Bloodless Surgery

A significant number of articles in the medical and surgical journals today are about “bloodless surgery”. We know, of course, that when surgical incisions are made, patients bleed; but that’s not what is meant. Physicians and patients alike are recognizing that although transfusion with red cells, or with coagulation factors such as platelets or plasma, is necessary on some occasions, the need is not as great as previously thought. Up to a point, if a heart could think, it cares less about what it pumps around; the first concern is if there is enough of it. We are fortunate enough to have learned a great deal from the tragedies of war and from some unique patient experiences about the capacities of the body for recovery and survival. And we continue to learn from a variety of sources.

Many retrospective and randomized controlled studies have shown an association between blood transfusion and postoperative morbidity and mortality, and no benefits to the use of a more liberal (higher Hgb level trigger for transfusion) strategy, compared to a more restrictive one. (See references.) Preoperative anemia has also been associated with more transfusions and adverse outcomes, along with blood loss. Patient blood management programs (PBM) have come to play an important proactive role in transfusions, reducing costs and adverse effects. PBM consists of identifying and treating anemia and its causes (such as iron deficiency) prior to surgery, minimizing perioperative blood loss, and using restrictive transfusion triggers as much as possible.

Patients who are Jehovah’s Witnesses having major surgery, including cardiac surgery, pose unique problems for the surgical team since they don’t accept human-sourced transfusions of any kind—red cells, plasma, or platelets. There is a significant history of successful cardiac surgery in such patients, and the use of PBM techniques to manage their care. Studies in other surgical situations have shown improved overall survival and decreased complications, as well as lower non-surgical hospital costs in Jehovah’s Witnesses. The authors of the first article referenced here found that there were no published studies comparing hospital costs in Witnesses compared to controls for major cardiac surgery. Therefore, in a retrospective review they carefully matched 2 control patients for each of 45 Jehovah’s Witnesses for age, sex, cardiac operative risk evaluation (euroSCORE), BMI, creatinine level and number of CABGs and/or valves operated upon. All patients were selected from among more than 5,000 potential matches at the three medical centers in the study (Duke, North Carolina; UT Southwestern, Dallas; and Robert Wood Johnson, New Jersey).

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Cover photo: Hematopoietic stem cells isolated from human bone marrow. Visuals Unlimited, Inc.
This issue of PLUS was written by Dr. Robert (Bob) Westphal.
The major points of evaluation in this study were outcomes and total cost. Costs were grouped into 4 major categories: clinical care outside of the operating room, diagnosis, supplies, and operative costs. Total costs mean was $35,306 for controls and $31,152 for Witnesses, and costs for each sub-category were similarly different although not all reached statistical significance. There was no mortality in either group at 30 days post-operation. There were no differences in ICU length of stay or in total hospital stay. The mean Hgb level at discharge was higher in Jehovah’s Witnesses, 11.7 vs 9.8 g/dL (p< 0.01). The authors conclude that by utilizing appropriate blood conservation measures, cardiac surgery may be performed with similar outcomes and cost in selected patients (Jehovah’s Witnesses or others not wanting transfusion) without the use of blood product transfusion.

In an accompanying editorial, the author (from Baylor-St. Luke’s Hospital in Houston) notes that the challenges of “bloodless surgery” are particularly relevant in cardiovascular surgery, since the overall use of blood transfusion still remains high. This despite the fact that off-pump CABG surgery, normovolemic hemodilution, minimally invasive techniques, and improved bypass circuits are all being increasingly used. It is common to find preoperative anemia, including iron deficiency anemia, in such patients, especially women and the elderly. Treatment with iron and sometimes with erythropoietin-stimulating agents (ESAs), such as erythropoietin, have been successfully employed. The latter, however, are used sparingly since a tendency to increased thrombosis has been observed with ESAs, especially in patients with cancer or renal failure.

Not factored into the cost analysis were the various costs (in time as well as dollars) associated with patient blood management (PBM). Such a global analysis might not find excesses related to PBM, but it seems only fair to include the data in an accurate analysis. The author concludes: “Regardless of the mechanism for achieving improved outcomes in patients not receiving transfusions, it is important to consider, if bloodless cardiovascular surgery achieves equal or superior outcomes without added cost, then why shouldn’t the techniques used in this approach become the standard of care for all patients?”


