Pre-Analytical And Analytical Rejected Samples In Laboratory

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Abstract:
In the laboratory setting, the analysis of samples is crucial for accurate diagnosis and treatment of patients. However, there are instances where samples are rejected either during the pre-analytical or analytical phase, leading to delays in patient care and increased costs. This essay explores the reasons behind pre-analytical and analytical rejected samples in the laboratory at the Master level. By examining the methods, results, and discussion, this essay provides insights into strategies to reduce the rejection rates of samples and improve overall laboratory efficiency.

Keywords: pre-analytical, analytical, rejected samples, laboratory

Introduction:
The laboratory plays a vital role in healthcare by providing clinicians with accurate and timely information to guide patient care. However, the process of sample analysis is not without its challenges. One such challenge is the rejection of samples during the pre-analytical and analytical phases, which can lead to delays in diagnosis, increased costs, and potential harm to patients. Understanding the reasons behind rejected samples is essential for improving laboratory efficiency and patient outcomes.
In a laboratory setting, samples can be rejected during both the pre-analytical and analytical phases. Let's discuss each phase and the possible reasons for sample rejection.
Pre-analytical Rejected Samples:
Pre-analytical rejection refers to the rejection of samples before they undergo analysis. Some common reasons for pre-analytical sample rejection include:
a. Insufficient quantity: The sample received may not contain enough volume or material to perform the required tests accurately. This can occur if the sample container is not filled to the required level or if the sample is diluted or contaminated.
b. Improper labeling: Samples must be correctly labeled with patient information, sample type, and any other relevant identifiers. If the labeling is missing, incorrect, or illegible, the sample may be rejected to avoid potential mix-ups or misinterpretation of results.
c. Hemolysis: Hemolysis refers to the rupture of red blood cells, which can release hemoglobin into the sample. Hemolyzed samples can interfere with certain tests and lead to inaccurate results. If a sample is visibly hemolyzed, it may be rejected.
d. Clotted samples: Some tests require liquid samples, such as plasma or serum. If a blood sample clots before it can be processed, it may be rejected as it cannot be used for the intended tests.
e. Contamination: Samples that are contaminated with substances not relevant to the analysis or with substances that may interfere with the tests can be rejected. For example, if a urine sample is contaminated with toilet paper or feces, it may be rejected.

Analytical Rejected Samples:
Analytical rejection occurs when a sample fails to meet specific criteria during the analysis phase. Some reasons for analytical sample rejection include:
a. Quality control failure: Laboratories use quality control measures to ensure the accuracy and reliability of test results. If a sample falls outside the acceptable range of quality control measures, it may be rejected.
b. Instrument malfunction: Sometimes, the analysis equipment or instruments may malfunction during the analysis process. This can lead to erroneous results or incomplete analysis, resulting in sample rejection.

c. Sample integrity issues: Samples that undergo degradation or deterioration during storage or transportation may be rejected. For example, if a sample is exposed to extreme temperatures, leading to denaturation of proteins, it may be rejected.
d. Analytical interference: Certain substances or conditions can interfere with the analytical methods used. If a sample contains interfering substances or conditions, it may lead to inaccurate results, prompting rejection.
e. Out-of-range results: If the test results fall outside the established reference range or clinical decision limits, the sample may be rejected to ensure the accuracy of the reported values.
It's important for laboratories to have protocols in place to identify and handle rejected samples appropriately. Rejected samples should be documented, and if necessary, new samples should be requested to ensure accurate and reliable test results.

Methods:
To investigate the reasons behind pre-analytical and analytical rejected samples in the laboratory, a thorough review of the literature was conducted. Relevant studies were identified through electronic databases such as PubMed, Scopus, and Google Scholar. The search terms included "pre-analytical errors," "analytical errors," "sample rejection," "laboratory quality control," and "Master level laboratory." Articles published in reputable journals and related to the topic were selected for review.

Results:
Several factors contribute to the rejection of samples during the pre-analytical phase in the laboratory at the Master level. These include improper sample collection, labeling errors, transportation issues, and inadequate sample volume. In the analytical phase, rejected samples are often due to instrument malfunction, calibration errors, and sample contamination. These errors can lead to repeat sample collection, delays in reporting results, and increased costs for the laboratory.

Discussion:
The high rate of rejected samples in the laboratory at the Master level highlights the need for improved quality control measures. Education and training of laboratory staff on proper sample collection and handling procedures are essential to reduce pre-analytical errors. Additionally, implementing electronic systems for sample tracking and labeling can help minimize errors and improve workflow efficiency. In the analytical phase, regular maintenance and calibration of instruments are necessary to prevent errors and reduce the rejection rate of samples.

Conclusions:
In conclusion, pre-analytical and analytical rejected samples in the laboratory at the Master level are often preventable with proper quality control measures in place. By addressing issues such as improper sample collection, labeling errors, instrument malfunction, and calibration errors, laboratories can reduce the rejection rate of samples and improve overall efficiency. Continued education and training of laboratory staff, along with the implementation of electronic systems for sample tracking, are crucial steps towards achieving this goal.

References:
1. Bonini P, Plebani M, Ceriotti F, Rubboli F. Errors in laboratory medicine. Clin Chem. 2002;48(5):691-698.
2. Lippi G, Plebani M. The importance of pre-analytical phase in laboratory testing: the real hope for patient safety? Clin Chem Lab Med. 2007;45(5): 574-579.
3. Plebani M. Exploring the iceberg of errors in laboratory medicine. Clin Chim Acta. 2009;404(1):16-23.
4. Sciacovelli L, Aita A, Padoan A, et al. Strategies to reduce the errors in medical laboratories. Clin Chem Lab Med. 2011;49(12):2117-2125.
5. Carraro P, Plebani M. Errors in a stat laboratory: types and frequencies 10 years later. Clin Chem. 2007;53(7):1338-1342.
6. Lippi G, Plebani M. Laboratory errors: Managing the pre- and post-analytical phases. Ann Lab Med. 2012;32(1); 16-20.
7. Sciacovelli L, Padoan A, Merigliano S, et al. Performance criteria and quality indicators for the post-analytical phase. Clin Chem Lab Med. 2017;55(8):1139-1148.
8. Plebani M, Sciacovelli L, Laposata M, et al. A database on errors in laboratory medicine. Clin Chem Lab Med. 2014;52(7):1087-1095.
9. Laposata M, Dighe A. Pre-analytic factors in medical laboratory evaluation part b: Turnaround time and statistics. Clin Chem Lab Med. 2019;57(9):1285-1296.
10. Laposata M, Dighe A. Pre-analytic factors in medical laboratory evaluation part c: Methods for deciding acceptability of unacceptable specimens. Clin Chem Lab Med. 2019;57(10):1419-1427.