Questions about the safety of transfusion arose in the 1980s and 1990s with evidence of transmission of hepatitis viruses and the emergence of human immunodeficiency virus (HIV) in the blood supply. People with hemophilia were particularly susceptible because factor concentrates were manufactured from pools of plasma containing up to 20,000 donations, and hepatitis transmission was suspected soon after their introduction.1 Transfusion-transmission of acquired immunodeficiency was recognized in 1983 when a 14-month-old infant developed unusual infections; this child had been transfused with blood from a donor who, although well at the time of donation, had subsequently died of acquired immunodeficiency.2 Transfusion-transmission was soon confirmed in several other cases.3,4 Screening of blood donations for HIV started in 1985.5 Fortunately, the steps taken by Blood Centers, a combination of donor exclusion together with viral screening of donations, have been very effective. The residual risk of HIV and hepatitis C virus among all allogeneic donations in the United States is currently less than 1 per 1 million donations. Only 20 HIV transmissions have occurred in the United States since 1988,6 the most recent in 2008.
risk of viral infection is now very low, and most recent estimates in the United Kingdom are shown in Table 1.

At that time there was no systematic surveillance of blood transfusion recipients for these infections or other complications of transfusion. Continued surveillance of infections in the blood supply is very important as shown by the emergence of West Nile virus and other agents. Different countries have different mechanisms and policies for surveillance. Some transfusion specialists were also concerned that there was no surveillance for other adverse outcomes or errors such as wrong transfusions. A survey of 400 UK hematology departments reported 111 wrong blood incidents (6 deaths and 12 instances of major morbidity due to ABO incompatibility) from 245 respondents, and the authors recommended setting up a national reporting scheme. Hence, hemovigilance was born.

HEMOVIGILANCE: DEFINITION

Surveillance procedures cover the whole transfusion chain, from collection of blood and its components, intended to collect and assess information on unexpected or undesirable effects resulting from the therapeutic use of labile blood products and to prevent their occurrence or recurrence (International Society of Blood Transfusion).

Hemovigilance is a recent addition to transfusion practice. National programs were developed in several European countries, most notably in France from 1991 and the United Kingdom in 1996. The UK system is described as a model of hemovigilance to demonstrate the benefits of hemovigilance. In addition, the UK system is unique in reporting data from pediatric transfusion. Although overall most transfusion recipients are older adults, premature infants are a particularly highly transfused group with a long life expectancy.

In the United States, the Food and Drug Administration requires reporting of serious adverse reactions and deaths. Between 2008 and 2012, 200 deaths were reported. The Center for Disease Control has developed a national reporting scheme with Internet-based entry (a Hemovigilance Module in the National Healthcare Safety Network). This reporting system is voluntary and anonymous; by 2012 more than 140 institutions had enrolled, but this probably reflects surveillance of less than 5% of transfusions. Baseline data collected by the most recently reported National Blood Collection and Utilization Survey (NBCUS) for 2008 in the United States suggested that the reported adverse reaction rate was 2.6 events per 1000 units transfused compared with 3 to 7 events in other national schemes, suggesting underreporting. Pediatric transfusions made up 2.6% of all red cell transfusions in this NBCUS.

In Europe, data collection is mandated by European Union law since 2002 and this has driven the development of several national systems. A recent review noted wide

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Estimated risk of infection from transfusion in the UK (Public Health England, 2013). The risk estimates in the UK, 2010–2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent</td>
<td>Risk Per Million Donations (95% Confidence Interval)</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>0.76 (0.22–1.61)</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>0.036 (0.015–0.07)</td>
</tr>
<tr>
<td>HIV</td>
<td>0.15 (0.09–0.32)</td>
</tr>
</tbody>
</table>

variations in data quality assurance and that it is therefore difficult to make compari-
sons between countries.12

HEMOVIGILANCE: AIMS

- To identify trends in adverse reactions and events
- To inform transfusion policy
- To target areas for improved practice
- To stimulate research
- To raise awareness of transfusion hazards
- To provide early warning of new complications
- To improve transfusion safety for patients

