

Case review reveals latest on overtransfusion

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March 2023—A retrospective study of patients who received blood transfusions at 15 community hospitals found that just over half of the patient encounters reviewed could have been managed without the transfusion of at least one component type, and 45 percent could have been managed without any transfusion (Jadwin DF, et al. *Jt Comm J Qual Patient Saf.* 2023;49[1]:42-52).

The researchers performed 1,558 retrospective case evaluations between 2012 and 2018 and found that “92 percent of the patients received one, or typically more than one, unit they didn’t need,” says coauthor David Jadwin, DO, chief executive officer and chief medical officer of Columbia Healthcare Analytics in Seattle, which is a provider for hospitals of external and independent chart review.

“The instances of overtransfusion found in this study are magnitudes higher than instances of undertransfusion,” he says.

Dr. Jadwin and others examined anonymized patient records from about 100 sequential encounters per hospital, amounting to 6,696 total component transfusion events. The aim was to determine if hospital transfusion guidelines accurately identify unnecessary blood component use. The 15 hospitals—nine faith-based, three for-profit, three independent—are located in five states. Each hospital had a qualified transfusion director, and all met accreditation oversight requirements for blood review. Three had patient blood management programs.

“The rates of overtransfusion are astonishing,” says study coauthor Jonathan Waters, MD, chief of anesthesiology at UPMC Magee-Women’s Hospital and professor of anesthesiology and perioperative medicine, University of Pittsburgh School of Medicine.

“Unfortunately,” Dr. Waters says, “since medical school we’ve been trained that transfusion is fairly benign. Clinicians fear anemia way more than they fear the side effects of the transfusion. Transfusion is kind of standard of care now, and from a medicolegal perspective, there’s not much legal risk in providing the standard of care. And we’re still a long way from shifting away from that traditional pattern.”

“There are so many priorities in health care,” Dr. Jadwin says, “I think blood use has fallen by the wayside.”

Still, cost, patient outcomes, blood supply shortages, and even a staffing crisis make it hard not to take note.



Dr. Jadwin

Two pathologist reviewers—Dr. Jadwin and coauthor Patricia Fenderson, MD, PhD, of Oregon Health and Science University, each of whom have more than 20 years of transfusion director experience—conducted the primary comprehensive chart reviews to determine if the patient could have been managed without transfusion or with less transfusion. The two then did a secondary blind review using two sets of 70 patient encounters (140 total) to test intra-reviewer and inter-reviewer agreement. They reviewed both sets of encounters without their knowing which of them had done the initial review or what was assigned to the encounter in the initial review. The Cohen kappa inter-rater coefficient (κ), used to measure intra- and inter-rater agreement during these internal reviews, was substantial (0.60–0.80) to excellent (>0.80), Dr. Jadwin says. “These were not controversial decisions. These were not the difference between maintaining a hemoglobin value of 7 g/dL or 8 g/dL, but were unnecessary

transfusions,” he says.

Independent external confirmation was performed by five clinicians, three transfusion medical directors, one transfusion medicine fellow, and one pathology resident. The κ coefficient for this external rater agreement was substantial to perfect, he says.

Among the study findings:

- Forty-five percent (± 17 percent) of red blood cells, 54.9 percent (± 19.3 percent) of plasma-cryoprecipitate, and 38 percent (± 15.6 percent) of plateletpheresis encounters could likely have been managed without transfusion.
- Between 2,713 units (40.5 percent) and 3,306 units (49.4 percent) were likely unnecessary.
- The median hemoglobin values were 9.4 g/dL (pre-transfusion) and 9.5 g/dL at time of discharge, indicating significant premature transfusion and overtransfusion, Dr. Jadwin says. Nearly 92 percent had a discharge Hb of greater than or equal to 8 g/dL. Thirty-seven percent had a discharge Hb of greater than or equal to 10 g/dL.

“If we could reduce by 30 percent the number of overtransfusions,” Dr. Waters says, “that would take care of the undersupply of blood and leave blood available for patients who truly need it.”

