to follow those guidelines as much as the patient's clinical situation allows. Every patient's clinical situation is different, and therefore a patient may not need blood even though the guidelines might say to transfuse."

Dr. Ziman considers the splitting of units an option during severe shortages. "We've split units to provide half doses to two patients, particularly with platelet transfusions where our inventory is really constrained. We evaluate the indication for transfusion—for example, whether the patient requires a prophylactic transfusion to prevent bleeding or if they're actually bleeding. With this information, we can determine the most patient-centered approach and employ a combination of split units—half doses—as well as trying to delay some transfusions until additional inventory becomes available."

To prepare for possible case-by-case triage, they implemented prospective auditing of orders and created an emergency blood management plan, Dr. Ziman explains. "If an order doesn't meet transfusion guidelines, we discuss the patient's indication for transfusion with the clinician and, when appropriate, cancel or delay orders. We employ additional strategies as our blood supply gets to more critical levels." During the most recent critical shortage, for example, they worked collaboratively with the surgeons to ensure there was sufficient blood to meet a patient's anticipated need for surgery before taking the patient into the OR. "It would be the worst-case scenario where you start a surgery and can't finish because there is not enough blood for the patient," she says.

The shortages may make it seem urgent to find ways to lower the discard rate. However, achieving lower discard rates has resulted in lean inventories, which can lead to more severe and protracted shortages, Dr. Ziman warns. "I think we learned from the pandemic that 'just in time' isn't great for pandemic preparedness," she says. "We're collecting just enough to take care of patients without excess reserve so there isn't excess wastage. I believe we must get away from a strategy aimed at minimizing wastage and rather focus on ensuring there is enough blood on the shelves for routine patient care as well as for unexpected emergencies." This patient-centered and community-centered strategy will come with some amount of acceptable wastage, she says. "If we get to the point where there's no wastage—if that's the goal—there will be times when there are no blood products for patient care."

The Blood Services Section of the National Institutes of Health Clinical Center Department of Transfusion Medicine,

which collects blood products to provide transfusion services for clinical trial patients, doesn't have an emergency room, says section chief Kamille West-Mitchell, MD. "So we don't have to be ready for a major emergency the way a lot of blood centers do."

But there can still be complications or unanticipated effects from the therapies under study. One example is when an infusion of a cellular therapy results in complications such as cytokine release syndrome or coagulopathy. During the pandemic, "we did have major unanticipated bleeding of patients in the ICU on clinical trials and we needed to respond immediately," she says.

Where patient blood management is most likely to be used at the NIH is before surgeries, when in multidisciplinary meetings clinicians decide a procedure will take more blood than is available and they reschedule to be sure it is a safe procedure. The transfusion service instituted triage criteria when the pandemic began "because we anticipated we would have shortages," Dr. West-Mitchell says. "These are the points at which we also developed critical thresholds for inventory."

She does not advocate the splitting of red cell units as a means of stretching the blood units on hand. In her setting, splitting units for pediatric patients is commonplace, "but for an adult you're not going to use less than a unit of red blood cells." But one of the current hot topics in transfusion medicine is low-dose platelets, products that contain fewer platelets than the minimum threshold for a standard unit. "We don't use this approach at NIH, but clinical trials suggest that low-dose platelet transfusions are safe to prevent bleeding in some stable patients," Dr. West-Mitchell says.

Like Dr. Cohn, she says hospitals should not count out the possibility of starting or stepping up their blood collection. "I know the cost of hospital blood banks and they're out of fashion and somewhere in the minority. But if you need to, you can adjust by increasing or decreasing your own collections."

Dr. Ramsey

The often competing needs of planned scheduled surgeries and emergency care can require transfusion services to consider dramatic interventions, Glenn Ramsey, MD, chair of the CAP Transfusion, Apheresis, and Cellular Therapy Committee, has found. For two or three weeks in January, Northwestern University, where he is director of transfusion medicine, put organ transplant services on a preapproval basis. "So if there was a group O patient who was getting a liver or heart or lung transplant, we were requiring them to check with the blood bank first before they took the offer of an organ," says Dr. Ramsey, who is also professor of pathology at Northwestern Feinberg School of Medicine.

