Identification Errors Involving Clinical Laboratories

A College of American Pathologists Q-Probes Study of Patient and Specimen Identification Errors at 120 Institutions

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Context.—Misidentified laboratory specimens may cause patient injury, but their frequency in general laboratory practice is unknown.

Objectives.—To determine (1) the frequency of identification errors detected before and after result verification, (2) the frequency of adverse patient events due to specimen misidentification, and (3) factors associated with lower error rates and better detection of errors.

Design.—One hundred twenty clinical laboratories provided information about identification errors during 5 weeks.

Results.—In aggregate, 85% of errors were detected before results were released; one quarter of laboratories identified more than 95% of errors before result verification. The overall rate of patient identification errors involving released results was 55 errors per 1 000 000 billable tests. A total of 345 adverse events were reported. Most of the adverse events caused material inconvenience to the patients but did not result in any permanent harm. On average, adverse events resulted from 1 of every 18 identification errors. Extrapolating the adverse event rate observed in this study to all United States hospital-based laboratories suggests that more than 160 000 adverse events per year result from misidentification of patients’ laboratory specimens.

Conclusions.—Identification errors are common in laboratory medicine, but most are detected before results are released, and only a fraction are associated with adverse patient events. Even when taking into consideration the design of this study, which used imperfect case finding, institutions that did a better job of detecting errors within the laboratory released a smaller proportion of results that involved specimen misidentification.

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in the collection of transfusion medicine specimens, compared with “routine” specimens, and because rejection criteria for these specimens are typically more stringent.\textsuperscript{14}

Identification errors are difficult to study systematically since many errors go undetected. The number of errors found at a particular institution depends to some degree on how hard laboratory staff and clinical caregivers look for errors. This fact sometimes produces a paradox—facilities that are more focused on detecting and correcting errors may appear to have error rates higher than rates at institutions that do not pay as much attention to discovering errors. Although it is theoretically possible to find all identification errors (eg, by performing molecular identity testing\textsuperscript{15,16} on every specimen received in the laboratory), this is a practical impossibility. Therefore, in addition to studying the frequency of identification errors, we also elected to examine the proportion of identification errors that were detected before release (verification) of laboratory results. We hypothesized that this proportion reflects the diligence with which laboratory staff identify errors before release of results and that facilities with a high proportion of identification errors detected preverification would have lower postverification error rates.

The specific aims of this study were to determine (1) the frequency of preverification and postverification identification error rates at a large number of institutions, along with the number of adverse patient events attributable to misidentification; (2) the fraction of identification errors that are not corrected before results are released and the fraction of released results with identification errors that culminate in adverse patient events; (3) whether institutions that detect a high proportion of errors before result verification have lower postverification error rates; and (4) whether any of several specific institutional practices are associated with lower postverification error rates or a higher proportion of errors detected before results are released.

MATERIALS AND METHODS

Conceptual Framework

This study was developed within a conceptual framework of human error that has been validated in a number of settings but not for specimen identification errors in clinical laboratories. Authorities who have studied errors systematically report that for every visible failure that leads to harm, there are many failures that lie “beneath the surface.”\textsuperscript{17–19} Most of these errors are corrected before harm occurs. Some remain undetected but do not result in any adverse outcomes because of chance. Only a small fraction of errors leads to patient injury. Accordingly, we hypothesized that for every adverse patient event that resulted from a specimen identification error, there would be several instances in which results were released for the wrong patient but in which no harm occurred, and an even larger number of instances in which identification errors were detected and corrected within the clinical laboratory before a result was released (see the Figure). One of the aims of the present study was to compare the frequency of preverification identification errors (detected before test results were released) with postverification errors (detected after results were released) and with adverse patient events, to determine whether the conceptual framework evidenced in other industries was applicable to specimen identification errors in laboratory medicine.

We assumed that detection of identification errors at each of the 3 levels depicted in the Figure was imperfect. For example, we assumed that laboratory staff would detect and report only a fraction of the specimens that arrived misidentified or that were misidentified during laboratory processing. Similarly, while physicians or nurses were likely to report laboratory test results that did not make sense for a patient, or that they never ordered on a patient, we assumed that a number of other verified test results released by the laboratory for the wrong patient would pass undetected by clinicians and never be reported. Finally, we assumed that some fraction of patients who were inconvenienced or harmed by a specimen identification error would never have their problems traced back to the error and would therefore not be reported. Because the methods used by laboratories (and this study) to detect identification errors were imperfect, it was not clear to us whether laboratories that detected a high fraction of errors before results were verified would report lower postverification error rates. It was possible that such a small fraction of identification errors was being detected, even by the most vigilant facilities, that postverification error detection rates would have no association with the frequency of postverification reporting errors. A second aim of this study, therefore, was to test the hypothesis that superior detection of errors by laboratories before results were released would cause fewer verified results to be released for the wrong patient.

