

# Improving the Safety of the Blood Transfusion Process

## ABSTRACT

Patient death or disability associated with incompatible blood is one of the Centers for Medicare and Medicaid Services Hospital-Acquired Conditions and is listed as one of the National Quality Forum's Serious Reportable Events. The Joint Commission's 2009 National Patient Safety Goal 01.03.01 lists the elimination of transfusion errors related to patient identification. Blood component transfusions to nondesignated recipients occur in about 1 of 10,000 transfused units. Two-thirds of these errors are associated with incorrect blood recipient identification occurring at the patient's bedside. There were 535 reports of blood transfusion-related events submitted to the Pennsylvania Patient Safety Authority during the 13-month period from July 2008 through July 2009. Reports involved mismatched units; events related to blood component collection; blood products dispensed, distributed, or administered; or wrong patients being transfused. Recipient identification at blood collection and administration are essential to the safety of the total blood transfusion process. The safe transfusion of blood components is a complex process involving many departments, multiple staff, and several steps. This article focuses on the process for safe transfusion and the risk reduction strategies that decrease the incidence of transfusion errors by developing adequate quality systems to ensure correct patient identification of the transfusion candidate, assigning clear responsibilities to qualified staff including a transfusion safety officer, and using identification technologies such as bar-coding or radiofrequency identification tags. (*Pa Patient Saf Advis* 2010 Jun;7[2]:33-40.)

## Problem

The Agency for Healthcare Research and Quality's report, "Statistics on Hospital-Based Care in the U.S., 2007," found that the number of blood transfusions from 1997 to 2007 increased 140% from 1.1 million to nearly 2.7 million.<sup>1</sup> Blood transfusions occurred in 1 of every 10 hospital stays that included a procedure during the same time period. Patient death or disability associated with incompatible blood is one of the Centers for Medicare and Medicaid Services Hospital-Acquired Conditions<sup>2</sup> and is listed as one of the National Quality Forum's Serious Reportable Events.<sup>3</sup> The Joint Commission's 2009 National Patient Safety Goal regarding blood transfusions includes the elimination of transfusion errors related to patient identification.<sup>4</sup> Blood component transfusions to unintended recipients occur in about 1 out of 10,000 transfused units, and two-thirds of these errors are associated with incorrect blood recipient identification that occurs at the patient's bedside.<sup>5</sup>

## Pennsylvania Patient Safety Authority Data

There have been 535 blood transfusion-related reports submitted to the Pennsylvania Patient Safety Authority's reporting system from July 2008 through July 2009. Analysts queried the database for events associated with blood transfusions, errors related to procedure, and complications of procedures, treatments, and tests. These included 14 Serious Events, 1 of which resulted in death. The death occurred in the operating room, and additional patient identification was identified as a recommendation to prevent future blood transfusion errors. Other Serious Events and Incidents involved mismatched units; events related to blood component testing collection; blood products dispensed, distributed, or administered; or the wrong patient being transfused.

Events reported to the Authority can be organized into three stages: (1) errors during pre-analysis including sample collection, (2) errors in laboratory through issue, and (3) errors post issue in clinical areas. Some events occurred in multiple stages (see Table 1).

## Pre-Analysis Area Errors

According to Pagliaro and Rebutta, the most common adverse event during blood transfusion therapy occurs during pre-analysis (e.g., blood specimen collection), typically at the patient's bedside.<sup>5</sup> This pattern was also evident in reports to the Authority, with 61% of reports describing errors in this stage of the blood transfusion process (see Table 1). Pre-analysis errors during blood specimen collection may include delays in collection, wrong blood in tube collected, or incorrect or no label applied to the specimen. Of the 344 errors identified in the pre-analysis area, 141 (41%) events involved the wrong patient because the specimens did not match historical records or failed the Delta checks (comparing prior test results from a patient to determine if a newly obtained test result is