Whether the computerized provider order entry criteria most hospitals used were met was one part of the chart evaluation, but full evaluation of the medical record was conducted in addition to that, including all relevant clinical data and not just laboratory results, Dr. Jadwin says. “For RBC transfusion, hospitals commonly use Hb less than 7 g/dL or bleeding as justification for RBC transfusion. However, Hb less than 7 is not an indicator of good patient blood management. The hemoglobin may be less than 7 due to the failure to employ good patient blood management, which otherwise may have prevented the hemoglobin from dropping below 7, so comprehensive chart review is required to judge the adequacy of non-transfusion PBM.”

Similarly, he adds, some physicians check “bleeding” as a default indication for transfusion when the Hb is not less than 7 g/dL, without assessing whether better patient blood management may have helped reduce the need for transfusion. “We encountered instances when CPOE indicators were not met.” In addition, while “GI bleeding” may seemingly be an indication for RBC use, 38 percent of those encounters received only one or two units of RBC. Of these, 98.7 percent (± 7.0) of those who received one RBC unit and 54.4 percent (± 28.3) of those who received two RBC units likely could have been managed without blood.

With 40 to 49 percent of units found to be likely unnecessary, the authors identified “substantial unnecessary blood use,” none of which the hospitals recognized prior to review. The authors point to three causes: overreliance on laboratory transfusion criteria, failure to follow standard patient blood management principles, and a rush to transfuse.

Although other studies have identified overtransfusion, Dr. Jadwin says, they have tended to target a single class of patient such as GI bleeding, ICU, or cardiac surgery. Says Dr. Waters, “There has been a lot of work published on overtransfusion, but this study looks at it from a multicenter perspective as well as with a variety of different hospitals, mostly community hospitals, over several years.”

The findings from their study are similar to what has been seen in the UPMC hospital network, which had about a

40 percent overtransfusion rate in its pre-patient blood management period, says Dr. Waters, who directs the UPMC patient blood management program. "That's right in line with what I've seen in other hospital systems." The 40 hospitals in the UPMC system transfuse about 300,000 units of blood a year, and though the overtransfusion rate has come down, "it's still high enough to be a significant cost savings if we're able to continue our reduction efforts," Dr. Waters says.

For many clinicians, there can be a rush to transfuse stemming from a strong sense that if hemoglobin is less than 7 g/dL or there is bleeding, they must do something, Dr. Jadwin says. "And this has seemingly led to habit-based behavior. Physicians tend to have a reflex of 'Let's transfuse immediately.' It's a stimulus-response, rather than sitting back and assessing the patient, perhaps being more conservative, watching the patient for another 12, 24, or 36 hours."

"Yes, when patients are actively bleeding you have to transfuse them right away," he continues. "But in our paper, a number of transfused patients were clinically stable and were not actively bleeding. But physicians can be very fearful that somebody's going to question their decision, and they just have to be really proactive and order transfusion."

"A retrospective review like this gives physicians a chance to look at their case management and learn how to provide better care."

None of the 15 hospitals in this study had documented retrospective chart review like that employed in the study. "Hospitals did chart review years ago, but then CPOE criteria indications were created and transfusion dashboards were developed, and over the years hospitals defaulted to these as measures of good performance," Dr. Jadwin says.

"So if there's a hemoglobin of 6.9, most of the time those patients get transfused because it's less than 7 and the hospital says we'll let the physician use their clinical judgment in that case. That's how rigid the application rule is. But what we show is that when you do the detailed chart review, you can see things aren't quite as they seem. A patient's hemoglobin may drop from 10 g/dL to 7 or 6.9 and two units of RBCs are transfused, but then the discharge Hb is 12 g/dL because the original drop in hemoglobin was due to fluid overload."

"If retrospective review isn't performed, then instances of unnecessary use like this will not be uncovered," Dr. Jadwin continues. "With retrospective review, you see the consequences of blood transfusion. Perhaps transfusion was seemingly indicated, but there was no transfusion benefit or worse—an adverse outcome. At the end of the day, the transfusion wasn't helpful."

At UPMC, efforts to curb overtransfusion are ongoing. In fact, the openness to patient blood management was part of what attracted Dr. Waters to UPMC. A pop-up alert in the CPOE system is triggered when a warning against transfusion is called for. "But we also provide an override for the physician caring for the patient to proceed with transfusing," which occurs about 15 percent of the time. However, it may occur more often, Dr. Waters says, because clinicians might be using a workaround. "You don't really know whether or not they are going back into our CPOE systems after they've been blocked" the first time to place a subsequent order.

