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Prequalification Unit Inspection Services
WHO PUBLIC INSPECTION REPORT
(WHOPIR)
Quality Control Laboratory

Part 1	**General information**
Inspected laboratory details	
Name of Laboratory	**Pakistan Drugs Testing and Research Centre (PDTRC)**
Address of inspected laboratory site	Sundar Raiwind Road, Commercial Area (North) Sundar Industrial Estates, Raiwind, Lahore Pakistan
Inspection details	
Dates of inspection	18, 21-22 October 2024
Type of inspection	Routine inspection
Introduction	
Brief description of testing activities	See table below
General information about the laboratory	The Pakistan Drugs Testing and Research Center (PDTRC) was originally established in 2005 as an initiative of the government of Punjab. The construction of the laboratory was completed in 2012 and it became operational in March 2015. The objectives of the laboratory included independent quality control testing for industry and the provincial government. In August 2023, the administrative control of PDTRC was transferred from the Industries, Commerce, Investment & Skills Development Department ("ICI&SD Department") to the Primary & Secondary Healthcare Department ("P&SH Department") under the provincial quality control and laboratories unit.
History	This was the second WHO Prequalification inspection. The previous WHO inspection was carried out in July 2018.

Type of Analysis	**Finished Products**	**Active pharmaceutical ingredients**
Physical/Chemical analysis	pH, conductivity, refractive index, weight variation, disintegration, dissolution	pH, refractive index
Identification tests	HPLC(UV-Vis), UV-Vis Spectrophotometry	HPLC(UV-Vis), UV-Vis Spectrophotometry
Assay, impurities and related substances	HPLC(UV-Vis), UV-Vis Spectrophotometry, Volumetric Titration	HPLC(UV-Vis), UV-Vis Spectrophotometry, Volumetric Titration

Brief report of inspection activities undertaken – Scope and limitations	
Areas inspected	Inspection of the Pharma Laboratory covered: Organization and management including: - Structure - QMS - Documentation and records - Computerized systems Planning and strategic management including: - Service providers and suppliers - Performance management - Quality Risk management Resources including: - Personnel - Premises - Equipment qualification - Reagents, RS Technical activities including - Handling of samples - Validation, verification and transfer of analytical methods - Testing, evaluation and reporting of results & OOS Safety
Restrictions	N/A
Out of scope	The microbiological laboratory and the bioanalytical extraction laboratory were not included in the scope of this inspection.
Abbreviations	**Meaning**
ALCOA	Attributable, legible, contemporaneous, original and accurate
API	Active pharmaceutical ingredient
CoA	Certificate of analysis
FPP	Finished pharmaceutical product
FTIR	Fourier transform infrared spectrophotometry or spectrophotometer
GMP	Good manufacturing practices
HPLC	High performance liquid chromatography (or high performance liquid chromatography equipment)
KF	Karl Fisher titration
LIMS	Laboratory information management system
MB	Microbiology
MR	Management review
NC	Non conformity
NCA	National control authority
NCL	National control laboratory
NRA	National regulatory agency
OOS	Out-of-specifications test result
PM	Preventive maintenance
PQ	Performance qualification
PQR	Product quality review

PQS	Pharmaceutical quality system
PW	Purified water
QA	Quality assurance
QC	Quality control
QCL	Quality control laboratory
QMS	Quality management system
QRM	Quality risk management
RA	Risk assessment
RCA	Root cause analysis
SOP	Standard operating procedure
URS	User requirements specifications
UV	Ultraviolet-visible spectrophotometry or spectrophotometer
VMP	Validation Master Plan

Part 2	**Summary of the findings and comments**

1. Organization and Management

The role of the Pharma Laboratory in the Primary & Secondary Healthcare Department was to conduct testing in case test results from other laboratories supervised by the above-mentioned department were contested by a manufacturer, or in case of a court order or to support the registration/authorization of a product. The laboratory conducted testing for its customers on payment of a pre-determined fee. The testing rates were defined in a matrix. The laboratory information file listed 6 categories of customers, namely:

1. Provincial Quality Control Board
2. Pharmaceutical Companies (Finished drugs and APIs)
3. Non-Regulatory drug testing services to public or private sector organizations
4. UN agencies, NGO and iNGOs
5. Government, semi-government, autonomous Hospitals and organizations
6. Private Hospitals

The laboratory had defined the organization and management structure. Responsibilities, authority, and interrelationships of personnel were specified in job descriptions and the organization charts. The total number of employees was reduced compared to the previous WHO inspection. Many of the current staff were new and had just recently joined in 2024, including the Director of PDTRC. In general, PDTRC had made arrangements to ensure that its management and personnel were not subject to political conflicts of interest. However, some discrepancies relating to potential commercial conflict of interest were identified.