**Table 1. Stages in the Blood Transfusion Process, July 2008 through July 2009**

STAGES*	NUMBER OF REPORTS (N = 535)		PATIENT HARM
		%	
Pre-analysis (e.g., sample collection, specimen labeling)	344	61	2
Lab (e.g., serology, computer transcription, transfusion unit labeling)	101	18	5
Clinical at the bedside with transfusion units (e.g., bedside testing, transfusion unit mix-ups)	115	21	10

\* Some events involving patient harm occurred in multiple stages.

likely to be in error) or because the wrong labels were placed on the tubes. Other pre-analysis area errors included those with incorrect patient information (19%), missing independent double checks (7%), missing computer transcription (6%), miscommunications (6%), blood bank armband issues (5%), missing consents (1%), and others (15%) (see Table 2). Examples reported to the Authority include the following:

*There was an outstanding, [unlabeled blood] specimen from the morning collection. The [phlebotomist] found the missing labels in a [patient] room, remembered drawing the blood from a patient [with the missing specimen labels], and [realized] she must have placed these labels on a [blood] specimen from another patient. [It was] determined [that another] patient had been labeled incorrectly.*

*Type and cross was ordered for a patient. When the lab [completed testing, the result] did not match [the patient's] previous blood type. The [original] blood had been drawn from another patient, and the wrong label [had been] applied.*

*A lab phlebotomist collected a specimen for a type and cross match on a patient. Blood bank typed the specimen as A+. The patient was on record in the blood bank as being O+. The phlebotomist drew the original specimen on the wrong patient [and mislabeled the specimen at the time of collection].*

*Type and cross match specimens were received in the blood bank. No phlebotomist's initials were on the labels.*

**Laboratory Errors**

Laboratory errors are those that occur in the blood bank and may include errors in computer transcription, patient identifier mismatches, testing errors, or incorrect blood component released from the blood bank. Of the 101 errors identified in the laboratory areas, 15 (15%) involved the wrong blood component dispensed. Other laboratory area errors included those with delays (13%), blood components that were dispensed before all testing was completed (12%), computer entry errors (11%), missing or incorrect unit tags (11%), incorrect antibody screening (9%), expired blood components (7%), missing patient identifier information (5%), mislabeled blood specimen tubes (3%), special orders not followed (2%), inability to open blood storage cabinet (1%), and others (12%) (see Table 3). Examples of laboratory errors reported to the Authority include the following:

*When the lab staff was signing out a unit of blood [to dispense to the nurse], it was noted [that] the unit number on the blood bank slip was incorrect. Upon investigation, [a transcription error was found].*

*[The blood bank issued] one unit of blood for this patient. When the nurse went to transfuse [the blood], the bracelet and the medical record number on the bracelet were checked but did not match. [It] appeared that [the numbers] were transposed between [the medical record number and the patient account number].*

**Table 2. Errors in the Pre-Analysis Stage of Blood Transfusion, July 2008 through July 2009**

ERRORS	NUMBER OF OCCURRENCES (n = 344)	PATIENT HARM (n = 2)
Wrong patient (e.g., did not match historical records, failed Delta test, wrong label on tube)	141	1
Incorrect patient information (e.g., missing blood bank number on band, incorrect date of birth, first and last name mix up, two different names used for same patient)	64	
Missing two independent double checks	25	
Computer issue (e.g., wrong order, no order, transposed numbers)	22	
Communication issues (e.g., special instructions, between healthcare providers)	20	1
Blood bank armband issues (e.g., missing armband, incorrect armband number)	17	
Missing signed consent	4	
Other	51	

*A patient's blood was sent for type and screening. The patient's blood type in the chart was O+. The blood bank called and stated that the blood type [for this patient] was A+. The patient had a blood redraw, and the lab [staff] stated that blood bank [staff] had made an [incorrect] computer entry.*