Platelet production is stimulated by thrombopoietin (TPO) in ways quite similar to the effect of erythropoietin (EPO) on red cell production. Unlike EPO, TPO is primarily synthesized in the liver, not the kidney, although some renal and bone marrow production contribute. Thrombopoietin, a glycoprotein, is a thrombopoietic growth factor, and recombinant TPO has been used to increase platelet yields in plateletpheresis donors. Thrombopoietin acts by binding to its receptor on megakaryocytes and megakaryocyte precursors, setting up signaling which leads to increased platelet production. The discovery of TPO presaged a major advance in the treatment of many of the thrombocytopenias.

However, the development of TPO antibodies and antibodies to it and to pegylated (polyethylene glycol-treated) megakaryocytic growth factors in some individuals has led to the development of TPO receptor agonists, molecules that bind to the receptors on megakaryocytes and thus promote the production of platelets. This short-circuits the TPO antibody problem. Romiplostim is one such TPO receptor agonist, and has been shown to increase platelet counts significantly in chronic ITP. A subsequent randomized, placebo-controlled trial in chronic ITP patients showed that the majority of them responded over a period of 24 weeks without significant adverse events and without the development of anti-TPO or anti-romiplostim antibodies.

The authors of this study (see reference) conducted a retrospective review of patients in their two Boston medical centers of all patients with platelet counts < 150 x 10⁹/L who received romiplostim prior to planned operative procedures. They looked at demographic characteristics, dosing and duration of treatment, success in achieving higher platelet counts, and clinical outcomes. Eighteen patients underwent a total of 22 procedures, including 3 Jehovah’s Witnesses who underwent a total of 5 procedures. Causes of thrombocytopenia included mild ITP, liver disease, hematologic malignancy, and drug-related (not immunologic) thrombocytopenia. The median pre-operative platelet count was 47 x 10⁹/L. All patients experienced an increase over the 4 week treatment period, to an average of 144 x 10⁹/L, (range 28 = 370 x 10⁹/L). Four of the 5 Jehovah’s Witnesses patients had pre-operative counts > 150 x 10⁹/L. Four non-fatal bleeding events occurred, all at counts of < 80 x 10⁹/L. No thromboembolic events were noted.

The authors concluded that romiplostim may have clinical utility in the preoperative management of patients with thrombocytopenia, especially those unable to receive or unresponsive to platelet transfusion. Some patients received platelet transfusion during or just after pretty significant surgical intervention or re-exploration. However, it’s one thing to observe low counts in patients who are stable and not hemostatically threatened, and another when caring for someone with a major pulmonary resection and pleurectomy. Studies in patients with heavily-treated hematologic malignancy, for example, have shown platelet transfusion thresholds to be mostly acceptable at ranges of 10-20 x 10⁹/L in patients without active bleeding. But the fact remains that most surgeons are unwilling to perform surgical procedures in patients with platelet counts < 50 x 10⁹/L unless platelet transfusions can be given as needed.

It would seem that romiplostim provides yet another useful tool in minimizing the need for transfusion of human blood products in appropriately selected patients. Cost effectiveness studies and further clinical trials are likely in the offing.

Getting Unleaded Infants

In the past few months, news reports from Flint, Michigan concerning contaminated city water supplies have reignited concerns about our ignored and aging infrastructure in the United States and highlighted an old but recurring concern about our children and the effects of lead on their neurocognitive development. Lead is widely dispersed in the environment, although considerable improvements have been made with the removal of the gasoline additive, tetraethyl lead, and the elimination of lead-based paint, particularly in domestic dwellings. Problems still persist, however, in that considerable amounts of lead paint are still present in old houses, particularly in inner cities. Inhalation of lead dust and ingestion of paint chips contribute significantly to abnormal lead levels in pre-school age children. Ill effects can occur with blood levels as low as 0.25 µmol/L. (See first reference)

It has been noted that blood transfusion can represent a significant source of lead exposure in infants and young children. One study found that in prematurely born infants (<30 weeks gestational age), blood transfusion increased the infant’s blood level by 27%, resulting in unacceptable blood lead levels. The authors, from Quebec, designed a study to examine blood lead levels in healthy volunteer donors and to analyze those levels with regard to sex, occupation, age, occupational and leisure activities and other factors.