Study Format and Data Collection

The study was conducted according to the Q-Probes study format previously described.\textsuperscript{20} After pilot testing and refinement of the data collection instrument, College of American Pathologists Q-Probes subscribers were mailed data collection instructions in early 2005.

Participants were asked to track identification errors for 5 weeks. Errors detected and corrected before verification (preverification errors) and errors that came to the laboratory’s attention after verification (postverification errors) were included. Identification errors related to all types of testing (anatomic and clinical pathology), and errors related to all patient types (inpatients, outpatients, and emergency department and outreach patients) were included.

For each identification error, participants categorized the error as a preverification or postverification error and indicated whether the error was known to have caused an adverse event (see “Definitions”). As an option, participants could classify the reason for the error as one of the following: initial registration or order entry error; primary specimen label error; aliquot, block, or slide label error; result entry error; other clerical error; or other reason.

Definitions

In order to ensure comparability of results, 4 operational definitions were adopted:

Identification Error.—For this study, the terms specimen iden-
An identification error that was reported for the wrong specimen (or would have been reported for the wrong specimen without some intervention) was considered an identification error. It was immaterial whether the error resulted from the actions of laboratory staff or nonlaboratory staff, or as a result of some other failure. A mixup of 2 specimens from the same patient collected at different times or from different body sites was still considered an identification error because the time of collection or body site can be important in interpreting results. Identification errors due to partial misidentification of the patient, for example, listing the wrong middle initial or gender on the label, were considered identification errors according to the policy in each laboratory. If the laboratory required only first name, last name, and date of birth to identify a particular specimen, then the omission of the middle initial or gender would not be considered an identification error in this study. Specimens that were rejected by the laboratory because patient identity could not be assured were considered preverification identification errors.

Error Detected Postverification.—An identification error that was detected after a result had been verified, even if the error was created well before the result was verified, was defined as a postverification error. An example of postverification error detection was when a surgeon called to say that the appendectomy report she received did not belong to “Mr Jones” as stated on the report, because “Mr Jones” did not have an appendectomy. When a specimen mixup involved 2 known patients, the error was recorded only once even though 2 patients might have been impacted.

Error Detected Preverification.—An identification error that was detected and corrected before a test result was released was defined as a preverification error. An example of an error corrected preverification involved a pathologist who placed a tissue slide under the microscope and noticed that the tissue type did not match the specimen requisition because of a slide labeling error. The label was corrected, and the proper slide located. Another example involved a laboratory order-entry staff person who noticed that the patient birth date on a specimen label did not match the birth date listed in the laboratory computer database for the patient in question. An error corrected preverification did not have to be discovered by laboratory staff. If a physician’s office staff or a nurse called to inform the laboratory that a specimen that was submitted was mislabeled, and the error was corrected before the test result was released, this was considered an instance of preverification correction.

To qualify as an error corrected preverification, the identification error had to have been detected by someone other than the person who caused the error. For example, an incident in which a pathologist accidentally picked up the wrong slide in a tray, noticed that the number on the slide did not match the number on the attached paperwork, set the slide down, and then picked up the correct slide was not counted as a preverification error (or an identification error of any type). Although this incident might be considered to be a quickly corrected “identification error,” it was caused and corrected by the same person.

Adverse Event.—An adverse event was defined as an untoward outcome resulting from a specimen identification error including a significant change in the way a patient was treated. An adverse event required that a patient be harmed by the identification error or that the patient’s care be significantly changed. Examples included patients who were admitted unnecessarily because the patient’s physician received a result that belonged to another patient, patients who had their admission unnecessarily delayed, or those who received any prescription medication or surgery that they would not have received as a result of an identification error. Adverse events also included patients who suffered unnecessary stress due to a laboratory identification error—such as receiving incorrect news that they had a serious illness—even if the identification error was later corrected. Adverse events included patients who suffered from a mixup of 2 of their own specimens. For example, if a mixup of blood glucose specimens obtained before and after insulin administration caused a patient to receive unnecessary additional insulin or to have needed insulin withheld, the episode was considered an adverse event.