During regular conferences with state and local departments of health, hospitals in his region of Illinois asked health officials whether hospitals ready to exhaust their blood reserves could cancel or postpone their trauma services. "The answer from the state was no. They would not allow hospitals to go on trauma bypass because of blood shortage."

"So we had to still be ready for the potential massive transfusion protocol in an obstetrical case with large-scale hemorrhage or severe trauma or gastrointestinal bleeding," Dr. Ramsey says. "What if we had a supermassive transfusion protocol using more than 20 units? We were able to tell the hospital administration what are the odds on a per-day basis of that happening." This is the type of balancing act that all hospitals need to think about when a severe shortage might lie ahead, he advises.

Advances in storage capability could help by extending platelets' shelf life. Clinical research protocols at a number

of hospitals across the country, Dr. Ramsey says, are studying whether refrigerated platelets could be stored for perhaps 14 days or longer, in contrast with a five- to seven-day outdate. Some hospitals and blood centers have applied for variance from FDA standards as a means of trying to get through shortages or to meet the platelet demands of rural trauma.

Splitting units is “definitely an option that should be considered in some situations,” in Dr. Ramsey’s view. Half units of platelets might be used in cases in which physicians want a threshold of platelet count for a procedure or for controlling bleeding or for prophylactic use. And it’s not only platelets that are candidates for splitting. Northwestern, in several dozen cases, started giving half units of red cells for the first time ever “to try to stretch our group O supply. We asked physicians to reduce their normal threshold for transfusion in stable patients from 7 g/dL to 6.5 g/dL. And if there was concern about a particular patient at the 6.5 level, we were offering half units to help with those concerns.” Evidence-based guidelines on when to transfuse support this practice, he says.

“There’s also been a growing movement in transfusion therapy on stable patients to use one unit at a time and reassess the patient between units. This is sort of a central tenet of patient blood management these days.” Clinical trials have shown that conservative transfusion practices result in the best patient outcomes, “and that’s been gratifying to see,” Dr. Ramsey says.

Patient blood management may focus on surgical patients but it applies to all patients, by recommending treatment of anemia before the patient needs transfusion, minimizing blood loss in surgical patients, and having a 360-degree view of patients to avoid coagulopathy and anemia, Dr. Ramsey says. It might entail not only figuring out bleeding risks before surgery but also salvaging blood during surgery for patients in the right context and finding ways to reduce unnecessary phlebotomy in the hospital, which is a source of iatrogenic anemia. In the ICU, patients can lose a tremendous amount of blood just through phlebotomy, he notes. A PBM perspective would involve asking: “Do we really need all those lab tests, or can we get by with fewer tests to reduce blood loss in the patients?”

More studies are needed on hematology/oncology patients who may need chronic transfusions, and cardiac disease patients for which there’s uncertainty about balancing cardiac ischemia with blood viscosity, he notes. “But there are a lot more guidelines out there now to help.”

More difficult transfusion protocols could be needed with certain patients, Dr. Ramsey adds. If a patient is requiring a large amount of blood, survivability becomes an important factor, and it becomes particularly important where the hospital’s blood supply may be threatened by one patient’s transfusion needs.

Whatever is done to mitigate a shortage, Dr. Ramsey and Dr. Kopko emphasize the need to involve hospital clinical leadership. Says Dr. Kopko: “The best advice I could possibly give is, if you are the director of your blood bank and you do not personally know your chief medical officer, it’s time to go make a friend. If you have the CMO supporting the things you are doing to mitigate shortages, people are going to get on board.”

Anne Paxton is a writer and attorney in Seattle. Dr. Ramsey and Matthew Karafin, MD, MS, of the Department of Pathology and Laboratory Medicine, University of North Carolina School of Medicine, will give a course on “Using Blood Wisely and in Shortages” on Oct. 8 at CAP22.