**Clinical Errors**

Blood transfusion errors that occurred or were reported in clinical areas that excluded pre-analysis errors consist of events that involve bedside testing or equipment used at the bedside, mix-up of transfusion units, and actual transfusion of the blood to the incorrect patient. Of the 115 errors identified in the clinical stage of the blood transfusion process, 40 (35%) involved patient reactions to the blood components. Other clinical area errors included intravenous line issues (17%), incorrect blood components administered (12%), expired or wasted blood component (8%), no type and cross laboratory testing before blood component administered (7%), incomplete documentation (6%), identification band issues (5%), incorrect patient received blood component (4%), inadvertent transfusion of type and hold component (1%), and others (5%) (see Table 4). Examples of clinical errors reported to the Authority include the following:

*The blood product was released from the blood bank according to the patient identification on the form, and [the blood] was administered without confirming the product label to the patient's [identification]. The patient received an incorrect unit of packed red blood*

**Table 3. Errors in the Laboratory Stage of Blood Transfusion, July 2008 through July 2009**

ERRORS	NUMBER OF OCCURRENCES (n = 101)	PATIENT HARM (n = 5)
Wrong blood component dispensed	15	2
Delay (e.g., staffing, no available blood)	13	1
Dispensed before testing (e.g., cross match, ABO compatibility, type and cross)	12	
Computer issues (e.g., incorrect ABO)	11	
Incorrect or missing blood bank unit tags (e.g., machine broken)	11	
Incorrect antibody screening	9	
Expired (e.g., cross match, unit)	7	
Missing armband information (e.g., missing date of birth, wrong blood bank identification number)	5	1
Mislabeled blood specimen tube	3	1
Special orders (e.g., transfusion prepared without leukocyte filter, blood component not irradiated)	2	
Unable to open blood storage cabinet (e.g., access code not working)	1	
Other	12	

cells, resulting in an intravascular hemolytic reaction that required fresh frozen plasma and platelets to correct the coagulopathy.

A patient was ordered to have a transfusion of fresh frozen plasma. Approximately 100 mL infused when the physician [cancelled the order.] Two patient records [had been] opened at the [time of the transfusion order, which had been written on the wrong patient's chart].

**Guidelines**

Several organizations and regulatory bodies provide safety guidance for transfusion medicine. The U.S. Food and Drug Administration (FDA) licenses and registers blood and transfusion centers. FDA's role is to inspect each facility's documentation of each step during collection, processing, compatibility testing, storage, distribution of blood components, and adverse event investigation.<sup>6</sup> AABB (formerly the American Association of Blood Banks) is a standard-setting professional organization in transfusion medicine.<sup>7</sup> In 2006, AABB, the U.S. Department of Health and Human Services, and representation from government and nongovernment organizations formed the U.S. Biovigilance Network. Reporting

recommendations from this group included using the Centers for Disease Control and Prevention's National Healthcare Safety Network as the national surveillance system for recipient outcomes of blood and blood products.<sup>7</sup> The College of American Pathologists (CAP) offers accreditation that focuses on the quality of laboratory testing and transfusion services that meets national and local standards. CAP's focus is on patient and blood sample identification, testing procedures and equipment, identification and investigation of transfusion reactions, and competency of staff.<sup>8</sup> Blood and transfusion centers may also be accredited by the Joint Commission, which focuses on the use, prescription, and administration of blood components.<sup>9</sup>

**Blood Transfusion Process**

While each element of the blood transfusion process presents inherent risk, every aspect depends on the accurate and successful completion of the prior step. (A reprinted, sample diagram of this process, titled "Transfusion Process Map," is available from the Authority online at <http://www.patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx>.) The blood transfusion process outlines the precise and detailed description of each step during standard and exceptional conditions.<sup>10</sup> Stainsby et al. analyzed 2,087 blood transfusion adverse events during a seven-year period and found that there were 1,393 (67%) instances of incorrect blood components being transfused.<sup>11</sup> Approximately 50% of these occurrences involved multiple errors in the blood transfusion process, which most frequently occurred during the pretransfusion bedside check.<sup>5,11</sup>