The UK hemovigilance scheme, Serious Hazards of Transfusion (SHOT), was
launched in 1996, funded by the UK blood services. All UK National Health Service
hospitals were invited to register for participation. Definitions of what to report have
been refined over the 16 years of reporting (Table 2)13 and are comparable to those
of the International Society of Blood Transfusion.14 The reporting categories can be
divided into pathologic reactions and those caused by error that should be completely
preventable. Some pathologic incidents are probably preventable by better pre-
transfusion assessment and better monitoring (eg, some instances of transfusion-
associated circulatory overload, and some hemolytic transfusion reactions by better
selection of red cells). SHOT does not collect donor events.

<table>
<thead>
<tr>
<th>Group</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathologic incidents</td>
<td>Acute transfusion reactions (allergic, hypotensive, severe febrile)</td>
</tr>
<tr>
<td></td>
<td>Hemolytic transfusion reactions (immediate or delayed)</td>
</tr>
<tr>
<td></td>
<td>Transfusion-associated graft vs host disease</td>
</tr>
<tr>
<td></td>
<td>Transfusion-related acute lung injury (TRALI)</td>
</tr>
<tr>
<td></td>
<td>Posttransfusion purpura</td>
</tr>
<tr>
<td></td>
<td>Transfusion-associated circulatory overload</td>
</tr>
<tr>
<td></td>
<td>Transfusion-associated dyspnea</td>
</tr>
<tr>
<td></td>
<td>Transfusion-transmitted infection</td>
</tr>
<tr>
<td></td>
<td>Autologous transfusion or cell salvage incidents</td>
</tr>
<tr>
<td></td>
<td>Uncategorized complications of transfusion</td>
</tr>
<tr>
<td>Incidents resulting from errors</td>
<td>Incorrect blood component transfused (wrong component or without specific requirements such as CMV negative or irradiated)</td>
</tr>
<tr>
<td></td>
<td>Handling and storage errors (eg, out of cold storage for too long, or transfused over more than 4 h)</td>
</tr>
<tr>
<td></td>
<td>Incidents where a patient received the right component but where one or more errors were made</td>
</tr>
<tr>
<td></td>
<td>Inappropriate, unnecessary, or delayed transfusions (eg, transfused for iron deficiency, avoidable use of emergency O RhD negative units)</td>
</tr>
<tr>
<td></td>
<td>Reporting errors in the administration of anti-D immunoglobulin to women during and after pregnancy</td>
</tr>
<tr>
<td>Incidents where no harm was done but from which lessons can be learned</td>
<td>Near miss events</td>
</tr>
</tbody>
</table>
In the first year (1996/7) 196 reports were received from 94 (22%) hospitals, but the reporting is now almost universal, with 99.5% registered to report, and 97.8% submitting greater than 3000 reports in 2012. Because the number of red cell units and components issued are known, it is possible to calculate risk estimates from the number of reports.

LOCAL INCIDENT REVIEW

An important part of hemovigilance, or any scheme of adverse incident reporting, is the local review of the incident as well as the national reporting of serious events. The purpose of hemovigilance is to improve practice by understanding what went wrong and why. All organizations should be encouraged to develop reporting with a view to corrective and preventive actions and not to look for blame. The level of investigation will vary depending on the severity of the incident and the risk that it will recur.

CASE STUDY: A GOOD ROOT CAUSE ANALYSIS

A 15-year-old boy regularly transfused for \( \beta \)-thalassemia major received a small amount of an incompatible red cell transfusion. His blood type was O and the transfused blood was group A. The transfusion was stopped and he suffered no adverse clinical consequences, although he was kept in hospital overnight for observation.