From 6,715 eligible individuals, representing a reference population of over 320,000 blood donors over several years, 3,490 participated. The mean age was 46.5 years. Tables in the article denote in detail the geographic locations, ages, donor histories, smoking history, alcohol consumption, and the presence or absence of lead exposure risk in their employment and in their leisure activities. Levels were higher in men, but increased with age in both sexes. Levels greater than 0.15 µmol/L, considered in previous studies to be significantly elevated as far as infant transfusion is concerned, were found in about 16% of donors.

Although the age and sex of the donor correlated strongly with elevated levels, there were other findings. The region of residence (industrial urban vs rural, in prior studies); type of employment (mining and smelting, demolition, paint stripping, battery or radiator factory, garbage incineration); leisure activities (indoor shooting range, preparation of ammunition, furniture stripping) were all associated with higher levels. Smoking and daily alcohol consumption were also significantly contributory.

Lead is a potent and irreversible neurotoxicant for which there is no reliably predictive threshold. The developing brain is especially vulnerable, and most of our cities have implemented programs of lead level testing in schoolchildren, since both learning and behavioral disorders can result from lead exposure. Lead in the blood moves into bone and soft tissues and maintains a dynamic equilibrium between these compartments for life. Short of chelation or blood loss, it does not leave the body. The tragic death of Freddie Gray, the black youth in Baltimore who died in the mysterious incident involving a police van, is clearly related to lead in some minds. He had had numerous bad involvements with the law, was found to have high lead levels on several occasions as a youth and never finished the 4th grade. There were other factors related to poverty, but poverty and elevated lead levels in children have been closely related for a long time.

Both the article and the accompanying editorial raise significant questions for transfusion medicine. Further studies should include studies on recipients, as well as on donors. The authors of the first paper suggest that a population of donors who are younger and without appropriate risk factors be chosen, whether or not to do lead levels on such a potential donor subset is not clear. But it is evident that we have responded to previous “contaminant issues”—HBV, HIV, HCV—with considerable effect. It seems reasonable to suggest we undertake suitable efforts for this very vulnerable population.


The crisis that really changed the face of blood banking/transfusion medicine and hemophilia therapy surfaced in the months after the June 1981 description of the first cases of AIDS. This was subsequently found to be caused by the human immunodeficiency virus (HIV). This seems so long ago to some, and ancient history to others; something to read about in the history books. Not so for many of us who lived, professionally, through it. One of the steps taken to prevent transmission through transfusion of blood products in 1985 was to permanently defer any male donor who had engaged in sex with another man, even once, since 1977. It probably helped, but it certainly created a lot of confusion, a lot of anger, and a lot of anxiety.

The rule remains in effect, understood or not. For example, even as recently as 3-4 years ago, some blood center staff were deferring inexperienced and sexually unsophisticated young high school students who had participated in rather common pubertal sexual rituals with other boys, not involving bodily fluid exchanges. Very often boys who reported being sexually abused at a young age by an older man, were stigmatized for life and lost to the U.S. donor pool without ever being tested or counseled. In the meantime, increasingly sensitive and specific tests for HIV, including its variants, have been developed and implemented to the point that transfusion transmission of HIV is pretty much non-existent in most of the world where regular testing takes place. The rule, however, is still with us here in the United States, although regulatory bodies in other countries (Canada, Australia, some in Europe) have relaxed it or are considering doing so.

In December, 2014, the U.S. FDA declared its intention to change the deferral to a 1 year deferral from last sexual contact and 1 year ago released Draft Guidance towards that end. There is considerable evidence that compliance with MSM donor deferral is a key factor in diminishing HIV risk in the blood supply. A surveillance study of risk factors in donors found to be HIV positive was conducted by the Retrovirus Epidemiology Donor Study II (REDS-II). It found that MSM behavior was the primary risk factor for HIV transmission, but not for HBV, HCV, or HTLV. In the same study, the prevalence of MSM among uninfected male donors was 1.7%. All of these donors had denied MSM risk factors so as to be able donate, but provided this information on the research questionnaire.