Osby et al. outlined specific steps in the blood transfusion process that organizations can use to identify risk areas: prescribing blood components, submitting blood samples to the blood bank, issuing blood components from the blood bank, transfusing the patient, and monitoring the patient for transfusion reactions.<sup>12</sup>

**Prescribe Blood Components**

Blood hemoglobin concentration is only one determinant of tissue oxygenation.<sup>13</sup> Medical indications for transfusion should exist and be thoroughly documented before prescribing blood components. Absent signs of hypoxia, a patient may not necessarily require blood products. A decision to transfuse is based on clinical presentation and supported by laboratory results.<sup>11</sup> If the laboratory results and the patient's clinical presentation do not match, a decision to transfuse may occur based on incorrect results or analytical errors. In addition, telephoned results may be erroneously transcribed or assigned to the incorrect patient, even if the reading back of test results is properly performed.<sup>11</sup> Patient consent for transfusion allows the patient to make an informed choice regarding the risks, benefits, indications, and alternatives for elective or nonemergency blood transfusion, which also includes the right to refuse the transfusion.<sup>10,12</sup>

**Table 4. Errors in the Clinical Stage of Blood Transfusion, July 2008 through July 2009**

<b>ERRORS</b>	<b>NUMBER OF OCCURRENCES (n = 111)</b>	<b>PATIENT HARM (n = 10)</b>
Reaction (e.g., fever, rigors, tachycardia, hypotension, chest pain, headache, urticaria, dyspnea)	40	4
Intravenous line issues (e.g., infiltration, leaking, no filter, timing of greater than four hours)	19	2
Wrong blood component administered	14	3
Expired/wasted blood component	9	
No type and cross before receiving blood component (e.g., trauma, emergency department)	8	
Incomplete documentation (e.g., unit tag saturated, numbers obscured tag numbers, no identification numbers)	7	
Identification band issues (e.g., no blood bank band, blood bank identification number cut off, improperly labeled blood bank band)	6	
Wrong patient received blood component	5	1
Order to type and hold only but was mistakenly transfused	1	

**Submit Blood Sample to the Blood Bank**

Proper specimen collection is the one of the most important steps of transfusion safety.<sup>14</sup> Twenty-one months of data collection and analysis at a university hospital by Quillen and Murphy revealed that the emergency department accounted for the disproportionately high number of wrong blood in tube specimens with most errors having major mislabeled specimens.<sup>14</sup> Major mislabeling specimens are those that are unlabeled, have mismatched information on specimen and requisition, or for which the current specimen does not match the historical record on file.<sup>14</sup> According to Ahrens et al., obtaining the pre-analysis sample for testing is by far the weakest link in the safety chain of blood transfusion.<sup>15</sup> This pattern was also evident in reports to the Authority, with nearly two-thirds (61%) of the blood transfusion reports describing errors in the pre-analysis stage. Stainsby et al. identified other blood sample issues: labeling blood sample tubes away from the bedside, failing to check the patient’s identity, failing to use preprinted labels, and using poor technique in blood sampling, which affects laboratory results.<sup>11</sup> Errors with specimen collection may be slip errors, which are caused by staff distraction, fatigue, or inattention. Such errors may result in the mislabeling of blood

samples and inadvertent administration of the wrong blood to the wrong patient.

In June 2009, nine facilities in the northeast region of Pennsylvania began working collaboratively with the Authority to identify and eliminate phlebotomy specimen mislabeling—one of the most common pre-analysis errors. These facilities committed to a year-long process of monitoring, investigating, and redesigning systems across many disciplines and units. Identified best practices from this collaborative will be shared in future updates in the *Advisory*. To learn more about this collaborative, visit the Authority’s Web site at [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2009/Sep6\(3\)/Pages/107.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2009/Sep6(3)/Pages/107.aspx).

