Version – 1.0

Guidance for CEPI Partners and Awardees: Technology Transfer Vaccine Manufacturing and Analytical Methods

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1. Introduction and Overview of Tech Transfer Process

This guidance document on technology transfer applies to the vaccine CMC processes and analytical methods. It shall act as a guiding principle for CEPI – manufacturing and supply chain networks team (M&SC). It shall enable CEPI M&SC team to support and facilitate the tech transfer at CEPI awardees and manufacturing partners thereof. Broadly, the scope of Tech transfer encompasses – early stage to late-stage development, scale up to phase III and commercial batches, inter-site transfer between innovator/developer to CDMO or manufacturing site and analytical techniques. Manufacturing activities shall cater to the needs as investigational product for phase I, II & III clinical trial, stockpile lots, commercial requirements, process validation etc. Transfer of the pharmaceutical manufacturing processes occurs at various stages of the product's life cycle, such as transition to late-stage development, scale up, manufacturing (strategic business decisions), product launch in the new markets, post approval changes etc. This guidance document is prepared keeping in mind CEPI's ways of working and projectized structure with awardees.
Typically, tech transfer activity and organization involve Sending Unit (SU), Receiving Unit (RU) and a dedicated tech transfer team at SU and RU. Tech transfer of a product in late stage / commercial phase requires a systematic and planned approach following principles of current Good Manufacturing Practices (cGMP), Good Documentation Practices (GDP), Quality Management System (QMS) of sending and receiving unit. QMS Tools such as – change control management, incidence management (deviation and corrective and preventive actions (CAPA)), Quality Risk Management (QRM), Standard Operating Procedures (SOPs) and documents management system. QMS and GMP at sending and receiving site should be in accordance with National Regulatory Authority (NRA) requirements.
Tech transfer can be considered as successful if the outcome meets the pre-defined acceptance criteria as documented in the tech transfer protocol and Validation Master Plan (VMP); and the RU can consistently manufacture the vaccine, meeting the Critical Quality Attributes (CQA) and successful outcome post health authorities' inspection. Results from the tech transfer and process data is captured in the tech transfer report and it should include summary of the deviations, CAPA which was agreed to address the same.

1.1. Vision and Mission Statement

Vision: To facilitate and provide CMC technical support for the tech transfer of vaccines manufacturing and analytical methods from CEPI awardees to manufacturing partners thereof. Thereby ensuring knowledge transfer between development and manufacturing team OR between 2 manufacturing sites as per cGMP and QMS. Knowledge transfer includes development history, process knowhow, control strategies, process validation methods and strategies for the continuous improvement.

Mission: To work in partnership internally within CEPI, project and disease program team, CMC lead, Regulatory, manufacturing, and supply chain networks (M&SCN) function and externally with awardees to support and create a resilient Drug Substance (DS) and Drug Product (DP) manufacturing network to quickly respond to outbreak situation.

1.2. Scope

This Guideline applies to technology transfer projects undertaken as part of CEPI sponsored vaccine development projects, including awardees facilities or subcontracted to Contract Development and Manufacturing Organizations (CDMOs). "Technology", as referred to in this guideline, only applies to manufacturing processes and analytical test methods. Manufacturing processes that may be affected are:

- DS and intermediates thereof, in-process control testing
- DP – Formulation, Filling and Packaging (FFP) and intermediates thereof, in-process control testing
- Specialty prepared standards, critical reagents, raw materials, and components
- Cell banks / seed stocks
- Analytical methods – release/stability testing, in-process control

- Product dependent studies – cleaning validation, media simulation, viral clearance, Shipping, and cold chain validation, scale down model characterization / qualification, frequency of resin reuse, extractables and leachables assessment etc.
- Technology transfer project scope may include end-to-end starting from DS to FFP operations and analytical methods or it can be specific to process area.

