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Problematic Specimens in Clinical Microbiology

A quality assurance study in an urban tertiary care teaching hospital explores the spectrum

By Ming Zhang, MD, PhD; Hang Zhou, MD; Raghava Potula, MHA, PhD; and Allan L. Truant, PhD

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As every healthcare professional knows, reporting an incorrect or delayed laboratory test result can have potentially devastating effects on patient outcomes. Therefore, the accuracy of laboratory specimen identification and the assurance of appropriate specimen collection are critical prior to performing a laboratory test.

"Problematic" specimens, such as mislabeled/unlabeled specimens or specimens collected in the wrong media or container, are not uncommonly seen in clinical laboratories. Since the routine clinical microbiology laboratory is the first line of identification of infectious diseases and determination of antibiotic susceptibility, it might be considered a sentinel area to identify and quantify this important area of concern. Perhaps due to the large test volumes and complicated specimen collection and transport requirements, microbiology laboratories may observe more medical errors associated with problematic specimens than other laboratories. Such errors not only increase the test turnaround time (TAT), but can also significantly affect patient clinical assessment and treatment protocols.

Techniques have been developed to improve the efficiency and accuracy of data entry in microbiology laboratories to decrease TAT, reduce reporting error rates, reduce length-of-stay (LOS) in the hospital and save technologists time.[1,2] Quality management in clinical microbiology laboratories has also been studied and reported;[3] however, there is little data focused on the rate, source and classification of clinical microbiology specimen errors in the literature. The goal of this quality assurance study was to investigate the spectrum of microbiology specimen errors in a large tertiary care teaching hospital.

Methods

A 5-month retrospective data review was performed in a large routine clinical microbiology laboratory to retrieve all specimens submitted and identified as "problematic specimens." The data was retrieved from the laboratory information system (LIS) and from problematic specimens recorded in a daily specimen log book. The specimens included those from bacteriology, mycology, parasitology, virology and mycobacteriology sections but did not include those from the immunology section.

The problematic specimens were classified into four categories:

1. type of error identified (i.e., mislabeled or unlabeled patient name or specimen type, specimen collected in the wrong media or container, specimen with quantity not sufficient [QNS], specimen sent for unavailable test, duplicate order or clerical error);
2. location of specimen collection, such as the emergency department (ED), intensive care unit (ICU), medical floor or outpatient office;
3. specimen type (i.e., blood, urine, stool, body fluid, or sputum); and
4. requested test (i.e., blood culture, urine culture, stool culture, or sexual transmitted disease test).

In addition, the outcome of the putative error was documented and the number and rate of the errors in each category were collected in an Excel format and analyzed.

Results

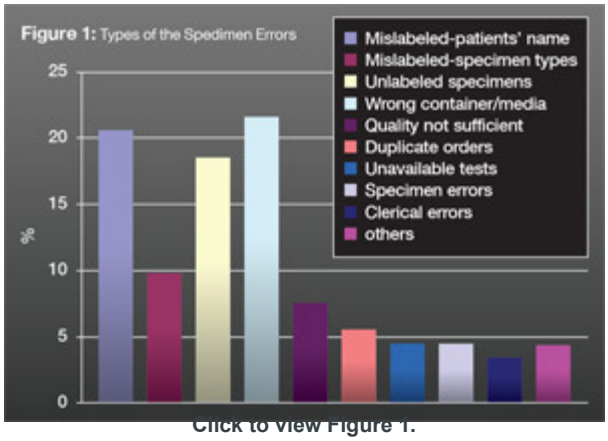
Out of 47,787 specimens submitted to this clinical microbiology laboratory during a five month period, 92 problematic specimens (0.2 percent) were identified. From these, the most frequent errors were either:

• mislabeled (combined rate of 30.4 percent),
• unlabeled (18.5 percent), or
• collected in the wrong media or container (21.7 percent) .

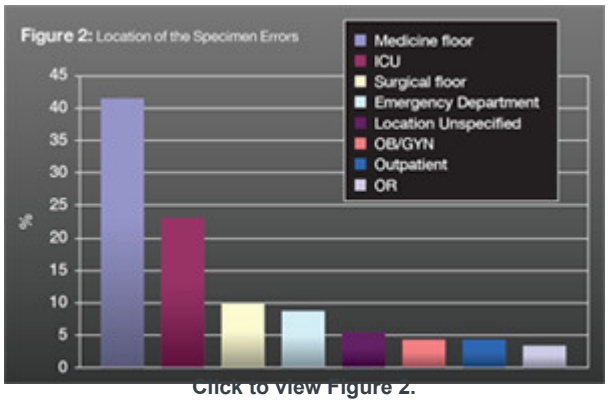
Other errors included:

• specimen with QNS (7.6 percent),
• duplicate order (5.4 percent), and
• unavailable test (4.3 percent) (Fig. 1).

