Quality Improvement to Decrease Specimen Mislabeling in Transfusion Medicine

Karen Quillen, MD; Kate Murphy, MT(ASCP), SBB

Context.—Proper specimen identification and labeling is a critical preanalytic step in pretransfusion compatibility testing.

Objective.—To gather baseline data for specimen mislabeling, specifically targeting major mislabeling events, and to design and implement a plan of corrective action.

Design.—All mislabeled specimens received by the transfusion service for a type and screen were recorded and classified into minor and major mislabeling categories. Major mislabeling events were tracked by origin of the specimen. Locations with a high proportion of major mislabeling were given timely feedback (within 1 week) of the events as they arose.

Setting.—A university hospital.

Main Outcome Measures.—The incidence of major mislabeling.

Results.—The incidence of mislabeling in the transfusion service was 0.5% (243/49,955) during 21 months of data collection. Of these mislabeling events, 47% were classified as major events (unlabeled, mismatched specimen/requisition, ABO/Rh result on current specimen not matching historical record on file). The emergency department accounted for a high proportion of these major mislabeling events. After the intervention of providing weekly feedback to emergency department staff, their contribution to major mislabeling fell from 47% in 1 year (23/49) to 14% (4/29) in the subsequent 3 quarters.

Conclusions.—Collecting and trending data on mislabeled samples with timely feedback to patient care areas can change phlebotomy practice and reduce specimen mislabeling.

(Arch Pathol Lab Med. 2006;130:1196–1198)

Acute hemolysis, primarily the result of ABO incompatibility, continues to be an important cause of transfusion-related mortality and morbidity.1 Although the majority of ABO errors that lead to fatal outcomes occur at the time of blood administration, a significant percentage occur at the time of specimen collection. Data collected in one event reporting system for transfusion medicine2 showed that mislabeled specimens accounted for 35% (83/236) of high-severity events (defined as those with the potential for patient harm). Attention to the prevention of such errors represents an area where focused quality improvement efforts could have a significant impact in improving transfusion safety.

A mislabeled specimen is one whose labeling does not meet the local institutionally defined criteria for accessioning into the clinical laboratory. In a recent College of American Pathologists Transfusion Medicine survey, 96% or more of the 3200 participants reported requiring the following identifying information for labeling pretransfusion compatibility testing specimens: patient’s first and last name, unique identification number, date of collection, and phlebotomist initials/identifier.3

Here we describe the efforts undertaken to document and classify all mislabeled specimens received by the transfusion service, with the goal of preventing such occurrences.

MATERIALS AND METHODS

Our criteria for accepting a specimen for pretransfusion testing include all of the following: patient’s first and last name, unique identification number, date of collection, phlebotomist initials/identifier on the specimen label; patient information on the specimen label must match that on the accompanying requisition form.

We classified all mislabeled blood bank specimens into the following categories:

1. Minor mislabeling. Truncated name or medical record number, misspelled name, missing information such as date or signature.
2. Major mislabeling. Unlabeled specimen; mismatched information on specimen and requisition; ABO/Rh result on current specimen not matching historical record on file. This last category is also known in the literature as wrong blood in tube (WBIT); the specimen appears to be properly labeled but is subsequently discovered to contain blood from an individual other than the one named on the label.4

Data were collected from January 1, 2004 through September 30, 2005 and tallied by quarter.

RESULTS

The incidence of specimens with minor mislabeling averaged to be 0.3% (129/49,955) during the 21 months of data collection and was below our preset threshold of 1%. The incidence of specimens with major mislabeling was 0.2% (114/49,955). Our preset threshold for major mislabeling was 0%.
Within the category of major mislabeling, we noted the origin of all the specimens. It was readily apparent that our busy hospital emergency department (ED) accounted for a disproportionately high number of WBIT specimens. Initially, we shared our data with the manager of the ED on a quarterly basis. As of January 2003, we shared our data with the ED on a weekly basis. Since then, the occurrence of WBIT specimens from the ED has dropped dramatically, from 47% (23/49) in the 12 months prior to the intervention to 14% (4/29) in the subsequent 9 months (see last line of the Table).

**COMMENT**

Transfusion safety involves an entire vein-to-vein chain of events from proper specimen collection, compatibility testing, and product issue from the blood bank, to blood administration at the patient’s bedside. Proper specimen collection is a prerequisite first step from which all other steps follow. Specimens that appear obviously mislabeled or unlabeled are automatically rejected for testing. Specimens that appear properly labeled but turn out to be otherwise are more insidious because the identified cases of WBIT specimens represent only a subset of the true number of WBIT specimens for 2 reasons: new patients with no historical record are not captured, and cases where the 2 misidentified patients share the same blood group by chance are also not captured. Correction factors to account for these 2 variables may be used to obtain the true WBIT rate from the raw number of WBIT cases actually identified.4

Mislabeled and WBIT specimens are not infrequent occurrences in the blood bank. In one major academic medical center blood bank, the mislabeled rate was 1 in 71 specimens (1.4%), and the WBIT rate 1 in 2800 specimens (0.04%).5 This study found that specimens with an obvious labeling error were 40 times more likely to contain WBIT. A large international prospective study of specimen collection for pretransfusion testing found a mislabeling rate of 1 in 165 specimens (0.6%) and a WBIT rate of approximately 1 in 2000 specimens (0.05%).6 Our data are within the range of these prior studies, although major mislabeling appears to account for a larger proportion of total mislabeling at our institution.