The root cause analysis demonstrated the following:

- The nurse was a lone worker and 3 children required transfusion; she therefore collected 3 units at one time because of staffing constraints despite that this was against hospital and national policy (which is to collect a single unit at a time).
- She borrowed a nurse from the next ward and checked each unit at the bedside with the correct patient, placing the units on tables between the beds.
- The first patient had a central line and required sterile access. The assisting nurse passed the unit to the first nurse; the unit was not checked again at the bedside as it was hung. The assisting nurse then returned to her own ward.
- The nurse realized the mistake as soon as she went to hang the blood unit for the next patient.

The case review established that this was a serious event that was likely to recur (scoring high on the risk matrix). Audit of practice demonstrated lone working on this ward occurred 74% of the time, and that transfusion observations were incomplete 47% of the time. The solution was to employ an additional nurse because it was clear that working alone had contributed to the potentially lethal error. The nurse involved needed revision of her competency assessment, but was supported for the manner in which she had dealt with the incident.

HEMOVIGILANCE CONTRIBUTES TO A REDUCTION IN PATHOLOGIC INCIDENTS

Annual reporting of incidents to SHOT has contributed to changes in practice at donor collection, resulting in fewer complications.

Reduction in Bacterial Infections

Bacterial infections from blood components are rare, but in the first 6 years of reporting 24 were described (6 fatal) with most contamination events caused by skin organisms contaminating platelet transfusions. SHOT and others\(^{15}\) recommended that strategies be developed to reduce this complication. Diversion of the first 20 mL of the donation was introduced in 2002, together with better techniques for skin
cleansing, and bacterial screening of platelet concentrates in recent years. These better techniques resulted in fewer bacterial infections; there have been none since 2010.

**Reduction in Cases of Transfusion-Related Acute Lung Injury**

These cases were observed to be associated with plasma-containing components, particularly platelets, and most often from female donors. The reaction is usually related to antineutrophil antibodies in donor plasma. SHOT recommended in 2002\(^{16}\) that female donors be excluded for production of fresh frozen plasma (FFP) and platelets, and this strategy, applied to plasma and as far as possible to platelets, has led to a reduced incidence of transfusion-related acute lung injury (TRALI) from a maximum of 36 cases with 7 deaths in 2003, to 11 with no deaths in 2012. Interestingly, the NBCUS for 2008 noted no difference in reports of TRALI despite the introduction of several TRALI reduction strategies (principally “to minimize the preparation of high plasma-volume components from donors known to be leukocyte-immunized or at increased risk of leukocyte immunization” and also to ensure that all transfusions are appropriate).\(^{17}\)

Observation of a reduction in events demonstrates the effectiveness of other strategies introduced by the blood services:

**Transfusion-associated Graft Versus Host Disease**

Universal leukodepletion was introduced in the United Kingdom in 1999. Following this, there have been no cases of transfusion-associated graft versus host disease since 2001 in patients who have received leukodepleted components, despite at least 800 recipients at risk receiving nonirradiated components, including children after hemopoietic stem cell transplants, those with immune deficiency, or those who had previously received intrauterine transfusion. The 2009 NBCUS reported that 80.4% of red cell units and 47.1% of platelets were leukodepleted in the United States in 2008\(^{11}\) but leukocyte-reduced made up 68.6% of units transfused. Reports of post-transfusion purpura have also reduced since the introduction of leukodepletion.

**HEMOVIGILANCE LEADS TO RECOGNITION OF PARTICULAR AT-RISK GROUPS**

**Patients Undergoing Hemopoietic Stem Cell Transplant**

Individuals undergoing hemopoietic stem cell transplant may not receive appropriate components if the supplying transfusion laboratory is unaware that the transplant has taken place. Errors have been made with blood groups and failure to provide irradiated products. Good communication is the key to this.

**Mistakes with Anti-D Administration to Pregnant Women**

Failures may put women at risk of immune anti-D development with the possibility of hemolytic disease in future babies. Most errors are made by midwives.\(^{18}\)

**Patients with Hemoglobinopathies**

People with thalassemia major or sickle cell disease (SCD) have particular risks relating to both the disease and the fact that many have a different racial origin from the donor population, making it more likely that they will meet different red cell antigens.