Various scenarios for technology transfer and cases where this guideline applies are included but not limited to below in Table 1,

Table 1: Technology Transfer scenarios

Sending unit	Receiving unit
Awardee vaccine development	Awardee GMP manufacturing site
Awardee vaccine development	Third-party GMP manufacturing site (CMO)
A third-party development site (CDMO)	Awardee GMP manufacturing site
Awardee vaccine development (small scale)	Awardee scale up / large scale development (large scale)

1.2.1. Out of scope

Following activities are not within scope of this document and are not discussed in detail here. These activities should be managed by manufacturing sites as per the local guidance document or as per regulatory guidance, sending and receiving site quality procedures.

- Process and analytical development
- Facility readiness and commissioning – User Requirement Brief (URB), User Requirement Specification (URS), Installation Qualification (IQ) & Operational Qualification (OQ), Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)
- Continuous Process Verification (CPV)
- Product discontinuation, commercial life cycle management changes*
- Process Validation (PV) – although PV is an integral part of technology transfer process, the requirements, criteria for no. of batches, re-validation, specification, and acceptance criteria for the same are not discussed in detail here.

** CEPI only fund until receipt of licensure, any post approval changes are out of scope, including but not limited to.*

Relation of technology transfer with general product life cycle is depicted in below schematic in Figure 1, ICH Q10 Pharmaceutical quality system (PQS)[1] illustrates overall lifecycle of the pharmaceutical product.

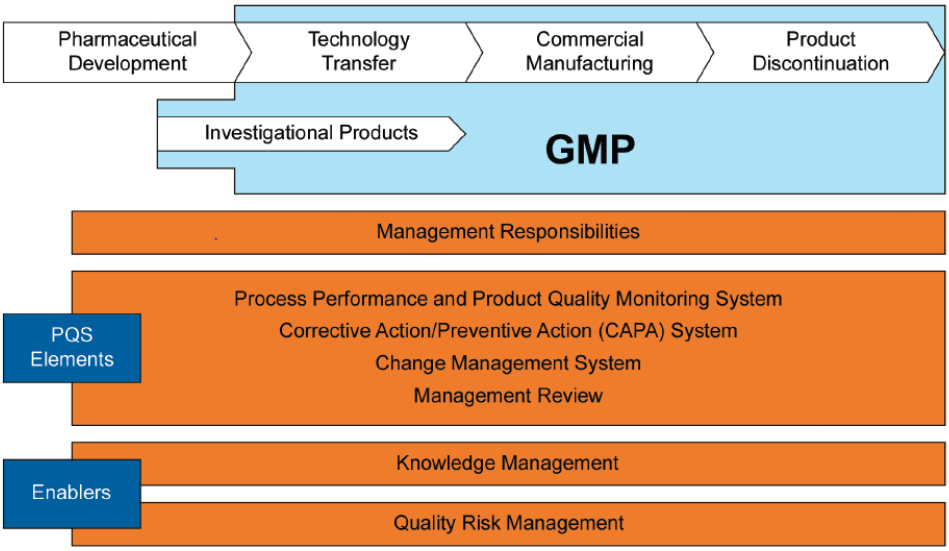

Figure 1: ICH Q10 Pharmaceutical Quality System (PQS)[1] and pharmaceutical product life cycle

