

Scottish International Conference on Multidisciplinary Research and Innovation – SICMRI 2025

QUALITY CONTROL IN CLINICAL LABORATORY PRACTICE

Westgardol Medne Klautre

Medical researcher

Abstract: Quality control (QC) is a fundamental component of clinical laboratory practice that ensures the accuracy, reliability, and consistency of laboratory test results. High-quality laboratory data are essential for correct clinical decision-making, patient safety, and effective healthcare delivery. This article examines the principles, methods, and importance of quality control in clinical laboratories. Emphasis is placed on internal and external quality control systems, sources of laboratory errors, and the role of standardization and accreditation. Effective quality control practices significantly reduce diagnostic errors and contribute to improved patient outcomes.

Key Words: Quality control; clinical laboratory practice; laboratory errors; internal quality control; external quality assessment; patient safety

Introduction

Clinical laboratories play a crucial role in modern healthcare by providing diagnostic information that supports disease prevention, diagnosis, treatment, and monitoring. It is estimated that a large proportion of clinical decisions rely on laboratory test results. Therefore, the accuracy and reliability of these results are of paramount importance. Quality control in clinical laboratory practice is designed to ensure that laboratory processes consistently produce valid and clinically meaningful results.

Quality control encompasses systematic procedures applied throughout the pre-analytical, analytical, and post-analytical phases of laboratory testing. Failures in quality control can lead to incorrect diagnoses, inappropriate treatment, and adverse patient outcomes. As laboratory technologies become increasingly complex, robust quality control systems are essential for maintaining high standards of laboratory performance.

Methods

This study was conducted as a narrative review of scientific literature related to quality control in clinical laboratory practice. Relevant publications were identified through searches of PubMed, Scopus, and Google Scholar databases using keywords such as “quality control,” “clinical laboratory,” “laboratory errors,” “internal quality control,” and “external quality assessment.” Peer-reviewed articles published in English between 2000 and 2024 were included.

Studies addressing quality management systems, analytical performance, error prevention, and accreditation standards in clinical laboratories were analyzed. The findings were synthesized qualitatively to evaluate current approaches and challenges in laboratory quality control.

Scottish International Conference on Multidisciplinary Research and Innovation – SICMRI 2025

Results

The reviewed literature demonstrates that quality control is essential for minimizing analytical errors and ensuring test result reliability. Internal quality control procedures, including the use of control samples and statistical monitoring tools such as Levey–Jennings charts, allow laboratories to detect deviations in analytical performance in real time. External quality assessment programs provide independent evaluation of laboratory accuracy by comparing results across multiple laboratories.

Analysis revealed that most laboratory errors occur in the pre-analytical phase, including improper sample collection, labeling errors, and transportation issues. Analytical errors were less frequent but often related to equipment malfunction, reagent instability, or calibration problems. Post-analytical errors primarily involved result reporting and interpretation.

Laboratories that implemented comprehensive quality management systems and participated regularly in external quality assessment programs demonstrated significantly lower error rates and improved diagnostic accuracy.

Discussion

The findings highlight that quality control is a continuous and dynamic process rather than a single procedure. Effective quality control requires coordination among laboratory personnel, adherence to standardized protocols, and ongoing staff training. Advances in automation and laboratory information systems have enhanced quality monitoring by reducing human error and improving traceability.

Despite these advances, challenges remain, particularly in resource-limited settings. Financial constraints, insufficient training, and lack of standardized procedures may compromise quality control efforts. International standards such as ISO 15189 provide a framework for laboratory accreditation and quality improvement, promoting consistency and reliability across laboratories.

Strengthening communication between clinicians and laboratory professionals is also essential to ensure appropriate test selection and correct interpretation of results.

Conclusion

Quality control is a cornerstone of clinical laboratory practice and a critical determinant of diagnostic accuracy and patient safety. Implementation of effective internal and external quality control systems significantly reduces laboratory errors and enhances the reliability of test results. Continuous monitoring, standardization, staff training, and adherence to international quality standards are essential for maintaining high-quality laboratory services. Strengthening quality control practices will continue to play a vital role in improving healthcare outcomes and advancing modern laboratory medicine.