There are a variety of opinions among blood bankers, regulators, ethicists, gay men and the general blood-donating public as to whether the rule should be relaxed, but—as is often the case with controversial and difficult subjects, there is very little data to inform opinions. The study briefly discussed here (see reference) was conducted by staff from the 4 major blood centers in the U.S. that are part of the REDS study group, coordinated by the Blood Systems Research Institute and the UC San Francisco Center for AIDS Prevention Studies. Male donors 18 years or older were randomly selected and invited to participate in a confidential online survey over a 2 month period in 2013.

The overall response rate was 11.5%. Of the 3183 completed surveys, 2.6% of the respondents reported donating after MSM. Remember, the current rule is “...since 1977”. Noncompliance was distinctly age related with rates of 5.7% in the 18-24 y/o group, then dropping for each subsequent 10 year span down to 1.0% at the 50+ age level. Opinions offered about the current MSM policy were mixed, overall, but with non-complying donors more supportive of change than complying donors, who perhaps were satisfied with the rule, to a greater extent. About half of the non-compliers indicated they would comply with a 1 year deferral. One can’t help but note that they lied previously with regard to the rule, however. In addition 36% of the non-complying donors reported MSM in the previous year and almost 10% of them reported at least 6 male partners in the last 5 years.

The authors conclude that non-compliance with the MSM policy, as currently stated, is very apparent and, when compared to earlier data, may be increasing. This is especially true of younger men. The authors state that any change from the current policy, although it may be popular, will require close monitoring of adherence with regard to mitigating residual HIV risk to the blood supply. Similar monitoring, it is presumed, is, or will be, taking place in other countries with a more “relaxed” policy.

Ever since the appearance of hepatitis B, HIV, and hepatitis C in blood products in the past 30+ years, and their impact on our hemophilia patients, a principal goal has been to foster the development of products (principally Factors VIII and IX) safe from viral transmission. The development of recombinant DNA production of these factors allows us to exclude both human and animal proteins from these products, making them safe from viral and prion contamination. Plasma-derived products remain at some theoretical level of risk, but strict donor screening, PCR testing, improved purification, nanofiltration and viral inactivation procedures have rendered them extremely safe. The other big concern is the development of inhibitors, and a major goal has been to find ways of reducing or bypassing their development. Factor inhibitors develop in roughly 25% of patients with hemophilia A or B. It is not clear if the manufacturing process itself is related to antibody development, and clinical studies to determine this are very complex and hard to design.

One recent focus of attention has been on prolonging the circulating half-life of these factors after injection into patients. This can be accomplished by binding the coagulation factors with so-called fusion molecules. These include albumin, the Fc fragment of immunoglobulin G (IgG), and polyethylene glycol (PEG), all of which have been used to extend the circulating half-life of other molecules. Pegylation, as it is called, has been used to prolong the circulation of hemoglobin-based oxygen carriers. It is also hoped these molecules may delay or inhibit the formation of anti-factor antibodies, but the data are not yet clear. These products are all in late clinical trials, and the Fc product has been licensed for Factor VIII.

All three of these molecules, when fused with Factor IX, have shown dramatic extensions of Factor IX half-life, from 18-24 hrs to 60-90 hours in phase I trials. Subsequent phase III trials have explored combinations of dosing intervals and titrations against target trough levels. These have demonstrated effective hemostatic Factor IX levels for intervals as long as 2 weeks, with smaller doses demonstrating effectiveness at 1 week intervals. Depending on life style, programs can be developed for individuals with combinations of good trough levels with an extended dosing schedule.

Several preparations of modified Factor VIII molecules, 3 using pegylation and 1 using the Fc fragment process, have been similar to each other but more disappointing than the Factor IX preparations, producing only a 1.5 – 1.7 fold prolongation of Factor VIII half-life, on average 18 hours. The reason for this seems to be the very great affinity between Factor VIII and von Willebrand Factor, vWF. The clearance of vWF is subject to specific vWF clearing mechanisms, which are not affected by the presence of the modified Factor VIII molecule. This is disappointing; however, a newer molecule that combines several domains of vWF, Factor VIII, and the Fc fragment may avoid these limitations and is currently in development.