2. Project team organization and Governance

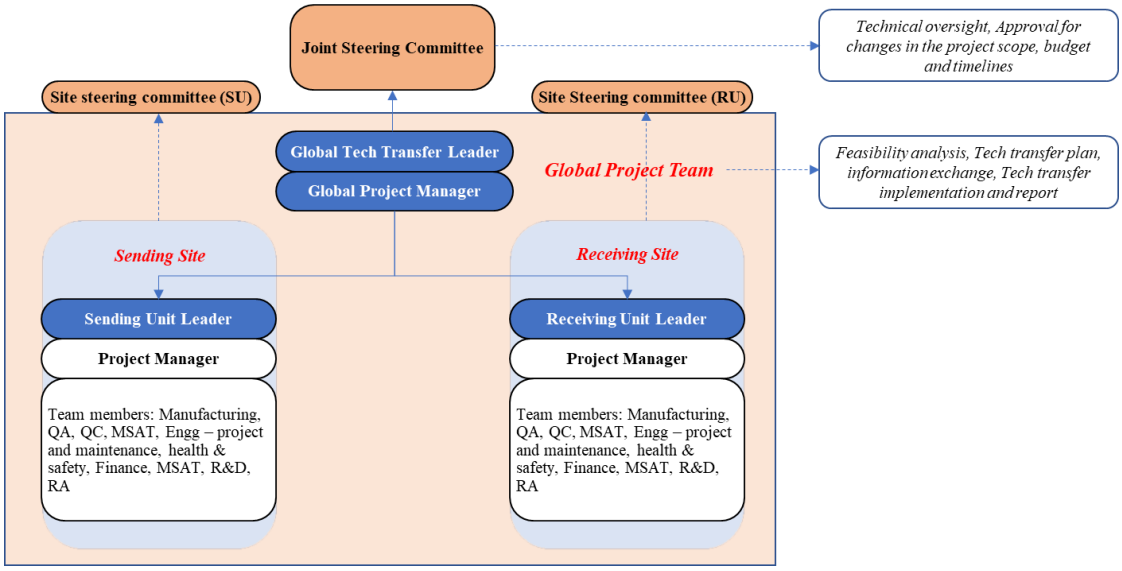

Figure 2: Tech transfer governance and team organization

Tech transfer project requires a multidisciplinary project team at both, SU and RU. The team typically shall have representatives from following functions, and one member each from SU and RU -

- Manufacturing – DS
- Manufacturing – DP / FFP
- Quality control
- Manufacturing Science and Technology (MSAT)
- Quality Assurance (QA)
- Engineering - Maintenance
- Engineering – Projects
- Project management
- Finance – controlling
- Environment, Health and Safety (EHS)
- Research and development
- Regulatory Affairs (RA)

Project teams shall be led by SU and RU leader and supported by the project manager. Global tech transfer is a transversal role and leads tech transfer team. Global tech transfer leader is a single point contact for joint steering committee (JSC).

The JSC shall consist of the appropriate levels of management from SU and RU, CEPI (Project Lead, CMC Lead, commercial manufacturing lead and Reg-CMC lead), corporate quality, financial controller. Representation can vary, based upon technology being transferred, and is not limited to the above indicated functions e.g., external consultant. Figure 2 above shows the governance structure for the Technology Transfer projects.

The responsibilities of each team member and groups relating to this charter are detailed in the Table 2 below. However, based upon the scope and complexity of the transfer scenario, certain responsibilities may be transferred to other groups or individuals at the recommendation of the TT team

Table 2: Roles and responsibilities of tech transfer team members

Role	Responsibility
Joint Steering Committee (JSC)	• Appoint the Global Tech Transfer Leader and members of the tech transfer team • Define general scope, high level project budget, key deliverables, KPIs and metrics • Approves the TT Plan and associated schedule(s), change in scope, timeline, and project budget (> 10%) • Approve final TT report • Resolve issues that cannot be resolved at the TT Team level • Ensure adherence to Policies, supporting Conformance Standards, and CEPI Directives
Global Tech Transfer Leader	• Global Tech Transfer Leader (either from SU or RU) leads the project together with support from Global Project Manager • Manages the tech transfer team, directly or indirectly through SU & RU leaders • Interface between tech transfer team and JSC • Together with JSC, defines project deliverables, scope & budget • Accountable for general management of the project execution, take part of in troubleshooting, resolving conflict • Team building, selection of the team members • Supports preparation of project summary updates, presentation slides for JSC, together with project manager
Site Steering Committee (SU and RU)	• Comprised of appropriate senior management • Assign site resources and establish project priorities in support of transfer process. Ensure adherence to Policies, supporting Conformance Standards, and CEPI Directives, wherever appropriate • Approve subordinate Project Plans, as applicable, and site TT Plan • Approve site TT Report
SU / RU Team Leader	• Prepare and update the TT Team Charter and Accountability Table • Serve as the primary liaison to Site Steering Committee and/or JSC through periodic presentation, report summaries, publishing of meeting minutes for distribution, or other selected media formats. Identifies potential issues and highlights potential resolutions for approval by the TTOC • Ensure TT Plan and performance milestones are approved and agreed by the JSC. Directs completion, review, and approval of detailed project plan(s), and TT Report • Monitor TT Plan to evaluate timelines, status of plan deliverables, milestones, etc. Supervises updating and changes in the scope as needed. Ensure effective execution of the TT Plan • Highlights issues as they arise and serve as a facilitator for resolution • Leads and facilitates TT Team meetings
Technology Transfer Team	• Develop TT Team Charter detailing transfer scope, objectives, and team membership • Prepare Site TT Project Plan, SU to lead the preparation of risk assessment • Use project management tools to itemize specific activities, assign accountability, and define transfer deliverables and documentation verification requirements • In partnership with TT Leader, identify potential obstacles and potential solutions for resolution and approval by the JSC • Ensure preparation and completion of the TT Report and recommends approval to the JSC / Site Committee
Technology Transfer Team	• Assume a primary responsibility for the following activities in the execution of the TT Plan:

