CHAPTER - 14

PRE-ANALYTICS IN A LABORATORY DIAGNOSTICS SETUP: ENHANCING QUALITY AND EFFICIENCY

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INTRODUCTION

The comprehensive diagnostic testing procedure within a laboratory comprises all the stages involved in performing diagnostic tests. Maintaining quality stands as a primary concern for laboratories, prompting the implementation of total quality management across the complete laboratory process, covering the pre-analytical, analytical, and post-analytical phases. Encompassing every facet of sample processing, from test requisition to the final interpretation of results by clinicians, total quality management seeks to minimize or eliminate errors occurring at each stage, thereby elevating the overall quality of laboratory services [1].

The entirety of the testing process, spanning from the initial test requisition to the interpretation of test results, is denoted as the total testing process. Comprising three distinct stages—pre-analytical, analytical, and post-analytical—this

process commences and concludes with the patient. In a newly established laboratory, pre-analytics holds significant importance for ensuring precise and dependable scientific research. Pre-analytics encompasses all the procedures conducted before actual testing, including the collection, transportation, processing, and storage of samples. These processes are critical as they significantly impact the quality of the outcomes. Initial emphasis is placed on the careful and proper collection of samples, with trained individuals adhering to specific protocols to prevent contamination and ensure the accurate representation of the intended samples. Proper containers and preservation techniques are employed to maintain sample integrity during transportation and storage [2].

Safe and meticulous handling is crucial during the transportation of samples from the collection site to the laboratory to prevent any deterioration or alterations. This involves appropriate labelling, packaging, and often necessitates the use of specialized tools like dry ice or temperature-controlled containers to maintain the desired conditions. Upon reaching the laboratory, samples undergo processing to prepare them for testing. This process includes sorting, organizing, and implementing relevant procedures such as centrifugation or filtration to remove specific components, like plasma, from blood. Adherence to instructions and maintaining cleanliness is vital to prevent sample contamination. Proper storage is essential to preserve the integrity of samples over time, requiring suitable conditions such as the right temperature, humidity, and lighting, depending on the sample type. An effective tracking system is also necessary to monitor sample location, usage, and disposal [3].

Furthermore, meticulous record-keeping and effective data management play a crucial role. It is imperative to track and document all information related to sample collection, transportation, processing, and storage, ensuring adherence to protocols and facilitating result evaluation. Additionally, establishing a secure and well-organized system for storing data is of utmost importance.

RESEARCH METHODOLOGY

A mixed-methods approach was employed, combining data from the internal laboratory system with descriptive analysis to comprehensively address the research issue. The primary objective was to conduct a meticulous review and analysis of various facets related to the research topic. To establish a robust understanding of the subject, descriptive analysis was employed. The review of pertinent literature aided in the identification and specification of key variables, considering that quantitative data were extracted from the internal system. The internal laboratory system served as a valuable source of information on experimental techniques, outcomes, and equipment usage. To ensure the accuracy and reliability of the data, measures such as validation checks and coordination with laboratory staff were implemented. Additionally, strict adherence to protocols for data security and privacy was maintained. Statistical methods were then applied to analyse the collected data. Descriptive statistics were utilized to summarize the quantitative data, providing an overview of the key characteristics. Simultaneously, inferential statistics were employed to investigate potential connections between variables.

RESULTS AND DISCUSSION

Out of the total 269 samples received, 84 tests, equivalent to 31% of the tests, were cancelled. The cancellation distribution by specimen type and laboratory department is presented in Table 4.1. The data reveals that the Histopathology department accounted for 44 cancelled tests, while the Molecular department had 40 cancellations. The primary reasons for test cancellations included unlabelled samples, inadequate volume (blood), inadequate content (FFPE), inappropriate samples, and discrepancies in Test Request forms. Participants emphasized the necessity for standardized guidelines and protocols to ensure consistent practices across laboratories. Regulatory bodies and professional organizations were deemed crucial in providing clear guidelines and overseeing compliance to enhance pre-analytics. In lab settings, the implementation of standardized processes for sample collection, transportation, processing, and storage is crucial. This approach is essential for achieving consistency, reducing error rates, and ensuring more reliable results. Standardization plays a pivotal role in addressing identified issues and contributes to an overall enhancement in the quality of laboratory testing.

Furthermore, the study emphasizes the critical need for comprehensive training programs to equip laboratory employees with the necessary skills for effective pre-analytical duties. Inadequate training is identified as a contributing factor to mistakes and inconsistent practices. Therefore, the study underscores the importance of organized training programs and continuous education to ensure that laboratory staff possess the skills and knowledge required for optimal performance in pre-analytical processes. Additionally, the value of robust quality control procedures is highlighted, encompassing regular

equipment maintenance, calibration tests, and strict adherence to quality assurance requirements. Integrating quality control as a fundamental aspect of laboratory procedures is essential. This approach aids in the identification and prevention of errors at various pre-analytical stages, contributing to the overall reliability and accuracy of laboratory results.

CONCLUSION

In summary, the study's discoveries underscore the pivotal need to address deficiencies in the pre-analytical phase of laboratory processes. The identified issues related to sample management and personnel practices underscore potential threats to the precision and dependability of laboratory test results. Standardizing procedures, augmenting training programs, and enhancing communication and collaboration are pivotal measures in overcoming these challenges. The implementation of such measures enables laboratories to substantially enhance the quality and reliability of samples, streamline operational processes, and ultimately guarantee more precise and reliable diagnostic outcomes. The research underscores the ongoing necessity for endeavours to optimize pre-analytical practices, underscoring their potential impact on overall laboratory performance and patient care.

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