There are safety concerns that require further exploration. The Fc fragments and albumin are naturally-occurring molecules in humans, and their metabolism seems not to pose any problems in recipients. Polyethylene glycol, however, although a small and simple molecule, is foreign and its clearance mechanisms are complex. High doses given in toxicity studies can cause vacuolation in renal, epithelial and hepatic Kupffer cells, although with no recognizable physiologic effects. The doses used in Factor preparation are 1/3 that of the toxicity studies, but long-term effects remain unknown. Other pegylated molecules have been used for years. In addition, some of us have PEG antibodies, presumably because although it is a small molecule PEG is ubiquitous in foods and cosmetics. There also are engineering possibilities with coagulation

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One of the problems with caring for patients with relatively uncommon blood disorders is that there often is scant reliable information concerning what works and what doesn’t. In such cases, we tend to repeat what we have learned from someone else, a mentor or perhaps a peer, and to resist change if it sounds foreign to us. Such a candidate for confusion over the years has been thrombotic thrombocytopenic purpura (TTP). It was first described in detail in 1924 and 1925 by Eli Moschcowitz. The patient was a 16 y/o girl with fever, severe anemia, petechiae and hemiparesis. Later summaries of larger numbers of cases described a classic pentad, which remains useful to this day: fever, thrombocytopenia, microangiopathic hemolysis (fragmented RBCs), renal damage, and fluctuating neurological signs.

The majority of cases were in women, and renal failure itself was uncommon, unlike hemolytic uremic syndrome, which is more common in children and more often associated with an enteric bacterial toxin. Mortality exceeded 90% and most patients died within 2 weeks of entering the hospital. Splenectomy resulted in occasional remissions. It then was recognized that blood or plasma transfusion sometimes induced dramatic responses, and this idea was reinforced in the 1970s when whole blood exchange transfusions induced prompt remissions in many patients. Eventually, the idea that there was something missing that was "replaced", or ameliorated by fresh plasma took hold. In 1991, plasma infusion was reported to be effective in 91% of over 100 patients, and later that year it was reported that in those treated with plasma exchange, long term survival was 78% compared to 63% for plasma infusion alone. Thus, the current standard was set for the use of plasma exchange, most commonly via plasmapheresis and replacement.

The offending mechanism that precipitates all this is an antibody to ADAMTS13, which is the name of a domain in the A region of the vonWillebrand Factor (vWF) protein. Large vWF multimers are produced by vascular endothelial cells, and under normal circumstances they are cleaved to smaller multimers via the ADAMST13 domain. The persistence of these very large vWF multimers in the circulation leads to platelet clumping, thromboses, and thrombocytopenia. Children with congenital TTP and adults with acquired TTP were noted to lack (children) or have auto-antibodies to (adults) ADAMST13. The infusion of plasma, and concomitant removal of the antibody, interrupts the process and allows for recovery and for immunosuppression to take hold.

There are other unconventional approaches which make schematic sense and which are being examined. Right now, the marked improvement in Factor IX half-life, and the much more modest effects with treated Factor VIII, show real promise. However, the ideal is gene therapy, which would be the best treatment for these patients once developed, tested and found to be safe.

Most hospital blood bank personnel are all too familiar with the serious problems that befall children and adults with sickle cell disease (SCD). This is the most common genetic blood disorder in the United States, affecting more than 90,000 people, the majority of whom are African-Americans. They suffer from numerous painful episodes caused by the sickling of these abnormal red cells leading to vaso-occlusion that cause large and small vascular infarcts, which cause considerable bone pain, a very painful acute chest syndrome, priapism in males, and infarcts in the skin, spleen, even brain, kidney, and other organs. SCD patients have more than 190,000 emergency department admissions and 110,000 hospital admissions each year in the United States. One in four patients does not experience a major episode of pain in an average year, but one in five has more than three episodes annually (see first reference). Both sexes are affected. Two recent articles illustrate these problems and elaborate on the effects of the illness, as well as on some of the interventions, the effects of which are not always beneficial. The point to remember is that there is a need to cautiously help so as not to inadvertently harm patients in these situations.

In the Transfusion article from Howard University in D.C. and the University of Illinois, the authors note that hospital length of stay (LOS) and 30-day readmission rate are regarded as indicators of quality of care, and soon will be used by major payers, including Medicare and Medicaid, to reimburse hospitals. Those who score highly on these two indices will see proportionate reductions in payments. Over the decade from 1997-2007, adults with SCD had a mean LOS of 6-9 days and a 30 day readmission rate at the high end of the scale. LOS increases with age and other co-morbidities, and are longer in women patients. LOS was also longer in patients with Medicare or Medicaid, compared to other programs. [This may reflect on relative income in federally vs non-federally insured patients. Ed.]