The CPOE system allows his department to determine which clinicians, departments, or hospitals are overriding the alerts so they can focus their education, though it can be difficult because the UPMC hospitals span three states. "UPMC has acquired a large number of hospitals in the last couple of years to try to expand our insurance base. So one of the things that's lagged as we acquire these hospitals is the implementation of their CPOE systems. That means that we've not impacted all of our hospitals but only the hospitals that are on our CPOE system."

Patient blood management programs like the one Dr. Waters directs at UPMC are in place to try to reduce the overtransfusion rate for one major reason, he says: "Blood transfusion doesn't seem to improve patient outcomes, which is what clinicians believe it's doing." But these programs face a hurdle in convincing clinicians of the error in their thinking because many factors confound the data on overtransfusion. Some orthopedic surgeons at UPMC hospitals performing total joint replacements, for example, transfuse 88 percent of their patients, while others

transfuse zero percent, he says.



Dr. Waters

"We started digging into that variability and found that with total hip replacement, the transfusion trigger varied quite a bit. The surgical approach varied—with surgeons doing classical incisions, anterior incisions, or taking minimally invasive approaches to the hip—and the differences made it difficult to determine whether the transfusions had an impact on the outcome for the patients." UPMC and its growing number of hospitals that are on the CPOE system have disseminated rankings among the surgeons in terms of blood transfusions for total joint replacement, and "that has had a fairly radical impact," Dr. Waters says. "At the hospitals where we've implemented our CPOE system, there's been a significant improvement in transfusion behavior."

But a fairly large cultural shift can be required before significant change can occur in traditional practices. "Fundamentally, the reason a patient is anemic should be determined and addressed, rather than letting the laboratory result trigger a knee-jerk response of transfusion," Dr. Waters says. Treatments such as intravenous iron and erythropoietin potentially could be less risky than a transfusion, and possibly address the underlying disorder as well. "But in health care it can be hard to get people to shift." His program implemented an artificial intelligence feature to identify patients with anemia for whom surgery is scheduled and to then send an email to the surgeon. "And we found the most common response was not to fix the anemia but to send the patient for the transfusion."

When he was at the Cleveland Clinic, he recalls, a surgery patient was identified pre-surgery through testing as having anemia, caused by occult colorectal carcinoma. Better care was provided than if a transfusion order had been placed and the cancer discovered post-surgery, he notes.

In orthopedic surgery patients at UPMC, "we saw about a half-day increase in length of stay when the patient is transfused versus not transfused," Dr. Waters says, referring to their tracking of outcomes, cost, and length of stay in the early days of the PBM program. "Translated into 6,000 patients, which is the number of total joints we do in an average year [at UPMC], it's a lot of days and a lot of costs associated with it." This finding, too, is confounded by the surgeons' use of varying surgical approaches.

An association is not a cause, Dr. Jadwin cautions, "but it's not unreasonable to think that blood transfusions could increase length of stay. Just because for one thing blood transfusions require time and resources. And secondly, it's been known for decades that complications are associated with blood transfusion such as renal impairment, fluid overload, increased susceptibility to sepsis, obviously transfusion reactions, and alloantibody generation." In the 15-hospital study, in patients who could have been managed without transfusion of at least one component type, unnecessary blood use was associated with a 0.38 (± 0.11)-day increase in length of stay for each additional unnecessary unit received. The authors write that unnecessary blood use as a cause for extended length of stay can't be determined from the data, but it also can't be excluded as a contributory cause.

An important result of the study, in Dr. Waters' view, is that "the retrospective review in hospitals currently doesn't work well and is often absent. That's why having CPOE systems can help by throwing a roadblock in the way" of some transfusion orders. But in addition to CPOE and improved retrospective review, Dr. Waters believes more education is needed. "The typical clinician gets about one hour of education in transfusion medicine during their residency. And considering that it's the number-one medical procedure performed on hospitalized patients, one hour of lecturing is inadequate."

At any given hospital, Dr. Jadwin says, the best way to measure true performance is to evaluate patient blood

management using retrospective chart review. “But I’ve looked at dozens of hospitals and no one’s doing chart review anymore; they’re defaulting to CPOE metrics and transfusion dashboards.”