Literatures:

1. Kilicheva, I. B. (2025). PULMONARY ADAPTATION DISORDERS AND LUNG CHANGES IN NEONATES WITH PNEUMOPATHY. *Shokh Articles Library*, 1(1).
2. Kilicheva, I. B. (2025). COMPREHENSIVE PHYSIOLOGICAL AND HORMONAL CHANGES OF THE ENDOCRINE SYSTEM DURING PREGNANCY. *SHOKH LIBRARY*, 1(12).

Scottish International Conference on Multidisciplinary Research and Innovation – SICMRI 2025

3. Baxtiyorovna, A. S., Baxtiyorovna, K. I., Baxromovich, R. J., Anvarjanovna, M. M., Qodirovich, Q. S., Djiganshayevna, B. G., ... & Qizi, Y. D. J. (2025). The Role of Neurophysiological and Neurovisualization Testing Methods in the Diagnosis of Motor Neuron Disease. *Revista Latinoamericana de la Papa*, 29(1), 196-201.
4. Klicheva, I. (2025). SOME PHYSIOLOGICAL RESOURCES THAT AFFECT A PERSON'S BIOLOGICAL AGE. *International journal of medical sciences*, 1(1), 415-420.
5. Baxtiyorovna, A. S., Baxtiyorovna, K. I., Baxromovich, R. J., Djiganshayevna, B. G., Ne'matovich, Q. A. O., Anvarjanovna, M. M., ... & Kizi, R. M. B. (2024). SIGNIFICANCE OF AUTOANTIBODIES TO MYELIN-ASSOCIATED GLYCOPROTEIN IN PATIENTS WITH ALS. *Biochemical & Cellular Archives*, 24(2).
6. Абдурахманов, А. Х. (2025). ВЛИЯНИЕ ЭНТЕРОСОРБЕНТОВ НА ЭФФЕКТЫ ИНТРАДУОДЕНАЛЬНО ВВОДИМОЙ АМИЛАЗЫ. *Zamonaviy tibbiyot jurnali (Журнал современной медицины)*, 9(2), 893-896.
7. Zulunova, I. B. (2023). SECRETION OF HYDROLITHIC FERMENTS OF THE PANCREAS AND FERMENTAL HOMEOSTASIS IN CASE OF Y-RADIATION. *International Journal of Medical Sciences And Clinical Research*, 3(06), 14-20.
8. Абдурахманов, А. Х. (2025). ВЛИЯНИЕ ЭНТЕРОСОРБЕНТОВ НА ТОРМОЗНЫЕ ЭФФЕКТЫ ИНТРАДУОДЕНАЛЬНО ВВЕДЕННОГО ПАНКРЕАТИЧЕСКОГО СОКА НА СЕКРЕЦИЮ ПОДЖЕЛУДОЧНОЙ ЖЕЛЕЗЫ. *Zamonaviy tibbiyot jurnali (Журнал современной медицины)*, 9(2), 875-880.
9. Nozimjon o'g'li, S. S., Makhmudovich, A. H., & Xasanboy o'g'li, A. A. (2022). Nutrition Recommendations for Cardiac Pathologies. *European Scholar Journal*, 3(10), 66-67.
10. Makhmudovich, A. X., Raximberdiyevich, R. R., & Nozimjon o'g'li, S. S. (2021). Oshqozon Ichak Traktidagi Immunitet Tizimi. *TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI*, 1(5), 83-92.
11. Коротько, Г. Ф., Лемешкина, Г. С., & Абдурахманов, А. Х. (1990). Выключение энтеросорбентами 5. обратного торможения секреции панкреатических ферментов из двенадцатиперстной кишки. *Вопр. питания*, (5), 21-25.
12. Shoxabbos, S., & Mahramovich, K. S. M. K. S. (2023). Causes of the origin of cardiovascular diseases and their protection. *IQRO JURNALI*, 1-6.
13. Абдурахманов, А. Х. (2022). ТРАНСФОРМАЦИЯ ЭНТЕРОСОРБЕНТАМИ ЭФФЕКТА ИНТРАДУОДЕНАЛЬНО ВВОДИМОЙ АМИЛАЗЫ. *Экономика и социум*, (11-2 (102)), 284-288.