**Issue Blood Components from the Blood Bank**

As previously noted, the laboratory discovery of the wrong blood in a tube specimen when comparing the results of two or more specimens from the same patient that have been collected at different times is known as a Delta check. If there is no historical laboratory data on the patient, an error such as the wrong blood in tube could escape detection and result in the wrong blood component being transfused, leading to an acute hemolytic transfusion reaction.<sup>12</sup> A disproportionately high number of laboratory errors take place outside the usual blood bank hours, particularly when there are fewer staff.<sup>11</sup> While routine blood groupings are automated in the blood bank, manual techniques may be needed for urgent blood grouping. These manual techniques are inherently unsafe and have the potential for errors in interpretation and documentation.<sup>11</sup>

**Transfuse the Patient**

The bedside check verifies the identity of the intended recipient and matches it to the identity of the person about to receive the blood transfusion. Verification takes place in the presence of the patient, using two licensed persons and a three-way check that includes the blood component tag, compatibility slip, and patient wristband.<sup>12</sup> This is the most critical step of transfusion safety and the final opportunity to interrupt any incorrect blood component.<sup>13</sup>

**Administer Blood Components**

According to AABB, “No medications or solutions may be routinely added to or infused through the same tubing with blood or blood components with the exception of 0.9% Sodium Chloride, Injection (USP), unless (1) they have been approved for this use by the FDA or (2) there is documentation available to show that the addition is safe and does not adversely affect the blood or blood component.”<sup>16</sup> Other considerations for blood component safety include types of administration tubing, intravenous access, and filters used with transfusions; infusion rates; and the use of infusion pumps.<sup>12</sup> Bar-coded systems and other technologies are better suited to the repetitive data matching that occurs with blood transfusions. Bar-coded systems are not subject to distraction and

can help organizations improve the labeling of blood samples, dispensing of blood components, and identifying the patient at the bedside.<sup>13</sup> Studies indicate that many facilities use bar-coded labels, but there continue to be issues of the incorrect bar-coded label from one patient to another, wrong blood in tube, or blood being administered to a nondesignated blood recipient with blood that appears correctly labeled. The positive donor-recipient identification at blood collection and administration is essential to the total blood transfusion process, so that if a transfusion error is detected, process monitoring and any action taken may be tracked.<sup>13,17</sup>

Other technologies such as radiofrequency identification tags (RFID) hold considerably more information, are more user friendly than bar-code equipment, and may help organizations to ensure the correct blood and amount is administered to the correct patient.<sup>5,13,15,18</sup> There are two kinds of RFID technology: active and passive. Active RFID refers to technology in which the chip is battery-powered and emits energy that can be read over a distance (e.g., cellular phone). Tags with active RFID technology can be used for asset tracking within facilities to locate valuable equipment.<sup>13</sup> Passive RFID technology is read only when it is brought in close proximity to an electronic RFID reader.<sup>13</sup> Machine-readable identification technology is ideally suited to meet the needs of the bedside check prior to the administration of blood components.<sup>13</sup>

### Monitor for Transfusion Reactions

Patients who receive any blood component transfusion are monitored for early and late complications. Routine monitoring includes documentation that a patient is tolerating the transfusion without adverse events. If the patient exhibits any signs of a transfusion reaction, the transfusion is stopped immediately, vital signs are obtained, and a comparison of the patient's armband with the blood component tag and label are performed.<sup>12</sup> Patient monitoring is a crucial part of the safe transfusion process so transfusion reactions can be promptly recognized and safely managed. The patient should be very closely monitored in the first half hour of an elective transfusion, according to the organization's transfusion policy, and when adequate staffing in the patient care area is ensured to provide adequate monitoring for a transfusion reaction. Any sign, symptom, or untoward event of the blood transfusion is documented so that the patient may be treated appropriately.<sup>12</sup> Examples of early noninfectious complications include febrile nonhemolytic transfusion reaction, circulatory overload, hemolysis, transfusion-related acute lung injury, mild to severe allergic reaction, and electrolyte or coagulation abnormalities, which may have an occurrence onset during or within hours of the transfusion.<sup>12,19</sup> Noninfectious late complications may include the formation of red cell antibodies with secondary complications, iron overload, immune suppression with secondary complications, formation of human leukocyte antigen

antibodies with secondary complications, formation of platelet-specific antibodies, and graft-versus-host disease. Late complications may have an onset of days to months following the transfusion.<sup>12,19</sup>