Role	Responsibility
Member: RU (Manufacturing)	○ Preparation of commercial scale production documentation ○ Prepare critical equipment qualification list ○ Prepare reference batch and commercial batch process characterization / qualification schedule ○ Ensure equipment and facilities are qualified and active programs are in place for calibration, preventive maintenance, and environmental monitoring ○ Execute manufacturing activities – dry runs, engineering runs, process validation etc. • Secondary responsibilities include document review and approval (such as Process Validation Master Plan, validation protocol, validation reports, etc.) and support of TT Team activities (such as safety and environmental reviews)
Technology Transfer Team Member: Transferring Site (Manufacturing)	• A generalized list of information that may be provided (not inclusive) ○ Process documentation ○ Raw material (active/inactive/excipient) documentation ○ Equipment documentation ○ Environment and safety documentation ○ Storage and shipping documentation • Working in collaboration with TT Team members, a technology transfer package consisting of the following types of documents may be complied: ○ Regulatory submissions ○ Technical reports ○ Licenses ○ Annual product reviews ○ Relevant manufacturing histories ○ Detailed product specifications ○ Relevant investigation reports
Technology Transfer Team Member: MSAT	• Oversee scale up and knowledge transfer between R&D and manufacturing • Training of the manufacturing process team members • Transfer of process knowhow • Identify scale dependent and independent parameters. • Define process and parameters for scale up process • Decide scale and equipment train for manufacturing process • Support in equipment PQ, routine manufacturing for initial manufacturing campaign, troubleshooting
Technology Transfer Team Member: Technical Services / Engineering	• Oversee execution of demonstration batches • Prepare and oversee execution of validation master plan(s) • Prepare & oversee execution of validation and qualification protocols • Assist in preparation of regulatory filings • Assist in providing technical support and problem solving • Training
Technology Transfer Team Member: Quality Assurance Compliance	• Ensure compliance with site QMS structure and inter-site QMS interface for deviations and incidents management, CAPA, change control management, investigations, and root cause analysis for any investigation • Ensure compliance of new process with established procedures and government regulations as per cGMP standards • Secure Quality and Technical Agreements • Quality audits of vendors and raw material suppliers based on criticality / risk assessment • To ensure training matrix plan is in place for all team members

Role	Responsibility
Technology Transfer Team Member: Quality Control	• Prepare analytical strategy – analytical validation mater plan, method development, qualification, tech transfer and validation of analytical methods • Coordinate analytical method validation and/or transfer • Reference standards management • Coordinate testing for project related studies e.g., in process, release testing and stability studies • Coordinate preparation of testing documentation – SOPs, samples management, stability protocol and report, specifications, and acceptance criteria
Technology Transfer Team Member: Regulatory Affairs	• Regulatory affairs strategy – product development path, target country for 1st licensure • Coordinate preparation of regulatory submissions • Coordinate written communications and meetings with regulatory agencies
Technology Transfer Team Member: Site Supply Chain	• Coordinate incorporation of new process into plant materials management systems • Coordinate procurement of raw materials • Secure Confidentiality Agreements with Co-manufacturing and third parties • Provide planning for product launch quantities and act as liaison with corporate materials management to ensure product distribution channels
CMC Lead – CEPI	• Support for transition of the activities from development project to tech transfer project • To have technical oversight on the progress of the project activities, through participation in technical review meetings, JSC review meeting and stage gate go / no-go decision making
Commercial manufacturing lead - CEPI	• Support for transition of the activities from development project to tech transfer • Support in developing tech transfer strategy, matchmaking • Support tech transfer leveraging CEPI manufacturing network, relevant database of vendors and service providers • To have technical oversight on the progress of the project activities, through participation in technical review meetings, JSC review meeting and stage gate go / no-go decision making
Quality lead - CEPI	• Support for transition of the activities from development project to tech transfer • Support in developing tech transfer strategy • To have compliance and cGMP oversight through participation in technical review meetings, JSC review meeting and stage gate go / no-go decision making