- Patients with SCD were noted to be overrepresented among reports of hemolytic transfusion reactions. Many of these cases (69%) are associated with major morbidity and one child died. Alloimmunization is a well-recognized risk in SCD\(^{19}\) and particular care is needed in making the decision to transfuse, and
the optimal choice of red cells. Patients should have their red cell phenotype analyzed preferably before any transfusion takes place, and the minimum recommendation is that red cells should be Rh and Kell matched. It is essential that the transfusion laboratory (Blood Bank) is aware of the diagnosis.

- Patients with thalassemia major are usually on regular transfusions. They continue to be at risk for acute transfusion reactions (ATRs; allergic type or febrile) and must be properly monitored with each transfusion.

**CASE STUDY: SEVERE DELAYED HEMOLYSIS WITH HYPERHEMOLYSIS AND DEATH IN SCD**

A child with SCD and a hemoglobin (Hb) level of 8.1 g/dL received 1 unit of red cells before a tonsillectomy. Thirteen days later, she was admitted unwell with a Hb level of 5.4 g/dL. After receiving 2 more units, her Hb decreased to 4.8 g/dL and she continued to decline. She was transferred to a pediatric intensive care unit (ICU), receiving a further unit of emergency O RhD negative red cells, but developed multi-organ failure and died. This child had developed hyperhemolysis as part of the hemolytic transfusion reaction.

**CASE STUDY: FAILURE TO INFORM THE LABORATORY ABOUT THE DIAGNOSIS OF SCD**

A patient was admitted 7 days after a transfusion with symptoms of a hemolytic transfusion reaction. The antibody screen showed 5 different alloantibodies. She had been transfused at a different hospital where the diagnosis of SCD was not transmitted to the laboratory, so that the 3 units were not of appropriate red blood cell phenotype.

**CASE STUDY: ROUTINE TRANSFUSION AUDIT DETECTS INADEQUATE IDENTITY AND MONITORING ISSUES IN CHRONICALLY TRANSFUSED PATIENT WITH THALASSEMIA**

A 14-year-old boy with β-thalassemia major was transfused without an identity band, without the local hospital transfusion checklist being completed, without observations being performed, and with an incomplete prescription.

**HEMOVIGILANCE REPORTING HAS RESULTED IN SEVERAL NATIONAL INITIATIVES TO IMPROVE PRACTICE**

Errors in the transfusion process remain the most important cause of adverse incidents (more than 60% of all reports to SHOT). The safe transfusion of blood is a complex process involving several steps and professionals from several different professional groups. Every step in the transfusion cycle must be correct to ensure patient safety (Fig. 1). Errors put patient lives at risk, the most serious being those that result in an individual receiving an ABO-incompatible transfusion (now included on the Department of Health’s list of events that should never happen, the “Never Events” list). In the first year of SHOT reporting, there were 12 deaths caused by transfusion and although the number of reports has increased year on year, the proportion with major morbidity or death has decreased from 34% in the first year, to 7% to 8% in 2011 to 2012. As a result of highlighting the error rate in transfusion through hemovigilance reporting, the following steps were taken:

- Government recommendations: Initiatives to improve transfusion training and practice—the Department of Health 3 “Better blood transfusion” circulars recommended actions for hospitals, such as the development of hospital transfusion committees, participation in SHOT reporting, and recommendations on
education, training, and the development of a better evidence base. The third circular focused on safe and appropriate use of blood and encouraged the employment of transfusion safety officers (hospital transfusion practitioners) who would promote teaching, training and audit.

- A National Blood Transfusion Committee: The UK Chief Medical Officers mandated formation of a national blood transfusion committee in 2001, whose functions included facilitation of the recommendations in the better blood transfusion circulars for the establishment of a network of regional transfusion committees who were linked to their local hospitals.