Laboratories could receive notification of adverse events by a number of means—by telephone, by a subpoena from an attorney, or through attendance at a teaching conference. Adverse events were included in this study regardless of the manner in which the laboratory learned about the episode. Laboratory staff at participating institutions were not asked to review the medical record of every patient for whom a postverification identification error was reported to determine whether an adverse event occurred as a consequence of the error. Only adverse events reported to the laboratory during the normal course of operations were recorded by study participants, and only a rudimentary classification of adverse events was undertaken, based on the information reported to laboratory staff.

Laboratory identification errors that required a second phlebotomy with no other consequences to the patient, were not considered adverse events. Billing problems that resulted from identification errors and that did not have any clinical consequences were not considered adverse events. If a patient was harmed by a laboratory result that did not involve an identification problem (such as a transcription error leading to reporting of the wrong potassium value), the episode was not considered an adverse event for the purpose of this study and was excluded from the analysis because it did not involve a problem with patient or specimen identification.

Participant Characteristics

A total of 120 institutions submitted data for this study. Most of the institutions (98.3%) were located in the United States. Approximately 36% of participating institutions were teaching hospitals and 18% had a pathology residency program. Within the past 2 years, the College of American Pathologists had inspected approximately 84% of the laboratories. The median institution reported that 50% of its specimens came from inpatients. Ten percent of laboratories reported that fewer than one fifth of specimens were derived from inpatients, while another 10% reported that 80% or more specimens came from inpatients. Table 1 displays other characteristics of participating institutions, and Table 2 summarizes methods used by specific laboratory sections to detect identification errors.

Statistical Analysis

The percentage of the total errors detected before verification was calculated for each participant, along with the rate of identification errors detected before release of results (per 1,000,000 billable tests) and the rate of errors detected after release of results (per 1,000,000 billable tests). The numbers of preverification, postverification, and total errors per 1,000,000 billable tests were calculated using pro-rated annual billable test counts, which included an adjustment for the number of days each participant actually collected data. (The actual data collection period varied somewhat among the 120 study participants; data about errors were collected for an average of 42.1 days, median of 35 days.) The number of identification errors observed by participants was highly correlated with the number of billable tests recorded by the participant (P < .001), supporting the appropriateness of using billable test counts as a denominator when calculating an identification error rate.

The postverification error rate and the percentage of errors detected preverification were considered the 2 principal quality indicators (dependent variables). Each of the 2 dependent variables was tested separately for associations with the 9 demographic and practice variables listed in Table 1 and the 9 additional variables listed in Table 2. Nonparametric Wilcoxon rank sum tests and Kruskal-Wallis tests were used to test associations; a P value of .05 or less was considered to be statistically significant.

Several participating institutions did not answer all of the questions on the questionnaire about institutional practices designed
to detect identification errors. These institutions were excluded only from tabulations and analyses that required the missing data elements.

### RESULTS
### Identification Error Rates

Participants from 120 institutions submitted information about a total of 6705 identification errors. Of these, 5731 (85.5%) were detected before verification, with the remaining 974 (14.5%) detected after results were released. Combining the results from all participants, the aggregate preverification error rate was 324 identification errors per 1000000 billable tests, and the aggregate postverification error rate was 55 per 1000000 billable tests.

The rates of preverification, postverification, and total identification errors (per 1000000 billable tests) were calculated for each institution. The proportion of errors detected before release of results was also calculated for each facility. The distributions of these four indicators are listed in Table 3. We considered the postverification error rate and the percentage of errors detected before verification to be quality indicators (i.e., low postverification error rates and higher percentages of errors detected preverification were indicative of high quality). We did not consider the total and preverification error rates to be indicative of laboratory quality, because laboratories that are more diligent in detecting errors may paradoxically record higher preverification and total identification error rates. Institutions that detected a higher percentage of identification errors before result verification had significantly lower postverification error rates ($P < .001$).

Participants were given the option to list the reason for each identification error, and they supplied reasons for 72% of the errors (Table 4). More than 50% of identification errors were reported to result from primary specimen labeling errors, and 22% were attributed to computer registration errors or order entry errors.

### Adverse Events

The number of adverse events that resulted from identification errors was recorded by 110 of the participating institutions. A total of 345 adverse events were reported. Because there were too few adverse events to analyze by institution, adverse events from all institutions were analyzed in aggregate. The 110 institutions that reported on adverse events also reported a total of 6123 identification errors. Therefore, approximately 1 in 18 identification errors resulted in an adverse event. More than 70% of the adverse events resulted in significant patient inconvenience with no known change in treatment or outcome. These data are shown in Table 5.

