Editorial

Avoidance of pre-analytical errors in laboratory testing: a neglected area needing prompt attention

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Medical errors have significant impact on patient outcomes; therefore, reducing them is critical for patient safety. Medical errors can be classified as diagnostic, therapeutic, preventive, or rehabilitative. Even as technology advances, these errors remain a significant issue in medical practice.[1] In laboratory medicine, three types of diagnostic errors can be identified in the processing of laboratory samples: preanalytical, analytical, and postanalytical errors.[2] Before a sample is prepared for analysis, preanalytical activity starts with a clinical request for a laboratory test. Preanalytical errors are the errors that happen prior to the actual analysis of a specimen. All three stages of the entire test procedure must be error-free to qualify for the results to be reported accurately. Pre-analytical errors are a significant source of errors in laboratory testing and thus may compromise patient care. In the analytical and postanalytical phases, automation has greatly decreased errors. However, because the preanalytical stage still relies heavily on human handling, there is still considerable room for improvement. The errors in this stage can range from sample collection to testing preparation, and need to be eliminated because they account for 70% of all errors in the diagnostic process.[3]

Sample mix-ups, inadequate sample amounts, incorrect labelling, and transportation delays are examples of common preanalytical errors.[4] These errors frequently result in sample rejection because of hemolysis, incorrect tubes, and clotted blood.[5] Patient safety and best practices may be jeopardized if these errors are not identified and fixed, which could delay the diagnosis and subsequent course of treatment. Minimizing these errors could be accomplished by training personnel who perform blood sampling on daily basis and adhering to standard laboratory procedures.[6] The venipuncture and collection of sample in appropriate tubes are important steps and have been identified as the most frequent causes of pre-analytical errors.[3-5] Blood samples are susceptible to hemolysis because of using small-bored needles, moving the plunger quickly, and shaking the sample vigorously in the collection tube after using incorrect phlebotomy technique. Selecting the incorrect blood collection tubes may result in the insufficient blood needed for analysis, cause clots due to improper additives or blood-anticoagulant mixing, lead to measurement errors of analytes. Furthermore some of the analytes may be falsely elevated due to phenomenon of hemoconcentration due to prolonged or inappropriate torniquet application. Samples that are rejected due to incorrect labeling lead to misidentification, and delay patients' diagnosis and management while putting additional burden on wastes resources. Sample integrity is compromised by poor storage conditions, delayed transportation, and sample processing, which leads to erroneous lab results. Moreover, laboratory results are influenced by drug-test interactions that may lead to inappropriate results. It is imperative to obtain information regarding the medications being taken by the patient.

Prevention of preanalytical errors needs prompt attention to improve the dependability of laboratory results and requires collaboration of everyone involved, including patients, physicians, nurses, and laboratory personnel. Patients should be informed about proper specimen collection procedures, encouraged to provide an essential medical and drug history, and advised not to give up contact with healthcare providers as needed. The test request slip must be appropriately filled in, providing all essential information related to the patient, his medical history, diagnosis, medications being used, and indication for requesting the test. The biochemical personnel can help to ensure patient safety by providing healthcare providers with accurate information about these errors and by adhering to best practices for phlebotomy and sample collection techniques. It had been reported that the degree of awareness among physicians and nurses employed in a large tertiary care hospital regarding pre-analytical errors and standardized phlebotomy technique was inadequate and constituted a serious concern.[7,8]

It is therefore necessary to arrange comprehensive training for medical professionals regarding the standard phlebotomy procedure for blood collection, storage, and transportation, as well as proper sample

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processing and documentation as essential components of respective curricula. Furthermore, specimen collection protocols must be established and strictly adhered to.

These errors should be identified and discussed frequently in morbidity/mortality meetings as well as Clinico-Pathological Conferences (CPC) being conducted in medical institutes so that occurrence of these errors may be avoided in future. Healthcare facilities must continuously monitor them using technological advancements such as electronic ordering and reporting, automation, and barcode scanning can help to create more efficient processes, reducing errors during the pre-analytical phase. Regular audits aimed at identifying areas that require correction can ensure even greater improvement. Finally, it is crucial to educate undergraduate medical & nursing students, the future healthcare providers, on how to avoid errors during the pre-analytical phase of specimen collection, handling, transportation, and documentation, as well as teaching them standard phlebotomy technique. In this context, such content should be incorporated into the undergraduate curriculum based on needs assessment so that medical & nursing graduates may acquire the necessary knowledge and skills to effectively address challenges due to pre-analytical errors while providing medical and nursing care to the patients in future. The efforts of the Biochemistry Department of Fatima Jinnah Medical University, Lahore, are underway in order to train and educate undergraduate medical students in the preanalytical and analytical phases of laboratory testing.

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