The laboratory had a policy in place to ensure the confidentiality of information contained in the marketing authorizations and test reports. In addition, an impartiality policy was in place and personnel working at PDTRC had to sign annually a confidentiality/impartiality undertaking and a conflict of interest declaration. Examples of these declarations were checked, e.g. for the QC analyst, signed on 20.09.2023.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

2. Quality management system

The laboratory had established, implemented, and maintained a quality management system based on ISO/IEC 17025:2017. A quality manual defining the principles of quality management was available. The Quality Manual and Laboratory Information File had been recently revised because of the transfer of the laboratory from the Industries, Commerce, Investment & Skills Development Department to the Primary & Secondary Healthcare Department. Activities of the laboratory were systematically and periodically audited internally. Management reviews were performed periodically according to an established procedure, covering audit reports, complaints, proficiency tests, etc.

The Laboratory Information File described the Quality policy and covered aspects according to good practices for pharmaceutical quality control laboratories. The contents included e.g. personnel, control of documentation, equipment management and maintenance, corrective actions, complaints, and internal audits.

Internal Audits

The laboratory had established a system for carrying out internal audits. The relevant SOP provided details on the organization, performance, and evaluation of internal audits. Auditors were qualified and categorized in three grades (A, B, C) depending on their training and experience. Grade A auditors had to be certified by an external certification body as "assessor" or "auditor" of ISO 17025 and they could provide training to Grade B and Grade C auditors. The QA manager was responsible for preparing the audit plan annually. An audit report with observations was compiled. Deficiencies were assigned criticality and CAPA had to be identified and implemented. Internal audits of the Pharma laboratory and the Quality Assurance department were conducted on 9th and 10th September 2024. The previous internal audit was carried out on 27th July 2022. An internal audit of the laboratory was not conducted in 2023 due to the transition period of the laboratory to the provincial Primary & Secondary Healthcare Department.

Change Control

The procedure for change management was presented and discussed. The procedure was applicable to all changes in PDTRC pertaining to laboratory testing and documentation. The aim of the procedure was to evaluate, control, and document changes, as well as to describe the necessary actions for implementation.

Quality risk management

A procedure defining the application of risk management principles was established. A risk management team (RMT) comprised of the PDTRC Director, and one member of the QA department and the laboratory (Pharma lab) was responsible for ensuring the implementation of QRM in the laboratory. The RMT would meet biannually with the QA manager to ensure and discuss that all operations and functions meet the established QRM criteria.

A risk and opportunity management register was in place. This register included all the different risks identified for the laboratory operations. An initial risk assessment was performed, and a risk rating was calculated based on impact/severity and likelihood of occurrence. After mitigation measures were put in place the risk rating was recalculated.

Proficiency Testing

According to the Proficiency Testing Policy, senior management was committed that the laboratory would participate annually in Proficiency Testing Schemes. Additionally, there was a procedure in place providing details on the roles and responsibilities for the selection of Proficiency Testing schemes and the conduct of the tests.

The final PT report for tablets and capsules testing, Round IV, 2023, was presented. The Industrial Analytical Center at H.E.J Research Institute of Chemistry, ICCBS, University of Karachi, Karachi, Pakistan was accredited with ISO17043 and was the provider of this PT testing program. The test material was Aspirin gastro-resistant tablets to be tested for assay, dissolution, disintegration, diameter, friability hardness, thickness, and uniformity of weight. The z-score suggested that the laboratory performed at a satisfactory level.

The preliminary PT report for tablets was also presented. Qarshi Research International was ISO 17043 certified and an approved PT service provider. Tests included disintegration, hardness, friability, melting point, loss on drying, pH, specific gravity, and refractive index.