3. Managing Technology Transfer

A technology transfer should be treated as a project. It is recommended to apply principles of project management such as standard guidelines available e.g. PMBOK by PMI, Agile management etc. As per PMBOK methodology, project is divided into following phases –

a. Initiation
b. Planning
c. Execution
d. Monitoring and control
e. Closing

Application of above principles shall be seen in section no. 4 later in this document.

In addition to the governance structure mentioned in section no. 2, tech transfer leader or SU/RU tech leader can decide to establish the sub-teams. Following sub-teams can be established depending on the scope of the project -

a. Drug substance – cell banking, Upstream, downstream
b. Drug product - formulation, fill and finish
c. Analytical methods – QC methods for in process, release testing, raw materials and stability studies

It is recommended to use tools such as RACI matrix. Tech transfer leader should assess need for additional training based on knowledge gaps and team capabilities and the training plan is in place. SU leader and RU leader together with tech transfer leader shall ensure communication channels are established and maintained between SU and RU team members, addressing any gaps. It is important that high level project plan is established with critical path identified and work packages are clearly communicated to all the team members. Execution plan is created and centrally managed by global project manager, tracking is done based on the project management tools such as project meetings, scrum, ERP tool such as MS project etc. People to people interaction at sub-team level shall be encouraged for effective communication and to facilitate proper knowledge transfer. There should be clearly agreed acceptance criteria for successful tech transfer e.g., for transfer of analytical methods it can be defined in the analytical method transfer protocol with quantifiable acceptance criteria for various parameters including others – linearity, range, precision, accuracy, limit of detection (LOD) & limit of quantification (LOQ).

Project manager shall manage prioritization of work packages and maintain flexibility of the work plan to have minimum to no impact on the timeline of the project key milestones. Depending on the criticality of the activity, additional resources could be requested to the local site management. Any changes in the project scope, budget and resources shall be presented and approved through project governance structure as mentioned above in section II – organization. Execution of the activities shall be managed complying with QMS structure (if available) at SU and RU, and regulatory guidance.

Outcome of the execution should be documented through reports, including others, few examples of the documents are mentioned below:

- Tech transfer master plan – scope, project charter, budget, GANTT chart, risk register, project team and meetings organization, sub-team definitions. In addition to execution plan of the DS, DP and analytical methods, it shall include regulatory strategy, change control management, commissioning and validation of associated technology
- Tech transfer scope definition and budget
- Process validation master plan
- Analytical methods transfer and validation plan
- Tech transfer report
- Risk assessments following QRM principles based on ICH Q9 guideline

Tech transfer leader and project manager should ensure that, to maintain traceability, all execution records and reports are summarized in a separate document such as validation master plan report. E.g., each analytical methods transfer shall have independent tech transfer report. Summary of all analytical methods validation report will be summarized in analytical validation master plan report.

At the end of tech transfer, it is responsibility of the tech transfer sub-teams, project manager to ensure closure of all work packages through summary documents, post execution or post mitigation plan risk assessment with revised risk ranking i.e., whether risk is mitigated or has been reduced to lower probability or severity. It should be clearly stated in the summary reports about the conclusion of the tech transfer and whether acceptance criteria defined in the protocol is met. Tech transfer team shall elaborate and recommend next steps including continuous improvement plan with proper handover to the manufacturing team to ensure smooth transition for routine commercial manufacturing. Few members from tech transfer team could be required to be on standby and required to be deployed based on the troubleshooting required in the initial manufacturing campaign e.g., for first 10 manufacturing batches.