Hospitals think their blood use is good, he says, because the number of units transfused has fallen, not recognizing how much more of their blood use is still unnecessary. “Nearly all hospitals gauge their blood use by counting the number of units they transfuse per month, something that could be termed the ‘CFO’ method of measuring blood use. A better metric is to measure the transfusion rate on a per-patient basis and actually determine which transfusions are still unnecessary.”

The “bleeding” CPOE indication on a transfusion order gives physicians an out, he says. “So if the hemoglobin is not less than 7, they merely have to check the box ‘bleeding’ and they’ll get what they want, even though the bleeding is marginal or nonexistent. So there are better ways to monitor blood use than listing bleeding as an indication.”

One problem is that physicians do not have time to perform peer review and they often perform this work without compensation, “so there’s no incentive to do it thoroughly. I’ve seen doctors go through charts in five or 10 minutes, sometimes only two minutes, and say there’s nothing wrong here, even though our review commonly finds five to 10 things that in many cases the ordering physician could have done but didn’t.”

In noting the retrospective study’s limitations, the authors say “attempts to second-guess transfusion decisions based on post-transfusion data were avoided.” Instead, review was directed to identify missed patient blood management opportunities to reduce blood use—earlier anemia management, cell salvage, more effective hemostasis, better medication management. The study spanned many years, but they say the review criteria were applied consistently during the encounter review. And the “modest 100-chart and 15-hospital samples” studied point to a need to “further define the extent of unnecessary blood use.” Dr. Jadwin, who notes the pandemic made additional enrollment in the first study difficult, says dozens of hospitals are being enrolled now for a follow-up study.

Dr. Waters says there may have been selection bias in the team of reviewers. “For the cadre of experts Dr. Jadwin put together, he looked for advocates of reduced transfusions. If you took the average blood banker, they probably couldn’t see a problem with a lot of the transfusions.”

Dr. Jadwin agrees. “Many hospital physicians probably would have said, ‘No, those are necessary transfusions.’ There is a bias, but I think it’s in the right direction—toward authoritative people who have published papers and managed a lot of transfusion-free patients well.”

One of the problems with internal review when done by hospitals, he says, is that “there may be an inherent institutional bias that’s difficult to overcome. Hospitals want to believe they are providing the best care.”

“People may not want to challenge physicians with whom they have special relationships, particularly people in key roles, or they may not want to upset personal relationships.” Internal hospital reviewers might review in a way that avoids putting the hospital in a negative light, he says. “Whenever people internal to the system perform review, there may be an inherent bias, and the question is which bias is lesser.” His view: “An objective, blind, external review is likely to be more objective, especially if many physicians can easily review the same case and quickly generate a powerful consensus opinion.”

Dr. Jadwin would like to see large-scale revision of the CPOE criteria. He suggests pre-transfusion questions such as: Has there been timely management and treatment of anemia? Is there a need to give back-to-back RBC transfusions? Is the transfusion urgently needed (not premature)? Has adequate laboratory testing been performed? Have all non-transfusion patient blood management measures been employed first?

There are surely appropriate instances of prospective review, where transfusion issues are referred to the pathologist who will call the physician and discuss the case. While he supports the intent, he notes prospective review is difficult: “If you have one director of pathology or transfusion director at a hospital that’s transfusing 500

or 700 patients a month, there's no way that one person can provide comprehensive oversight at that level." Often prospective intervention is performed only by phone (without seeing the patient or the chart) to determine if the patient is bleeding or has a special compromising condition or conditions.

Meaningful peer review is important but commonly missing, he says. "Pathologists probably do the best job of peer review because of the nature of our work, looking at images."

"Pathologists review a Pap smear or a breast biopsy and if something doesn't look right, we share it with others or send it for outside consultation to proactively reduce diagnostic errors. We have a culture of peer review that is probably not found in other specialties. So because of good peer review, pathologists generally come up with the right diagnosis and help serve as the conscience of the medical staff. My work over the past 16 years has been to bring pathology-style peer review to the rest of medicine and give physicians an opportunity to learn from their case management. It is better to show physicians how to provide better care than to tell them what to do."

What's needed, he says, is "an anonymized, objective, mentoring peer-review process, where physicians are given an opportunity to learn from their case without being punished."

Anne Paxton is a writer and attorney in Seattle.