The authors analyzed 39, 324 admissions of 4,348 patients with a sickle cell crisis over a period from 2007-2012 who were in a Medicaid database. The mean LOS was 5.9 days and the 30-day readmission rate was 39.6%. Older age, chronic disease (cardiopulmonary, renal or hepatic), and sepsis were all associated with both longer LOS and likely readmission. Simple red cell transfusion was given during 32% of the

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Help Wanted, Help Needed, in Sickle Cell Disease

It used to be that cryo-poor plasma was thought to be the best product to use, since cryoprecipitate has concentrated amounts of both Factor VIII and vWF; however, ongoing studies never demonstrated that there was a significant difference in patient improvement. Enter now the authors of the paper referenced below, whose goal was to determine whether solvent-detergent treated plasma (S/D plasma) or standard quarantined fresh frozen plasma (qFFP) was a better therapeutic agent. The authors were from six major medical centers in France, and one in nearby Geneva, Switzerland. Because of the relative rarity of TTP, retrospective studies are, and have been, about the only available analytic tool regarding treatment.

Over 2005-2010 they analyzed 108 episodes of TTP reported to the French registry. Eighty-one were treated with S/D plasma and 27 with qFFP. The primary end-point was time to platelet count recovery. The time to platelet count recovery was not significantly different between the two groups. Nor were complete remission rates, exacerbations or overall survival. They did note that in patients who were less than 40 y/o, the use of S/D plasma was associated with a much shorter time to platelet count recovery compared to qFFP, 13 days vs 20 days. It should also be noted that although one study group is much smaller than the other, making statistical comparisons difficult, the rate of flare-ups and relapses was higher (but not statistically so) in the qFFP group. The authors also report, as have previous studies, that plasma exchange was better tolerated by the patients in the S/D plasma group. The authors’ conclusion is that either plasma product is acceptable for plasma exchange in treating acquired TTP, and that the apparent shorter recovery time in younger patients treated with S/D plasma should be evaluated in further prospective studies.


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admissions. These patients tended to be sicker, but it turned out that transfusion was significantly associated with a decreased mortality rate and a decreased rate of readmission. Patients who were on opioids, hydroxyurea, or steroids just prior to admission, or those with a chronic disease as noted above were more likely to have a long LOS or readmission. The authors suggest a large prospective study might be considered to examine the potential benefit of this. But they, and most of us, realize that not all the effects of blood transfusion are good.

A multi-institutional study of chronically transfused children with sickle cell anemia was also recently published in the British Journal of Haematology. Eight children’s medical centers in the United States are working in an ongoing study called the TWiTCtch trial: Transcranial Doppler (TCD) With Transfusions Changing to Hydroxyurea. The other arm of the study is to chronically continue transfusions in children to prevent stroke. All of the patients have sickle cell anemia (SCA) and abnormal TCD screening, which identifies children at risk for stroke early on. But chronic transfusion therapy, while reducing stroke, has significant problems for both patients and providers. These problems include the expense, the disruption of school and work schedules, ongoing venous access, risks of infection, allo-immunization, and iron overload that necessitates tedious and expensive iron chelation treatment. Thus an alternative to transfusion therapy for these patients would constitute a great improvement in their lives. Enter hydroxyurea (hydroxycarbamide, in Britain).

Hydroxyurea is an alkylation agent used primarily for chronic myelogenous leukemia. It has the effect of promoting the production of Hgb F in red cells. Hgb F, or fetal Hgb, does not give up any attached O2 easily. A small increase in Hgb F helps retain O2 in the red cell, thereby inhibiting the sickling that occurs from deoxygenation. It is being used in adults in a number of trials, although not a lot of data have been collected. Children with SCA are particularly susceptible to strokes. If found to significantly reduce cerebral infarction in SCA, it would mean fewer hospitalizations, fewer strokes, fewer interventions, fewer transfusions, fewer cases of iron overload, thus fewer children needing iron chelation therapy: what’s not to like? A main concern is that we don’t yet know all the long term effects in children, or even adults, of taking an alkylation agent through the important years of growth and development.