### Risk Reduction Strategies

Risk reduction strategies assist facilities to improve the safety of blood transfusions by including all steps in the process from collection, compatibility test, product issue from the blood bank, to blood administration at the bedside, monitoring of transfusion reactions, and thorough documentation.<sup>14</sup> Though some strategies may be considered "low-tech," a simple approach may have more appeal and be easier to implement than some of the automated interventions.<sup>20</sup> Consider the following strategies for formally engineering or re-engineering the blood transfusion process:

- Establish an interdisciplinary transfusion committee that includes a transfusion safety officer.<sup>5,12</sup>
- Evaluate current organizational blood transfusion practices, and re-engineer needed changes to transfusion systems or processes.<sup>12</sup>
- Develop organizational blood transfusion policies and procedures using AABB guidelines that include the use of two patient identifiers. All blood components should be refrigerated or frozen and stored according to FDA and AABB requirements and transfused before the expiration date indicated on the blood component label. Any component that was previously frozen must have an expiration time assigned when the unit is thawed.<sup>6,7,12</sup>
- Review prescriber ordering procedure of blood components. The use of computerized prescriber order entry (CPOE) provides a structured, legible, and traceable communication between the prescriber and the blood transfusion service. CPOE combined with computer-assisted decision support provides readily available information intended to assist the clinician in making proper transfusion decisions using the alerts built into the system. These alerts provide the prescriber with valuable guideline information at the time of the blood request and provide feedback to the clinician on the indication for the transfusion.<sup>13</sup>
- Consider the use of a blood transfusion record that guides the prescriber to indicate the basis for the transfusion when one is ordered.<sup>12</sup> Algorithms may be used to identify appropriate transfusions.<sup>13</sup> Davies et al. indicated a 12% decrease in transfusions in the year following the introduction of the electronic prescribing of blood components using algorithms which incorporated guidelines.<sup>21</sup> The prescription for the administration of a blood component provides instructions regarding the rate and volume of the transfusion. Particular care must be exercised when prescribing for infants, children, and small adults, during which failure to adjust the quantity can result in overtransfusions and can lead to serious morbidity or mortality.<sup>11</sup>

- Review patient consent for blood components and ensure right for refusal clause appears on the consent. The consent includes information about the infectious and noninfectious risks of transfusion, given in an appropriate reading level and in the patient's native language. The consent also includes the opportunity for the patient to ask questions about the transfusion and should be obtained as soon as it has been determined that there is a possibility that a transfusion may be needed.<sup>12</sup>
- Monitor, track, and trend all blood samples for type and cross, type and hold, wrong blood in tube, mislabeled tubes, and issued blood components from blood bank. Blood bank hours of operation and staffing issues should be considered with the review or development of blood transfusion safety. (For example, elective transfusion should be strongly discouraged in the off hours due to possible staffing shortages in the laboratory and on the patient care area.)<sup>11</sup>
- Consider the use of a statistical process control to monitor the quality of an organization's errors in patient specimen collection of the blood transfusion processes.<sup>13,17</sup>
- Consider the use of a bedside checklist that lists safe handling of blood components when transfusions are administered.<sup>10</sup> Positive patient identification includes matching wristband identification to the blood compatibility label and matching the two patient identifiers with the blood request.<sup>13,20</sup> In addition, the review of blood component compatibility, expiration date, unit number, and ABO/Rh type for both the recipient and the unit should be present as well as special attribute alerts.<sup>12,13</sup>
- Consider the use of bar-codes or RFID to ensure the correct blood and amount goes to the correct patient.<sup>13</sup>
- Ensure that patients have appropriate IV access before picking up blood from blood bank.<sup>12</sup>
- Transfuse patient within 30 minutes of blood component pickup from the blood bank.<sup>12</sup>
- Monitor patients for early and late transfusion reactions.<sup>12</sup>
- Document allergic reactions.<sup>12</sup>
- Provide ongoing structured educational opportunities for healthcare practitioners that include annual assessment of blood transfusions competence.<sup>5,9</sup>