- A National Audit Program produced its first report in 2003. This program has been valuable in establishing denominator data and benchmarking, because the hospitals are compared with one another (within their own region, and against the national overall results). Repeat audits can show improved practice.24

- Promotion of national transfusion guidelines: The results from hemovigilance reporting demonstrated areas for which additional or revised guidelines were required. National guidelines are produced for the United Kingdom through the British Committee for Standards in Hematology and can be viewed at www.bcshguidelines.com. Recent guidelines include those for the investigation of ATR,25 and guidelines for pretransfusion compatibility testing.26 Guidelines for transfusion of children and neonates were published in 200427 and are currently in revision, but it is notable how little good evidence there is to guide pediatric transfusion practice.

PEDiatric PATIENTS HAVE PARTICULAR RISKS

Children form a relatively small proportion of all transfused patients and there is a lack of standardization. Guidelines for pediatric transfusion in 2004 noted the lack of good evidence for many of the recommendations. There are still relatively few good studies. Neonates are the most transfused group in pediatrics, and
patients with SCD are likely to be transfused in childhood, particularly now that transfusion-related benefit for management or prevention of cerebrovascular complications has been demonstrated. A systematic review of randomized controlled trials examining the safety and efficacy of red cell transfusions in neonates found 27 trials but only 2 of these examined neurodevelopmental outcome, with conflicting results. The authors of these studies criticized the design of many prior trials and noted that they had not reported on outcomes likely to be of importance to clinicians. Some data on transfusion triggers in neonatal ICU have also been published that suggest, similar to findings in adult ICU, that a lower transfusion trigger of 7.0 g/dL is appropriate.

WHAT DO WE KNOW ABOUT TRANSFUSION COMPLICATIONS IN PEDIATRICS?

- Information was gathered by a multi-institutional analysis in the United States using the Pediatric Health Information System, which collects discharge data. Data were obtained from 35 hospitals. In more than 1 million discharges, 4.8% children (51,720) received transfusions. Neonates received 17.5% of the transfusions. There were 492 patients with 793 complications of transfusion. The overall rate of complications was 10.7 per 1000 products transfused, which is higher than in adults (2.5 per 1000 components transfused) but the complications were not well defined in this report. There were interesting differences between racial groups.

- Information from a UK National Blood Transfusion audit: A national audit was conducted in the United Kingdom in 2010 to describe current red cell transfusion practice, to comment on the appropriateness of transfusions, to compare practice with national recommendations (in previous British Committee for Standards in Haematology guidelines), and to identify areas where further studies are required. More than 2500 patients, with more than 4000 transfusion episodes, were monitored at 141 hospitals. Children transfused outside the neonatal unit (1302 patients) most often had cancer or leukemia (28%) or a hemoglobinopathy (20%), suggesting that there needs to be local transfusion guidelines for these groups. Prescribing by units of blood rather than by milliliters occurred in 39%, including small children. In the neonatal audit (1222 patients, 2718 transfusions) 73% were aged less than 1 month, and most transfusions were given for anemia with (60%) or without (21%) symptoms, and 75% were either mechanically ventilated or on continuous positive airway pressure at the time of transfusion (Table 3).

The results raised concern that infants were being prescribed excessive volumes; the mean was 18.7 mL/kg, and 24% received greater than 20 mL/kg. The recommended booster transfusion amount is 10 to 20 mL/kg. These high volumes place infants at risk of transfusion-associated circulatory overload. The authors recommend improved education and training about safe prescribing and administration of red

| Table 3 |
| The number of transfusions was related to the gestational age at birth |
| Number of Transfusions | <28 wk | 23–32 wk | >32 wk |
| 1–2 | 34% | 60% | 75% |
| 3–4 | 22% | 17% | 6% |
| 5–9 | 24% | 8% | 4% |

cell transfusions for infants and for children. There was poor recording of the benefits of transfusion (18.5%), which should be documented rather than assumed. Anemia is the most common reason for transfusion, but this rationale is being challenged in the absence of symptoms.