The medicine floor submitted the most problematic specimens (41.3 percent) while the ICU ranked second (22.8 percent) in this category (Fig. 2). In terms of test type, urine culture (16.3 percent) was the most common incorrect request followed by tissue culture and AFB culture (Table 1). The most commonly submitted problematic specimen type was body fluid (19.6 percent), followed by urine, stool and sputum with equal number (16.3 percent) (Table 2). Most of the error specimens received in the clinical microbiology laboratories were rejected (78.3 percent) while some of the errors were corrected by the clinical staff (21.7 percent).



Click to View Figure 1.



Click to View Figure 2.

Discussion

Of the three phases of testing, most errors occur in the pre-analytical phase, such as incorrect test request and errors with wrong sample collection.[4] Therefore, the recognition and classification of the reasons for specimen errors are very important.[5] Since many clinical decisions are made based on clinical laboratory results, the recognition and correction of such specimen errors prior to performance of the actual test are extremely important for error avoidance. This would obviously lead to improved laboratory quality and the overall provision of optimal healthcare.

In this study, the rate and composition of clinical microbiology specimen errors in a large urban tertiary care teaching hospital was investigated. The results demonstrated an overall 0.2 percent specimen error rate. Although there is no established national reference rate for laboratory errors, the number of errors identified in this study does not appear very striking considering the relatively large test volumes (47,787 tests in five months) and variety of the test types.

However, as mentioned earlier, even a small number of errors can extrapolate to compromised patient care for the patient being evaluated. This study found that mislabeling (either the patient name or specimen type) is the most common error made by the clinical staff. Unlabeling was also a significant source of error. A recent study also has reported that mislabeled and unlabeled specimens consitute a significant proportion of the overall specimen errors.[6]

The medicine inpatient floor submitted the majority of the specimens in the problematic specimen category (41.3 percent), most likely due to the high patient and specimen numbers. Also,

the ICU ranked second on the hospital location list, probably due to the critical and challenging nature of the clinical setting.

In terms of requested tests, urine culture (16.3 percent) was the most common problematic test requested. Interestingly, although blood cultures are frequently submitted, very few of them (3.3 percent) fall into the error category. The majority of problematic specimens are rejected due to the nature of the errors (unlabeled, collected in wrong media or container, unavailable tests, quantity not sufficient), while a small portion of the specimens are accepted after the appropriate correction by the clinical staff.

Table 1: Requested tests which were "problematic;" urine culture (15/92, 16.3%) was the most common problematic test requested.

Test Types	# of Specimens	%
Urine culture	15	16.3
Tissue culture	10	10.9
AFB culture	10	10.9
Sputum culture	9	9.8
STD	9	9.8
Test unspecified	8	8.7
Stool culture	7	7.6
Stool *C Diff*	7	7.6
Pleural fluid Legionella DNA	4	4.3
Surveillance MRSA	3	3.3
Unspecified test types	3	3.3
Blood culture	3	3.3
Body fluid culture	2	2.1
Influenza A/B	2	2.1
Total	92	100

Click to view Table 1.

Study Conclusions

This study indicated that problematic specimens are still commonly encountered in the clinical microbiology laboratory, especially in a busy tertiary care teaching hospital setting. The timely recognition and correction of such errors by laboratory technologists are important to ensure accurate lab results, rapid TAT, decreased LOS and patient safety. As well, appropriate and ongoing education of clinical staff for proper specimen submission is warranted and necessary for optimal patient care.

Dr. Zhang is with the department of pathology and laboratory medicine, Temple University Hospital, Philadelphia; Dr. Zhou is with the department of pathology and laboratory medicine, Temple University Hospital; Dr. Potula is with the department of pathology and laboratory medicine, Temple University Hospital and School of Medicine; and Dr. Truant is with the departments of pathology and laboratory medicine, microbiology and immunology, and internal medicine, Temple University Hospital and School of Medicine.

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Click to view Table 2.

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