## Conclusion

The process for safe transfusion is a complex one that involves several hospital departments and types of staff, multiple steps, and hundreds of individuals.<sup>17</sup> Facilities may consider risk reduction strategies that decrease the incidence of transfusion errors by the development of adequate quality systems to

uncover prescribing practices that may be inappropriate, ensure correct patient identification of the transfusion candidate, assign clear responsibilities to qualified staff, and consider the development of a transfusion safety officer. Guidelines should be clear, unambiguous, and readily accessible.

## Notes

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## Self-Assessment Questions

The following questions about this article may be useful for internal education and assessment. You may use the following examples or come up with your own.

1. Which is the most critical strategy to improve the safety of the blood transfusion process?
  - a. Use manual techniques when the laboratory has performed routine blood grouping.
  - b. Use identification technologies such as bar-coding systems or radiofrequency identification tags to improve proper specimen labeling.
  - c. Obtain positive donor-recipient identification and verification during blood collection and administration.
  - d. Provide patient monitoring during blood or blood component administration.
2. Risk reduction strategies to ensure the safety of the blood transfusion process include all of the following EXCEPT:
  - a. Guide prescribers to use algorithms and blood transfusion records to indicate the basis for transfusions when ordered.
  - b. Use a standardized algorithm for all patient populations.
  - c. Implement a standardized checklist for the safe handling of blood components when transfusions are administered.
  - d. Standardize labeling of blood samples using bar-coded systems.
3. A patient was admitted to the hospital for exacerbation of congestive heart failure (CHF). Laboratory results were hemoglobin 6.4, hematocrit 21, and red blood cells 2.6. The attending physician ordered a transfusion, although mindful of the patient's CHF. The physician had considered that the risk of fluid overload was outweighed by the patient's deteriorating condition and laboratory values. Precautions were taken pretransfusion, including the administration of medication in an attempt to prevent any transfusion reaction. The patient was transfused with one unit of packed red blood cells and, two hours later, became acutely short of breath and hypoxic. Oxygen was administered to the patient, and the physician was summoned to the patient's bedside. Repeated laboratory testing of the original blood specimen revealed that the results did not match the patient's previous blood type. The original blood had been drawn from a different patient, and the wrong label had been applied. The patient had received an incorrect unit of packed cells based on an incorrect blood type.
 

In the case study described above, breakdowns or errors that led to wrong blood delivery associated with transfusions likely included all of the following EXCEPT:

  - a. Verification took place in the presence of the patient.
  - b. Prescribed blood or blood components were based on clinical presentation.
  - c. Failed Delta test occurred in the laboratory.
  - d. Unlabeled blood samples were submitted to the blood bank.

4. Select the stage in the blood transfusion process in which the most common errors occur.
  - a. The laboratory stage, which begins when the blood specimen is delivered to the laboratory through the distribution of the blood or blood components
  - b. The pre-analysis stage, which begins during collection of blood specimens and typically occurs at the bedside
  - c. The clinical stage, which begins in the clinical area, excludes the pre-analysis stage, and includes additional bedside testing or equipment used at the bedside
  - d. The monitoring stage, which begins in the clinical area after the blood or blood component has been transfused and includes monitoring the patient after the transfusion is complete
5. Routine medication and solutions may be added to or infused through the same tubing with blood or blood components.
  - a. True
  - b. False



# PENNSYLVANIA PATIENT SAFETY ADVISORY

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