- Information about transfusion complications from hemovigilance reporting: Many hemovigilance systems have not clearly reported incidents caused by errors, or near miss events. SHOT reports from pediatric patients make up 5% to 10% of reports each year (a total of 219 in 2011, and 203 in 2012). An initial SHOT analysis of pediatric incidents found that children were more likely to receive incorrect components (82.2%) than adults (63%). The most frequently transfused group were neonates (29.9%). Nine children had hemolysis from ABO-incompatible transfusions. Children with SCD suffered delayed hemolytic transfusion reactions. Mistakes in identification of proper recipients continue to occur, particularly confusion in neonatal units, where the babies are unable to confirm their identity, may look similar, and may not be wearing identity bands. Each year SHOT receives reports whereby blood samples from twins have been confused and mislabeled. Maternal and cord blood samples may be mixed up. Infants transfused at birth in one hospital may then require a booster transfusion elsewhere, and information about the original group is confused, leading to an inappropriate choice of group.

**CASE STUDY: ABO INCOMPATIBLE FFP TRANSFUSION**

A 1-month-old preterm infant with a suspected bowel perforation was transferred urgently. A single transfusion sample was grouped as O RhD negative and the infant was given group O FFP. On testing a later blood sample, mixed field reactions were obtained; further inquiry established that the child had received multiple group O transfusions at the first hospital and that her original group was AB RhD positive. The local policy, when only a single grouping sample has been received, is to issue group O red cells and AB plasma only. This policy was not followed.

A further source of error in pediatrics relates to the volume transfused when the calculations are incorrect. In some instances, this is because pediatric patients are sometimes managed by doctors who usually see adults and are unfamiliar with the calculations. Such errors are more likely to occur where there is urgency associated with panic in emergency departments.

**CASE STUDY: A MASSIVELY OVERTRANSFUSED INFANT**

A 1-year-old child was admitted with suspected gastrointestinal bleeding and Hb was 9.8 g/dL. He was thought to have arterial bleeding. Emergency group O RhD negative units were supplied, and the transfusion was prescribed in units rather than milliliters (the child’s weight was 10 kg). He received 4 units (1123 mL), 3 very rapidly over 20 minutes each. On transfer to the operating room, no source of bleeding was found. His Hb rose to 27.0 g/dL, and he required venesection and transfer to the pediatric ICU.

**Uncategorized Complications of Transfusion**

Uncategorized complications of transfusion is a reporting category for incidents that do not fit elsewhere. In 2011 there were 2 cases of transfusion-associated necrotizing enterocolitis (NEC) reported to SHOT. The association of this disease with transfusion is unclear and needs further research, but some evidence suggests that some infants are at risk.
CASE STUDY: NEC ASSOCIATED WITH TRANSFUSION WITH A FATAL OUTCOME

A clinically stable nonventilated 6-week-old premature infant born at 26 weeks’ gestation was transfused for anemia of prematurity Hb 9.3 g/dL. There were no adverse findings during transfusion and the posttransfusion Hb was 16.7 g/dL. Four hours later the baby developed signs consistent with NEC and subsequently deteriorated and died 36 hours after transfusion.

There is a national audit of cases of NEC in the United Kingdom, where transfusion data are also being collected that may help to clarify the association.

ATR (ALLERGIC, HYPOTENSIVE, AND SEVERE FEBRILE)

The number of reports of ATR has increased over recent years, comprising the largest group of pathologic incidents in both adults and children. The increase may partly be a result of the European Union legislation introduced into UK law in 2005, making hospitals more aware of their responsibility to report adverse events.

In the United Kingdom, because of the potential of infection with variant CreutzfeldtJakob disease from transfusion, all children born since January 1, 1996 (by which time the variant Creutzfeldt-Jakob disease agent was no longer thought to be in the blood supply) are treated with pathogen-inactivated FFP, either methylene blue–treated (MB-FFP) (supplied by the UK blood services) or solvent detergent–treated (commercially available). MB-FFP has been withdrawn in France because of concerns that it was associated with more severe allergic reactions and variable fibrinogen concentration. SHOT reports of allergic reactions to FFP were reviewed to see if there was any excess of events related to MB-FFP in the UK experience and to date there is no evidence, and no change to current practice in the United Kingdom, demonstrating an additional benefit of hemovigilance, the ability to perform surveillance for possibly emerging complications.