It is also useful to define the documentation and appropriately qualified IT tools employed in the tech transfer. For example, principles for document structure, ownership and approval should be aligned

between RU and SU (refer Annexure 2). Furthermore, the IT tools and systems used for transfer of documentation shall ideally be defined. Many tech transfers have successfully employed a common share point for transfer of documentation.

4. Process of Technology Transfer

Tech transfer activity can be divided into 4 phases as mentioned in the Figure 3 below.

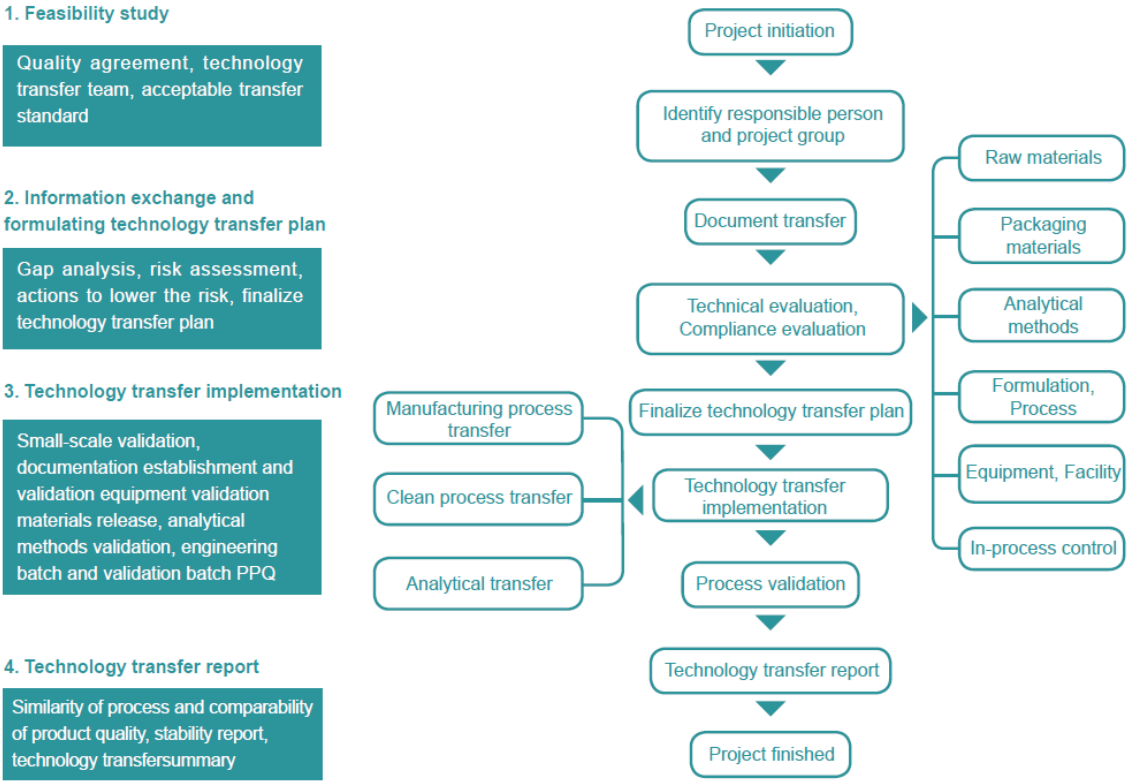

Figure 3: Phases of the tech transfer project[2]

4.1 Feasibility study

Usually, technology transfer can be divided in four parts - First step is feasibility study, which includes assessing technical feasibility, regulatory due diligence, quality, and tech transfer agreement, establishing project team, identification of tech transfer leader, creation of the project charter which includes high level project scope, budget, main deliverables, key risks, project key milestones identified. Management team should ensure standards / regulatory guidance that shall be followed for the transfer are agreed by project sponsors and management team. After project charter is effective, tech transfer leader should create SU and RU teams and identify project team members. Stages in the Tech transfer project can be broadly defined are summarized in figure 03.

