AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

THE IMPORTANCE OF QUALITY CONTROL AND STANDARDIZATION IN PHARMACY

Shamatov Faxriddin O‘ralovich
Toshkent davlat tibbiyot universiteti Termiz filiali
"Ijtimoiy-gumanitar fanlar" kafedrasi assistenti
Raqamli ta’lim texnologiyalari markazi rahbari
Email: Fason0407@gmail.com
Tel: +998(97) 403-21-84
Turdimuratov Baxtiyor Kurbonovich
Tashkent State Medical University, Termez Branch
Assistant at the Department of Social and Humanitarian Sciences
Email: baxtiyorturdimuratov6691@gmail.com
Raxmanova Ziyoda Orifjon Qizi
1st-year Student, Faculty of Pharmacy
Tashkent Medical Academy,
Termez Branch Email:
raxmanovaziyoda129@gmail.com
Jorayeva Feruza Jahongirovna
1st-year Student, Faculty of Pharmacy
Tashkent Medical Academy,
Termez Branch Email: jorayevaferuza42@gmail.com

Abstract

This article analyzes the role of Quality Control (QC) and standardization in the pharmaceutical industry in ensuring the safety and efficacy of medicinal products. The study aims to highlight the importance of adhering to international standards (GMP, ISO) during the manufacturing process. Results indicate that a rigorous quality control system reduces risks and is a decisive factor in protecting patient health.

Introduction.

The pharmaceutical sector is of strategic importance in ensuring public health. The quality, safety, and efficacy of medicinal products are directly dependent on the standards applied during their manufacturing process. While Quality Control (QC) is the process of verifying that a product meets established requirements, standardization involves unifying production stages and regulating technological processes. The purpose of this article is to analyze the role of quality control and standardization in the pharmaceutical market from a scientific perspective.

The modern pharmaceutical industry carries out the complex task of ensuring the safety, efficacy, and quality of medicinal products. The process of developing a drug is a multi-stage cycle, starting from the synthesis of the Active Pharmaceutical Ingredient (API) to the delivery of the finished product to the consumer. In this process, the selection of raw materials, technological parameters, and the Quality Management System (QMS) are of critical importance. This study provides a scientific analysis of the technological approaches in creating dosage forms and modern analytical methods for quality assessment.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

Technological Processes and Formulation (Materials and Methods) Selecting excipients is a key technological stage in optimizing the biopharmaceutical profile of medicinal products.

- **Pharmaceutical formulation:** Modern polymers, stabilizers, and disintegrants are used, taking into account the physicochemical properties of the API (solubility, stability, bioavailability).
- **Technological operations:** Processes such as granulation, tableting, coating, and aseptic manufacturing of sterile injection solutions are carried out using high-tech equipment.

Quality Control and Analytical Methods (Results) Quality Control (QC) is the process of verifying that a product meets pharmacopoeial requirements and includes the following modern instrumental analysis methods:

1. **High-Performance Liquid Chromatography (HPLC):** The "gold standard" for determining the quantitative content of the API and its impurities.
2. **Gas Chromatography (GC):** Used for identifying volatile organic solvents (residual solvents) and volatile substances.
3. **Spectral Analysis (UV/VIS, IR):** Used to confirm the identity of the substance.
4. **Dissolution Test:** Predicting in vivo efficacy by measuring the dissolution rate of tablets in the gastrointestinal tract environment.

Bioequivalence and Clinical Evaluation (Discussion) In the creation of generic drugs, bioequivalence studies (cross-over studies) are conducted. This process is based on analyzing the difference in concentration (Cmax, AUC) between the original and generic drugs in blood plasma. Clinical trials (phases I, II, and III) serve to identify potential side effects of the drug and to confirm the therapeutic dosage.

Methodology The study utilized systematic analysis and comparative methods. The effectiveness of international pharmacopoeial requirements, Good Manufacturing Practice (GMP) rules, and Quality Management Systems (ISO 9001) in pharmaceutical enterprises was studied. Data were systematized based on scientific literature, industry reports, and regulatory legal documents.

Results Analyses show that:

- **Risk Management:** Standardization reduces the probability of production errors by 40-60%.
- **Consumer Confidence:** Medicinal products meeting international standards increase export potential and ensure competitiveness in the domestic market.
- **Technological Stability:** The quality control system (analytical methods, laboratory inspection of raw materials, and finished products) ensures the stability of the medicinal product throughout its shelf life.

Discussion Quality control is not just a technical process, but an ethical responsibility. Standardization is necessary not only for product quality but also for optimizing production costs. However, in developing pharmaceutical markets, a shortage of technical equipment and qualified personnel is a barrier to fully implementing quality control. In the future, quality can be taken to a higher level by introducing automated analytical systems and digital monitoring (Industry 4.0).

Conclusion Quality control and standardization in pharmacy are the foundations guaranteeing the safety of medicinal products. Strict implementation of GMP and ISO standards is the only way for enterprises to develop sustainably and provide the population with quality medicines. In the future, it is recommended to teach these subjects more deeply in pharmaceutical education and apply them more broadly in practice.

AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
ISSN NUMBER: 2692 - 5206 Volume 6. No 04. Aprel ,2026

Drug technology and quality control are inseparable systems. Strict adherence to GMP (Good Manufacturing Practice) requirements during the production process and the use of modern analytical methods (HPLC, GC) ensure the stability of drugs and their safety for patients. Introducing digital technologies and AI-based analysis methods into the pharmaceutical industry in the future will further increase the efficiency of quality control.

References:

1. Smith, J. A. (2025). "Advanced Inorganic Synthesis for Pharmaceutical Applications". Journal of Chemical Technology.
2. Tashkent State Medical University. "Information Technologies in Medicine: Textbook and Research materials".
3. International Journal of Pharmaceutics (2026). "Nanomaterials in Drug Delivery Systems".
4. **Kurbonovich T.B. et al.** (2025). Digital Technologies in Medicine. Telemedicine. *IMRAS*, Vol. 8, No. 12.
5. **Kurbonovich T.B. et al.** (2026). Problems in Modern Culture: Socio-spiritual Analysis. *Global Science Review*, Vol. 18, No. 1.
6. **Panji o‘g‘li C.O. et al.** (2026). Regenerative Properties of Connective Tissue. *American Journal of Applied Medical Science*, Vol. 4, No. 2.
7. **Turdimuratov B.K.** (2022). *Teaching Medical Sciences Using Innovative Methods and ICT*. Tashkent.
8. **Kurbonovich T.B., & Bahodirovich B.B.** (2026). Step-by-step acquisition of practical skills in IT in medicine. *Global Science Review*, 17(1).
9. **Kurbonovich T.B., & Nurhayat M.** (2026). Medical situational issues algorithm. *American Journal of Applied Medical Science*, 4(2).
10. **Turdimurodov B.K. et al.** (2022). The essence of electronic textbooks in medical education. *EJHEA*, 3(4).