Management Review

The SOP for management review required the Chief Operating Officer (COO- the Director), to chair the management review meetings, and the participation of a management review committee. The frequency of management review was twice a year as per schedule. The inputs to the management review comprised of 12 areas as a minimum but did not include all the review inputs with respect to the new WHO GPPQCL. A management review report dated 13.9.2024, showed that the meeting was chaired by the COO and attended by eight other senior staff. The agenda included most of the items required in the new guidelines. The management review report of the 16th meeting that took place on 13.09.2024 described the recommendations and decisions for each agenda item. The person(s) assigned to each action and the target date, were indicated in the minutes of the management review meeting.

Customer Complaint Handling

The SOP for customer feedback and complaint handling was comprehensive and included a flow chart for the handling process, and a customer feedback process tree. Customer complaint handling and investigation required root cause analysis and corrective actions to be implemented. Complaints were to be received at PDTRC on a customer complaint form via email or by telephone call. However, no customer complaint had been received from 2022 to the date of this inspection.

A customer satisfaction survey was carried out on 03.10.2024 whereby an email was sent to 13 customers requesting feedback on the services they received from the PDTRC laboratory and informing the customers that this was for service improvement purposes only. The email had an attachment that had closed-ended questions about the satisfaction level in terms of very good, good, fair, poor, and very poor. The survey was still ongoing at the time of this inspection.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

3. Control of documentation

A procedure for document and data control was established. The procedure defined the documentation hierarchy which consisted of four levels and included the Quality Manual, the Quality Policies, and the Quality objectives on the top level (Level 1). The procedure further detailed the codification and structure of quality documents. The creation and change of level 1 and 2 quality documents were managed through the change control system. According to the procedure, documents were reviewed once per year provided a revision was not necessary earlier, and they were assigned a validity of 3 years. The master list of controlled documents was provided.

The SOP for Data Integrity was reviewed and was based on the principles outlined in WHO TRS 996, Annex 5. The SOP included provisions for both onsite and offsite backups, audit trails, and access control. It specified security rights and privileges for laboratory equipment (UV, HPLC, IR), utilizing a four-user system: Administrator (IT officer), Developer (Manager), Operator (Analyst), and Guest (Auditor/Vendor). The controls for time and date on laboratory equipment, password management, data handling in accordance with ALCOA+ principles, as well as data modification and retention, were all clearly defined.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

4. Records

The SOP for Control of records required all technical records related to testing/analysis of raw data, and copies of reports to be retained for a period of one year after the expiry of the product. Access to the document archive room was through a biometric access control system. Test reports were archived by year in separate lockers, labelled “confidential”.

The SOP for Control of Records/Technical Records included among others, the control of external records and documents like pharmacopeia guidelines, etc. The retention period for external documents was permanent.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

5. Data processing equipment

Major laboratory equipment included HPLCs, UV-visible spectrophotometer, analytical balances, and pH meters. The installation qualification and operational qualification for the new HPLC were reviewed. Installation of a new electronic balance with a statistical printer was ongoing at the time of inspection.

The UV-visible spectrophotometer was operating on Windows 7. The software allowed for one user password. Individual passwords could only be created on the Windows software. The date and time setting could not be altered even when the data files were copied and transferred/pasted to another computer program, e.g. on Desktop. The output port on the computer’s central processing unit (CPU) was locked; only the port for the printer output was enabled.

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6. Personnel

Job Descriptions (JD) of key personnel were available. The JD for the Quality Assurance/Quality Manager was authorized by the Director (COO) and acknowledged by the incumbent on 22.08.2024. The QA manager was directly reporting to the director. It provided for required qualification, responsibilities and authorities. The JD required him to perform analysis of quality data on yearly basis. The JD for the Technical Manager was also reviewed and found adequate.

The Training SOP provided for initial, ongoing and annual trainings and assessment. The training records for the deputy QA were verified against the certificates attained. The annual training calendar for 2024-2025, signed on 23.09.2024, indicated 12 training topics. The QA manager had completed a data integrity training and conducted in-house training for laboratory staff on 28th August 2024. The course included an overview of ALCOA principles.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

7. Premises

The laboratory consisted of a reception area, a room to store both incoming and retention samples, an archives room, a dedicated chemical reagents room, the physicochemical laboratory, the wet chemistry laboratory and the HPLC laboratory. In addition, administration offices and other laboratories were housed in the same building. The design of the facilities was appropriate and facilitated movement of personnel and samples. Biometric access control was established for key areas. Temperature and relative humidity were monitored in the sample room.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