### Factors Associated With Superior Performance

A number of factors were tested for association with the 2 quality indicators—postverification identification error rate and the percentage of identification errors detected before release of results. Significantly lower postverification errors were recorded by institutions that (1) used improper specimen labeling to detect identification errors on the transfusion medicine service, and (2) had an identification error tracking program in place prior to the beginning of the study ($P = .03$ and $P = .04$, respectively; see Table 6).

A higher percentage of errors detected before release of results was recorded by institutions that (1) checked the patient name or number against the existing patient database in the general chemistry and hematology sections; and (2) did not perform a clerical check of the requisition against results that had already been verified (both $P = .02$; see Table 7). Table 8 lists institutional practices that were not found to be associated with either quality indicator.

### COMMENT

We believe this is the first large multi-institutional study to examine specimen misidentification in the general clinical laboratory. The precise impact of misidentified laboratory specimens is unknown, but this study suggests that the impact is significant. Among 110 study participants that collected adverse event data, for an average of 42.7 days, a total of 345 adverse events were reported. Most of the adverse events caused material inconvenience to the patients without permanent harm. Several resulted in unnecessary medication changes or other outcomes. If we extrapolate the rate of adverse events to the nation's 6000 hospital-based laboratories, we estimate that 160900 ad-
verse events per year result from misidentification of patients’ laboratory specimens. Since this projection does not take into account commercial or physician office laboratories, and because this study used case finding methods that are likely to underestimate the frequencies of both errors and adverse events, it is likely that the true incidence of adverse events due to patient identification errors is higher.

We would have liked to collect detailed information about the types of adverse events caused by misidentification of laboratory specimens but we were concerned that laboratories could not reliably determine the clinical impact of each event. When a patient event was brought to the attention of laboratory staff at participating institutions, staff were asked to ensure that the event met the study definition of an adverse event (ie, patient harm or material inconvenience more significant than simple re-collection of a specimen). In some cases, therapy was known to have been altered, but more detail about the

### Table 2. Methods Used to Detect Identification Errors

<table>
<thead>
<tr>
<th>Method Used to Detect Errors</th>
<th>Clerical/Specimen Processing</th>
<th>Chemistry and Hematology</th>
<th>Microbiology</th>
<th>Transfusion Medicine</th>
<th>Anatomic Pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requisition name/number does not match specimen label/number</td>
<td>Yes</td>
<td>113</td>
<td>98.3</td>
<td>104</td>
<td>94.5</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>1.7</td>
<td>6</td>
<td>5.5</td>
<td>3</td>
</tr>
<tr>
<td>Requisition not received with specimen</td>
<td>Yes</td>
<td>90</td>
<td>79.6</td>
<td>64</td>
<td>59.8</td>
</tr>
<tr>
<td>No</td>
<td>23</td>
<td>20.4</td>
<td>43</td>
<td>40.2</td>
<td>38</td>
</tr>
<tr>
<td>Patient name/number not in database of existing patients</td>
<td>Yes</td>
<td>66</td>
<td>59.5</td>
<td>45</td>
<td>44.1</td>
</tr>
<tr>
<td>No</td>
<td>45</td>
<td>40.5</td>
<td>57</td>
<td>55.9</td>
<td>53</td>
</tr>
<tr>
<td>Improper specimen labeling (some element other than name/number missing or improperly recorded)</td>
<td>Yes</td>
<td>86</td>
<td>76.1</td>
<td>74</td>
<td>68.5</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>23.9</td>
<td>34</td>
<td>31.5</td>
<td>30</td>
</tr>
<tr>
<td>Lost specimen (alerts laboratory to possibility of identification error)</td>
<td>Yes</td>
<td>95</td>
<td>87.2</td>
<td>94</td>
<td>85.5</td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>12.8</td>
<td>16</td>
<td>14.5</td>
<td>15</td>
</tr>
<tr>
<td>Communication from patient care unit or physician office</td>
<td>Yes</td>
<td>104</td>
<td>93.7</td>
<td>100</td>
<td>93.5</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>6.3</td>
<td>7</td>
<td>6.5</td>
<td>5</td>
</tr>
<tr>
<td>Requisition matched to results after verification to ensure all tests ordered</td>
<td>Yes</td>
<td>45</td>
<td>41.3</td>
<td>38</td>
<td>35.5</td>
</tr>
<tr>
<td>No</td>
<td>64</td>
<td>58.7</td>
<td>69</td>
<td>64.5</td>
<td>65</td>
</tr>
<tr>
<td>Delta check—value compared to previous value from same patient</td>
<td>Yes</td>
<td>110</td>
<td>97.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABO check—ABO compared to type on file for patient in database</td>
<td>Yes</td>
<td>109</td>
<td>98.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Interinstitutional Distribution of Identification Error Rates