ATRs in pediatrics show some differences compared with adults. A higher proportion of pediatric ATRs occur after platelet transfusions than in adults where the reactions are more commonly occur with red cells. Anaphylaxis can occur at any age (including in neonates) and is a reminder that closely monitoring the initiation and completion of all transfusions is an essential safety requirement. After careful review, SHOT has decided not to include minor transfusion reactions that have no serious consequences. The total number of serious allergic reactions does not seem to be increased year on year.

“NEAR MISS” REPORTING

“Near miss” events are errors which, if undetected, could result in the determination of a wrong blood group or transfusion of an incorrect component. These errors make up a third of all reports made to SHOT; 1080 in 2011, and 981 in 2012. “Near miss” reporting is valuable as lessons can be learned and practice altered before a patient comes to harm. Each year about half the near misses are sample errors and more than 90% of these are “wrong blood in tube” (ie, the sample is from the intended patient and labeled with the wrong patient’s details, or is taken from the wrong patient and labeled with the intended patient’s detailed). These errors happen because either the patient is not identified correctly or the sample is labeled away from the patient. These mistakes are most commonly made by doctors and rarely by phlebotomists. Such events also occur in pediatric practice and, of 25 “wrong blood in tube” incidents in 2012, 12 were related to infants less than 7 days old, and 13 of the 25 occurred because the patients were not identified.
correctly. Each year the same errors are identified, and confusion of neonates is a particular risk in pediatrics.

Hemovigilance reporting over 16 years in the United Kingdom consistently shows that the greatest risk to patients is that a mistake will be made somewhere in the transfusion process. This error in the transfusion process has not been reduced despite efforts to improve education, the introduction of competency assessments, and publication of several guidelines. The key points are correct identification of the patient at the time of sampling, and the final check at the patient’s side where errors occurring earlier in the process may be detected. SHOT reports often show multiple errors.

CASE STUDY: NEAR MISS DETECTED AFTER SEVERAL ERRORS

Blood was prescribed for 2 patients being transfused in the same bay on a hematology ward. The prescriptions were at the nurses’ station. The nurse instructed a health care assistant to collect blood for patient X but handed her the prescription for patient Y. When the unit arrived, the nurse checked the blood with the patient’s identity band using the electronic bedside verification system, and the scanner audibly alarmed to warn of a mismatch. The nurse contacted the laboratory, who advised that a new identity band should be printed, and the nurse used the identity details on the blood bag, instead of confirmation with the patient, to generate the identity band. This band was then applied to the patient without any verbal identification checks, and the unit was rescanned and now was consistent with the band. Fortunately the patient asked why the unit was not irradiated and on investigation the nurse realized she had the blood bag for the other patient in the bay.

Errors are not unique to transfusion but occur across medicine and surgery at all levels, and indeed in other complex systems. The benefits of introduction of checklists in the aircraft industry are well known. Gawande notes that “the volume and complexity of what we know has exceeded our individual ability to deliver its benefits correctly, safely or reliably. Knowledge has both saved us and burdened us… we need a different strategy.”43 The introduction of a checklist before surgery has clearly improved patient safety44 and SHOT recommends the use of a checklist in the transfusion process. A model checklist is available on the SHOT Web site at http://www.shotuk.org/wp-content/uploads/2010/03/SHOT-Transfusion-Process-Checklist-May-2012.pdf.

SUMMARY

Hemovigilance is an essential part of the transfusion process from which many lessons can be learned about pathologic reactions and why they occur, but also about errors that contribute to morbidity and mortality. Pediatric transfusion is relatively underresearched and systematic vigilance, together with audit, will result in improved practice and increased patient safety.

REFERENCES