8. Equipment, instruments and other devices

In general, laboratory equipment, instruments and devices were appropriately installed to suit testing purposes although some of the equipment was quite old and required to be upgraded or replaced. Laboratory equipment was appropriately labelled including identification and calibration/qualification status. Separate instrument rooms for different measurement techniques were available as required. Adequate safety equipment was appropriately located, and measures were in place to ensure good housekeeping and cleaning routines.
The following documentation was reviewed:

- Logbook for the disintegration apparatus
- Operating procedure for the disintegration apparatus
- Logbook for the pH meter
- Operating procedure for the Ultrasonic Bath

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

9. Contracts

The laboratory presented the SOP for the selection and evaluation of suppliers. The Technical Manager and the QA Officer were responsible for the evaluation of the vendors of chemicals, glassware, equipment, reference standards, spare parts, calibration services, training providers, accreditations and PT samples as required. A questionnaire was used as part of the initial evaluation. Criteria for the evaluation were established and samples were requested, where appropriate. A list of qualified vendors/service providers was available. Performance indicators for the re-evaluation of suppliers were established. A vendor re-evaluation was performed annually.
A procedure for the procurement of materials and services was also established. The process for purchasing laboratory related materials and services was adequately defined and documented.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

10. Reagents

Chemical Reagents

A procedure for the management of laboratory solutions and solid chemicals was in place. It adequately described the receipt, and stock management of the reagents. MSDS were also available either electronically or as hard copies. Chemical reagents were stored in a dedicated room. A cabinet under a working bench was used to store acids, while flammables were stored in the cabinet under the fume hood. An inventory was maintained.

Water

A new water purification system using reverse osmosis and ion exchange resins had been installed and was in use. The RO water was kept in a 75liter plastic reservoir tank. The daily water testing reports, registered in a hard-bound book, were reviewed. The test results for off-line conductivity were specified at NMT 1.0s/cm at 20^{o}C.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

11. Reference substances and reference materials

The SOP for registration, labelling, handling, storage and use of primary reference standards and calibration standards was reviewed. Three storage conditions were specified: 2 to 8^{o}C; 20 to 25^{o}C; and -25 to -10^{o}C. The list of primary reference standards available, included only 5 USP CRS. Temperature of the refrigerator was recorded twice daily.

There were five certified secondary working standards. There were no working standards prepared by the pharma laboratory.

The pH standard buffer solutions for pH 4.0, pH 7.0 and pH 10.0 that were metrologically traceable to SRM from NIST and PTB were used for the calibration of pH meters. Their respective CoAs from the suppliers were available.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

12. Calibration, verification of performance and qualification of equipment, instruments and other devices

A VMP was available. It aimed to define the process for verifying that any significant changes to premises, equipment, or processes will not affect the validity of the test results. The procedure referred to equipment qualification, computer system validation, reagent standardization, analytical method validation/verification and method transfer.

The following documentation was reviewed:

- Calibration of the Disintegration Apparatus
- Calibration certificate of the standard Tachometer
- Calibration of the UV/ Vis Spectrophotometer
- Calibration of the Dissolution apparatus
- Performance qualification protocol for the Dissolution apparatus
- USP Prednisone tablets RS, certificate.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

13. Traceability

Each sample was allocated a unique identification code upon receipt, that was used throughout the testing process and traceable on all records generated. Chemical reference substances e.g. USP RS, pH standard buffer solutions, etc., had certificates of analysis that provided metrological traceability to international standards.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

14. Incoming samples

A procedure for the receipt and tracking of samples was presented. A test/analysis request form had to be completed, reviewed by the Pharma Lab responsible and the QA department and approved by the COO. After evaluating the capacity of the laboratory to perform the requested test, a meeting would be held with the customer to discuss the details including but not limited to, the method transfer, the reference standards, the required number of samples, and the testing fees.