Analyzing our data enabled us to identify patient care areas where the majority of the major mislabeling events were occurring. Not surprisingly, one of the areas was the emergency department where there is a high patient turnover. When we shared our findings with the emergency department on a weekly basis, we were surprised and gratified to discover that the staff were able to pinpoint practices that were contributing to mislabeling (in particular, major mislabeling) and change their practices to reduce the WBIT rate. Weekly feedback facilitated staff accountability; it is much easier to investigate and pinpoint an error 1 case at a time rather than 6 or 7 cases per quarter. In busy emergency departments, it is tempting to obtain many specimen tubes at the time of initial phlebotomy in case additional tests are ordered during physician evaluation. If a computerized hospital information system is used to generate specimen labels, there will be no label for such extra tubes unless handwritten or manually stamped addressograph labels are used. These workflow issues were one of the problems uncovered during our study. Accurate patient identification at the time of registration is another potential pitfall. One example consists of patients with the same name being registered incorrectly. Another example might stem from the lack of universal health care access in this country leading to health insurance cards being shared. Consistent with this latter danger, in the international study cited above, it was noted that the presence of national health patient identification systems in Sweden and Finland was associated with low rates of WBIT specimens. Clearly, we have not reached our goal of eliminating major mislabeling events, but we feel we have taken a necessary first step toward that eventual goal.

Improving the accuracy of patient identification has been a national patient safety goal established by the Joint Commission for the Accreditation of Healthcare Organizations for several years. The most recent College of American Pathologists checklist for transfusion medicine also cites the need to have a documented program to ensure that the risk of pretransfusion sample misidentification is monitored and subjected to continual process improvement (TRM.30550, Phase II). The 23rd edition of Standards for Blood Banks and Transfusion Services of the American Association of Blood Banks requires, for the first time, that near-miss events be monitored (standard 8.2); WBIT specimens constitute one important example of a near-miss event that merits monitoring and tracking.

We have been sufficiently encouraged by our experience in the transfusion service that we hope to expand data

---

**Mislabeled Blood Bank Specimens Classified by Quarter and by Location**

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total TYSC</td>
<td>6763</td>
<td>7223</td>
<td>6936</td>
<td>6745</td>
<td>7224</td>
<td>7724</td>
<td>7340</td>
</tr>
<tr>
<td>Minor</td>
<td>24</td>
<td>11</td>
<td>11</td>
<td>35</td>
<td>23</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>(0.4%)</td>
<td>(0.2%)</td>
<td>(0.2%)</td>
<td>(0.5%)</td>
<td>(0.3%)</td>
<td>(0.2%)</td>
<td>(0.2%)</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>19</td>
<td>13</td>
<td>12</td>
<td>14</td>
<td>15</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>(0.3%)</td>
<td>(0.2%)</td>
<td>(0.2%)</td>
<td>(0.2%)</td>
<td>(0.2%)</td>
<td>(0.3%)</td>
<td>(0.2%)</td>
<td></td>
</tr>
<tr>
<td>WBIT</td>
<td>16</td>
<td>10</td>
<td>10</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Unlabeled</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Req</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>WBIT-ED</td>
<td>5/16</td>
<td>7/10</td>
<td>5/10</td>
<td>6/13</td>
<td>1/9</td>
<td>1/7</td>
<td>2/13</td>
</tr>
<tr>
<td>(31%)</td>
<td>(70%)</td>
<td>(50%)</td>
<td>(46%)</td>
<td>(11%)</td>
<td>(14%)</td>
<td>(15%)</td>
<td></td>
</tr>
</tbody>
</table>

* Total TYSC indicates total number of specimens received for type and screen; Minor, number (percentage) of specimens with minor mislabeling; Major, number (percentage) of specimens with major mislabeling; WBIT, number of specimens discovered to contain the wrong blood in tube; Unlabeled, number of unlabeled specimens; Req, number of specimens with discordant information on tube and requisition; ellipses, not applicable; and WBIT-ED, number (percentage) of WBIT specimens from the emergency department.
collection and tracking to other sections of the clinical laboratory. Delta checks in a clinical hematology or chemistry laboratory can identify WBIT specimens not yet detected by the blood bank. Delta checks are comparisons of the patient’s current result with the most recent set of prior results. This checking is performed automatically by some laboratory information systems. For a routine hematology specimen where a complete blood count is ordered, the mean corpuscular volume delta check is commonly used. Other algorithms are used in the chemistry lab. Any delta check program in a clinical laboratory (such as hematology) should include an alert to other clinical laboratory sections (such as the transfusion service) once the possibility of a WBIT specimen is raised.

Preventing the occurrence of mislabeled or WBIT specimens can involve strategies such as requiring 2 hospital staff members to verify patient identification prior to phlebotomy, requiring photo identification prior to phlebotomy, or requiring 2 independently drawn samples for new patients in the transfusion service. New technology is also available to improve the accuracy of patient identification in specimen collection: barcode or radio-frequency identification chips for patient identification, barrier systems for specimen collection and blood administration, and patient identification wristbands that include a photograph are some of the options available. Many of these systems have wider applications in other areas of the hospital such as pharmacy.

**CONCLUSION**

Preanalytic variables are crucial in clinical laboratory testing, and nowhere are they more critical than in pretransfusion testing. Data collection and trending on mislabeled specimens in general, and WBIT specimens in particular, can go a long way toward improving transfusion safety.

**References**