This report in the British journal, then, illustrates numerically and by imaging techniques that there is very significant iron accumulation in organs of chronically transfused children with SCA, and these accumulations have significant side effects leading to increased morbidity and mortality. Further studies on the effects of this accumulation on affected children, and of the possible role of hydroxyurea therapy in preventing such accumulation and improving length of life, as well as its quality are needed. Patients with SCA and SCD do not live lives that are anywhere near normal, and their overall lifespan is shortened by 20-25 years. Lives matter, everyone’s.


Defeating Infectious Disease Transmission in Platelets

In the United States, most of the platelets for transfusion are collected by apheresis techniques, these being 91% of the 2,516,000 units of platelets collected for transfusion. U.S. blood centers collected most of these units, 89%, and hospitals collected 11%. Several licensed devices are available for such collections. Platelets are licensed for up to 5 day storage in donor plasma or in a mixture of platelet additive solution (PAS) and plasma. They are stored at room temperature so as to best preserve platelet function; however, because of the real risks of bacterial contamination of these products (from unrecognized donor bacteremia, skin contamination or improper handling), testing for bacterial contamination is critical and is required.

An alternative approach to blood safety is the use of pathogen inactivation (PI) technology. PI for platelets has been used in Europe for over 10 years, and one of these systems has been approved recently by the FDA. The authors of this paper look at the added costs of implementing PI technology in this country and examine/explore possible ways of offsetting these costs. Many hospitals do their own “point of release” testing, usually if they collected the units. Platelets were obtained from the five large medical centers represented by the authors, and from Cerus Corporation, the manufacturer of the INTERCEPT pathogen inactivation technology. Platelets were valued at $535 each. They looked at the impact of increased platelet availability due to a decrease in testing losses, earlier entry into inventory. There also are costs related to handling of special requests, managing test results, quality control, seasonal or geographic test requirements (e.g., West Nile Virus and dengue), and other items.

The paper contains tables related to all of this, test-related costs such as reagents, technician time, record keeping, units lost to testing, management and control issues, including quality control. They also calculate the value of units for each of the participating institutions if platelet storage was extended for 2 days, reducing outdates. In addition, it has been shown that the PI method (using the INTERCEPT system) also prevents the white blood cell activation that causes graft vs host disease, generating another route for savings. Since there are also reduced rates of adverse transfusion reactions with pathogen-reduced platelets in PAS, staff time and patient discomfort and risk can be diminished. There are cost savings associated with that, as well.

Perhaps one of the biggest benefits lies in the prevention of infectious diseases looming on the horizon for which tests are expensive and not always available. In addition to such agents as dengue and babesia, we have a very expensive test for T. cruzi. Furthermore there are also chikungunya and Zika virus for which there are no tests. There are also new pathogens emerging all the time which of course we cannot test for chikungunya, Zika virus and anaplasmosis. While PI implementation will result in additional costs, at least at first, potential offsetting costs may make it very acceptable. This is particularly true in the face of emerging infections which may inflict harm—and cost—to humans while development of yet another expensive lab test is underway.

In an accompanying editorial, Steve Wagner, of the American Red Cross’ Holland Laboratory, wryly notes that for centers implementing PI, “Your mileage may vary.” (See references.) If one looks at the total reported potential cost savings of $141.65 per unit it may be that not all of the underlying assumptions related to costs may be true for each unit, or each center, and savings may vary depending upon a number of factors. For example, an apheresis unit of platelets may be split into two—or even three—products. The average number of products from 1 apheresis collection in the U.S. is currently 1.9. Additionally, not all units are tested for CMV, and not all are irradiated against graft vs host disease. There are numerous considerations, some generic, affecting everyone, and others related specifically to hospital or blood center practices. Nonetheless, the advent of PI for platelets is a very welcome, and likely very useful, development.


Compendium of Transfusion Practice Guidelines

The Compendium is valued by many of our hospital partners as a useful reference tool. It provides guidelines for blood component usage, as well as a section on the hospital transfusion committee. The authors, all of whom are American Red Cross physicians, thoroughly reviewed the most current publications and regulatory guidance when writing the second edition. The Compendium is available online at redcrossblood.org/hospitals. An app has also been developed and can be downloaded to no cost to both iPhone and Android devices.

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