

Multicenter Assessment of Gram Stain Error Rates

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Abstract

Gram stains remain the cornerstone of diagnostic testing in the microbiology laboratory for the guidance of empirical treatment prior to availability of culture results. Incorrectly interpreted Gram stains may adversely impact patient care, and yet there are no comprehensive studies that have evaluated the reliability of the technique and there are no established standards for performance.

In this study, clinical microbiology laboratories at four major tertiary medical care centers evaluated Gram stain error rates across all nonblood specimen types by using standardized criteria. The study focused on several factors that primarily contribute to errors in the process, including poor specimen quality, smear preparation, and interpretation of the smears.

The number of specimens during the evaluation period ranged from 976 to 1,864 specimens per site, and there were a total of 6,115 specimens. Gram stain results were discrepant from culture for 5% of all specimens. Fifty-eight percent of discrepant results were specimens with no organisms reported on Gram stain but significant growth on culture, while 42% of discrepant results had reported organisms on Gram stain that were not recovered in culture. Upon review of available slides, 24% (63/263) of discrepant results were due to reader error, which varied significantly based on site (9% to 45%). The Gram stain error rate also varied between sites, ranging from 0.4% to 2.7%.

The data demonstrate a significant variability between laboratories in Gram stain performance and affirm the need for ongoing quality assessment by laboratories. Standardized monitoring of Gram stains is an essential quality control tool for laboratories and is necessary for the establishment of a quality benchmark across laboratories.