The laboratory maintained a registry for receiving and distributing samples for analysis. Only 84 pharmaceutical samples had been received since the beginning of 2024, of which 8 were for proficiency testing. Testing had been completed for 58 products. None of the products analysed were WHO prequalified. In 2023 due to the transfer of PDTRC to the Primary & Secondary Healthcare Department, only 34 samples were tested.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

15. Analytical worksheet

Analytical worksheets were stamped and issued by QA, and issuance details were recorded in a logbook. The analytical worksheet for Iohexol USP injection 350mg/ml was reviewed. Page numbering had been done after the entire analytical worksheet (7 pages) and attachments had been compiled. The attachments comprised 30 pages, and included chromatograms, copy of the specific monograph that had been used, CoA, and the sample receiving checklist and tracking form.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

16. Validation of analytical procedures

According to the VMP, the laboratory could adopt the manufacturer's validated analytical method provided it was included in the dossier as part of the regulatory submission. The method validation/verification requirements could be waived if the customer provided the validation study. However, the laboratory would have to ensure that the method met the precision requirements.
Procedures for analytical method validation and analytical method verification were in place.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

17. Testing

Nonconforming testing

The SOP for Control of Nonconforming Testing and/or Calibration Work outlined the requirements for reports and records of corrective actions, action logs, OOS investigations, notifications for work stoppages, customer notifications, and resumption of work. Nonconforming testing work was recorded on the Nonconformity Report Form. An example reviewed was related to the correlation factor that was not labelled and used on measurement equipment, e.g. analytical balances.

Out-of-specifications results investigation

The SOP for Handling Out of Specifications Test Results was reviewed. The OOS results log indicated that three and five OOS results were registered in 2023 and 2022, respectively.
All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

18. Evaluation of test results

Test results were reported on the Test Report by the QC officer (analyst) and reviewed for completeness and consistence with the test procedure by the manager of the Pharma Lab (technical manager) and verified by the QA manager.
All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

19. Certificate of analysis

The test/analysis report for identification, disintegration, dissolution, and assay of Thalidomide USP capsules, dated 5.09.2024, was signed by the QC officer (analyst), the manager of Pharma lab (technical manager), and verified by the QA officer. It was also signed and stamped by the Director (COO).

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

20. Retained samples

An air-conditioned room was used for the storage of samples. The room had 3 metallic storage racks. Retained samples were stored on one rack while samples to be tested were stored on another. At the time of the inspection, the room temperature was 20.2ºC, and the relative humidity 52%. Temperature and relative humidity were recorded manually, twice a day. Each sample was given a unique sample code printed on a sticker label that was fixed on each outer container or group of blister packs. Sample reconciliation was managed on the sample intimation request & issuance form in terms of quantity issued, used, and returned (if any). Left-over samples after testing, were added to the retention samples.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

21. Safety

A procedure for handling accidental spillage and disposal of chemical waste was in place. The SOP provided definitions for minor, moderate and large spills, and instructions on handling such events. A spill kit was available at the laboratory. In addition, the procedure provided instructions on the storage of chemical waste (liquid, organic liquid, inorganic liquid, chromic liquid, halogenated liquid, solid and poisonous) and disposal through a third-party contractor.

All the non-compliances observed during the inspection were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR.

Part 3	**Conclusion – Inspection outcome**

Based on the areas inspected, the people met and the documents reviewed, and considering the findings of the inspection, including the observations listed in the Inspection Report, ***Pakistan Drugs Testing and Research Centre***, located at ***Sundar Raiwind Road, Commercial Area (North), Sundar Industrial Estates, Raiwind, Lahore, Pakistan*** was considered to be operating at an acceptable level of compliance with WHO GPPQCL Guidelines.

All the non-compliances observed during the inspection that were listed in the full report as well as those reflected in the WHOPIR, were addressed by the laboratory, to a satisfactory level, prior to the publication of the WHOPIR

This WHOPIR will remain valid for 3 years, provided that the outcome of any inspection conducted during this period is positive.

Part 4	**List of WHO Guidelines referenced in the inspection report**

1. WHO Good Practices for Pharmaceutical Quality Control Laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-seventh Report, Geneva, World Health Organization, 2024 (WHO Technical Report Series, No. 1052), Annex 4.
   Short name: WHO GPPQCL Guidelines, TRS No. 1052, Annex 4

2. WHO good practices for pharmaceutical microbiology laboratories. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 2.
   Short name: WHO TRS No. 961, Annex 2

3. WHO Good Manufacturing Practices: water for pharmaceutical use. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report. Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 3.
   Short name: WHO TRS No. 1033, Annex 3

4. WHO guidelines for sampling of pharmaceutical products and related materials. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Thirty-ninth Report. Geneva, World Health Organization, 2005 (WHO Technical Report Series, No. 929), Annex 4.
   Short name: WHO TRS No. 929, Annex 4