<table>
<thead>
<tr>
<th>Metric</th>
<th>Institution Percentiles (N = 120)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10th</td>
</tr>
<tr>
<td>Percentage of identification errors detected before release of results*</td>
<td>44.4</td>
</tr>
<tr>
<td>Rate of identification errors detected after release of results (per 1,000,000 tests)†</td>
<td>335</td>
</tr>
<tr>
<td>Rate of identification errors detected before release of results (per 1,000,000 tests)‡</td>
<td>1104</td>
</tr>
<tr>
<td>Overall rate of identification errors (per 1,000,000 tests)‡</td>
<td>1291</td>
</tr>
</tbody>
</table>

* Higher percentiles indicate better relative performance (higher percentage of errors identified before release of results).
† Higher percentiles indicate better relative performance (lower postverification error rates).
‡ Higher percentiles do not necessarily indicate better relative performance, as discussed in the text.
types of adverse events experienced by patients was not available to us.

In this study, 5731 identification errors were detected before test results were released, and 974 were found after results had been verified. Thus, 85% of reported identification errors were detected within the laboratory before result verification. This percentage varied widely from one facility to the next. One-quarter of institutions were able to identify at least 19 of 20 identification errors before results were released, while another quarter failed to identify at least 3 in 10 errors before releasing results. Institutions that identified a higher percentage of errors before results were verified had significantly lower postverification error rates, underscoring the importance of early detection.

What can be done to improve early detection of identification errors? This study provides some guidance. Since laboratories tend to serve a similar population over time, the practice of flagging registration of new patients for further review presents one opportunity to increase early detection of identification errors. Institutions that adopted this practice in the chemistry or hematology sections had higher preverification error detection percentages.

The practice of matching results against a test requisition to ensure all tests were ordered is a useful method for finding identification errors. However, if the matching takes place after result verification, any corrections made will necessarily take place after verification, meaning the potential for adverse events will not be entirely eliminated. Laboratories that matched results against requisitions after verification had lower preverification error detection percentages. While we do not wish to discourage the practice of checking requisitions against results because it is likely to catch some patient identification errors that might otherwise go undetected (as well as detect test order entry errors), institutions that check computer orders against requisitions before tests are verified will enjoy the same error-detection benefits and will additionally be able to correct identification errors before results leave the laboratory.

Postverification error rates were lower at institutions that had been monitoring identification errors prior to the onset of this study than at institutions that had not previously monitored identification errors. Since experience with monitoring is likely to make a facility more adept at detecting identification errors, the lower postverification error rates of sites with established monitoring programs suggests that monitoring may be a useful method for heightening awareness about identification errors and promoting their detection before results are released.

Finally, in the transfusion medicine service, the imposition of strict requirements to use multiple identifiers before accepting specimens was associated with a lower postverification error rate. Our observation is consistent with a previous study that suggested that specimens with one or more minor labeling errors were 40 times more likely to contain someone else’s blood than specimens that met strict labeling standards.14

Many of the methods for detecting identification errors that are listed in Tables 1 and 2 were not found to be significantly associated with a lower postverification error rate or a higher percentage of errors detected before verification. For example, the use of bar codes, patient identification numbers with check digits, or delta checking was not associated with lower postverification error rates or

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**Table 5. Frequency of Adverse Event Types (N = 345)**

<table>
<thead>
<tr>
<th>Type of Event</th>
<th>No. of Adverse Events</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant patient inconvenience; no known change in treatment or patient outcome</td>
<td>251</td>
<td>72.8</td>
</tr>
<tr>
<td>Patient impacted by identification error; nature of impact unknown</td>
<td>78</td>
<td>22.6</td>
</tr>
<tr>
<td>Change in patient treatment; no known change in patient outcome</td>
<td>16</td>
<td>4.6</td>
</tr>
<tr>
<td>Known change in patient morbidity or mortal change</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 6. Institutional Practices Associated With Lower Postverification Errors**

<table>
<thead>
<tr>
<th>Institutional Practice</th>
<th>Median Postverification Errors (per 1 000 000 Billable Tests)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfusion medicine: improper specimen labeling used to detect identification errors*</td>
<td>49</td>
</tr>
<tr>
<td>Identification error tracking program in place prior to this study†</td>
<td>145</td>
</tr>
</tbody>
</table>

* P = .03.
† P = .04.

**Table 7. Institutional Practices Associated With Higher Rate of Errors Detected Preverification**

<table>
<thead>
<tr>
<th>Institutional Practice</th>
<th>Median % Identification Errors Detected Preverification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry/hematology match patient name/number against existing patient database*</td>
<td>89.9</td>
</tr>
<tr>
<td>Clerical or accessioning areas match requisition to results postverification*</td>
<td>83.3</td>
</tr>
</tbody>
</table>

* P = .02.
higher preverification detection of errors. This study was not powered to detect small effects, and some of these practices have proven efficacious in other settings. For example, Oosterhuis et al reported that an expert system that validated test results on the basis of a multianalyte delta check detected 78% of intentionally altered test results. Killeen et al reported that the introduction of bar codes and clinician physician order entry in an emergency department reduced identification error rates from 2.56 to 0.49 per 1000 specimens. Colard and Rao et al have also reported reductions in identification errors attributable to bar code use.

We believe it helpful to acknowledge several limitations of this study. The most important limitation is that the case-finding methods used to detect errors were imperfect. Detection of preverification errors relied on laboratory vigilance, and detection of postverification errors relied upon clinical caregivers’ ability to detect identification failures and willingness to report these incidents to the laboratory. We suspect that clinicians are more inclined to report postverification errors that cause adverse events than postverification errors that did not result in any patient harm, but there is very little we can say with confidence about the frequency or characteristics of identification errors that were not detected or reported.

The impact of case-finding methodology on the reported frequency of identification errors is illustrated by 2 studies of “wrong blood in tube” errors in transfusion medicine. A New York State study, which used hemolytic transfusion reactions as a case-finding method, reported a specimen identification error rate of 19 per million specimens, but a study that relied on historical ABO typing to determine whether an incoming specimen was improperly identified estimated a “wrong blood in tube” rate of 337 per million specimens. This latter figure is comparable to the overall identification error rate reported by the median institution in our study (390 identification errors per million specimens).

A study conducted in 14 Australian laboratories examined errors transcribing a patient’s name from pathology requisitions to computer systems. The median institution made transcription errors involving patient identity in 1% of cases, whereas the worst performer made identification errors in 9% of cases. This error rate is significantly higher than that observed in our study. A number of other studies of laboratory errors, performed at individual institutions, have found preanalytic errors (and specimen identification errors in particular) to be the most common error type detected. The error rates we report in this study are generally comparable to the rates reported in these investigations.

Several additional limitations of this study should be noted, in addition to the underestimates produced by the imperfect case-finding methods we used. First, data from study participants were self-reported, and we could not validate all of the data submitted by participants, although the College of American Pathologists uses statistical procedures to eliminate certain outliers from the data pool prior to analysis. Nevertheless, reporting errors may have occurred. Second, in the outpatient/outreach arena in the United States, approximately 30% of testing is performed by commercial laboratories that were not represented in this study. The frequency of identification errors experienced by commercial laboratories may be different from the frequencies observed in this study. Finally, the 120 participants in this study may not be representative of hospital-based laboratories. They may experience more or fewer identification errors than the average laboratory, may be more or less adept at detecting errors, and may serve a clientele that is more or less inclined to bring an identification error to the attention of laboratory management. Therefore, the results of this study may over- or under-represent the performance that is being achieved within the industry.

In spite of these limitations, we believe the data from this study support at least 4 recommendations that can be followed to reduce identification errors:

1. Monitor identification errors. Ongoing monitoring is associated with a lower rate of errors.
2. Ensure new patients are properly identified. Investigate whether patients who are new to the laboratory (not already found in the laboratory or hospital patient database) have been identified properly. This investigation may consist of a requisition and registration check prior to release of results.
3. Use multiple identifiers (more than 2) to ensure accurate identification in transfusion medicine. Adopt strict standards that require correct and consistent recording of all information on a specimen label and test requisition (first name, last name, middle initials, date of birth, sex, medical record number). Consider similar standards for specimens outside of transfusion medicine.
4. Match requisitions to tests ordered in the computer to detect identification errors (and test order entry errors). When matching requisitions to information that has been entered into the computer, attempt to perform checking before results are released. This requires matching of requisitions to computer orders before results have been finalized.

References