5. Guideline on data integrity. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fifth Report Geneva, World Health Organization, 2021 (WHO Technical Report Series, No. 1033), Annex 4.
   Short name: WHO TRS No. 1033, Annex 4

6. WHO good manufacturing practices for pharmaceutical products: main principles. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-eighth Report Geneva, World Health Organization, 2014 (WHO Technical Report Series, No. 986), Annex 2.
   Short name: WHO GMP guidelines or ***TRS No. 986, Annex 2***

7. WHO good manufacturing practices for active pharmaceutical ingredients. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 2.
   Short name: WHO TRS No. 957, Annex 2

8. WHO Good Practices for Pharmaceutical Products Containing Hazardous Substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fourth Report. Geneva, World Health Organization, 2010 (WHO Technical Report Series, No. 957), Annex 3.
   Short name: WHO TRS No. 957, Annex 3

9. WHO good manufacturing practices for sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 6.
   Short name: WHO TRS No. 961, Annex 6

10. WHO guidelines on transfer of technology in pharmaceutical manufacturing WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 7.
    Short name: WHO TRS No. 961, Annex 7

11. Model guidance for the storage and transport of time-and temperature-sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations.

Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 9.
Short name: WHO TRS No. 961, Annex 9

12. General guidelines for the establishment maintenance and distribution of chemical reference substances. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-first Report Geneva, World Health Organization 2007 (WHO Technical Report Series, No.943) Annex 3.
Short name: WHO TRS No. 943, Annex 3

13. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-second Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 8.
Short name: WHO TRS No. 1010, Annex 8

14. Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. Part 2: Interpretation of Guidelines on heating, ventilation and air-conditioning systems for non-sterile pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-third Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1019), Annex 2. **Short name: WHO TRS No. 1019, Annex 2**

15. WHO guidelines on quality risk management. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 2.
Short name: WHO TRS No. 981, Annex 2

16. WHO guidelines on variation to a prequalified product. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-seventh Report Geneva, World Health Organization, 2013 (WHO Technical Report Series, No. 981), Annex 3.
Short name: WHO TRS No. 981, Annex 3

17. WHO guidelines for preparing a laboratory information file. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-fifth Report Geneva, World Health Organization, 2011 (WHO Technical Report Series, No. 961), Annex 13.
Short name: WHO TRS No. 961, Annex 13

18. Good Manufacturing Practices: Guidelines on validation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-third Report Geneva, World Health Organization, 2019 (WHO Technical Report Series, No. 1019), Annex 3. ***Short name: WHO TRS No. 1019, Annex 3***

19. WHO General guidance on hold-time studies WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 4. ***Short name: WHO TRS No. 992, Annex 4***

20. WHO Technical supplements to Model Guidance for storage and transport of time – and temperature – sensitive pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Forty-ninth Report Geneva, World Health Organization, 2015 (WHO Technical Report Series, No. 992), Annex 5. ***Short name: WHO TRS No. 992, Annex 5***

21. Production of water for injection by means other than distillation. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-fourth Report. Geneva, World Health Organization, 2020 (WHO Technical Report Series, No. 1025), Annex 3. ***Short name: WHO TRS No. 1025, Annex 3***

22. Stability testing of active pharmaceutical ingredients and finished pharmaceutical products. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fifty-second Report Geneva, World Health Organization, 2018 (WHO Technical Report Series, No. 1010), Annex 10. ***Short name: WHO TRS No. 1010, Annex 10***

23. Guidance for organizations performing in vivo bioequivalence studies. WHO Expert Committee on Specifications for Pharmaceutical Preparations. Fiftieth Report Geneva, World Health Organization, 2016 (WHO Technical Report Series, No. 996), Annex 9.
Short name: WHO BE guidance or ***TRS996 Annex 9***

24. Guidance for Good chromatography practices. WHO Expert Committee on Specifications for Pharmaceutical Preparations Fifty-fourth report, (WHO Technical Report Series, No. 1025, 2020), Annex 4.
Short name: WHO TRS No. 1025, Annex 4

25. Good Manufacturing Practices, Annex 3; Guidelines on validation Appendix 5. Validation of computerized systems (adopted, subject to the changes discussed by the Expert Committee - WHO Technical Report Series, No. 1019, 2019)
Short name: WHO TRS No. 1019, Appendix 5