4.1.1 Quality Risk Management

Quality risk management (QRM) principles are essential to the tech transfer project and project lead should ensure that Tech transfer team members understand and follow the QRM principles as detailed in ICHQ9. Risk assessment can be carried out based on the tools such as Failure Modes and Effects analysis (FMEA), Ishikawa (fishbone) analysis, Hazard and Operability analysis (HAZOP). After risk assessment, risk categorization shall be done using Risk Prioritization Number (RPN). Tech transfer teams can use RPN or similar methodology to quantify the risk criticality, majorly based on combination of risk severity, probability of occurrence, detectability etc. Based on the RPN score and

criticality assessment, tech transfer team can finalize on the risk mitigation plan. While for critical risk (with high RPN) it is required to have a risk mitigation plan with the objective to implement risk mitigations which will lower the RPN, for minor risk, project team may decide to accept the risk and monitor. After completion of mitigation plan implementation, post implementation risk assessment should be done with revision in RPN score. Figure 4 depicts the process flow from risk identification, analysis, risk mitigation and risk mitigation /closure.

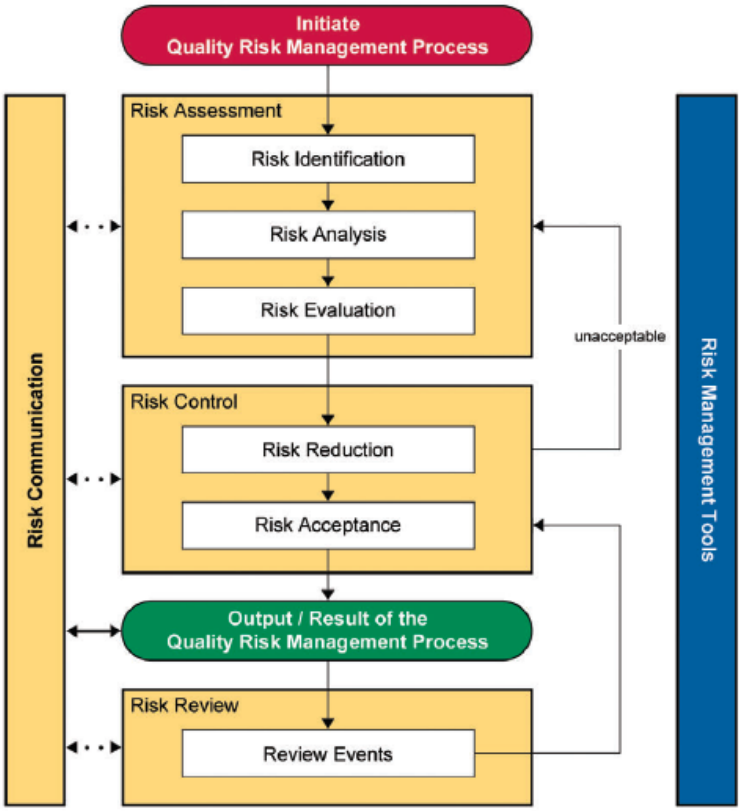

Figure 4: Risk assessment flow diagram (ICH Q9)[3]

4.2 Information exchange and creation of technology transfer plan

SU and RU team should perform gap assessment of equipment, consumables, facility, personnel. Risk assessment shall be performed to assess the gaps, along with proposed risk mitigation plan. Identified process and analytical gaps shall lead to list of regulatory variations. Outcome of this step is detailed technology transfer plan including resources, timeline, critical path, and risk assessment. Tech transfer plan shall be detailed including with work packages, it shall also list specific activities planned related to individual countries of licensure. Tech transfer team shall identify and establish interface with interlinked projects e.g., facility construction and commissioning (IQ and OQ), equipment procurement and installation.

4.2.1 Assess Technology Transfer Project scope

Technology transfer plan should be prepared based on the requirements stated in regulatory guidance of the target country/ies of licensure and requirements of WHO Pre-Qualification. Acceptance criteria, batch scale, no. of batch runs to be performed, intended production capacity, estimate of required capacity of clean and black utilities shall be built in the transfer execution plan.
Sending site shall prepare for the technology to be transferred including following parameters, list of documents to be transferred among others -

- Process flow diagram(s)
- If SU is a development site, product development report should be available and provided to RU

- List of equipment(s) – drawings, manuals, maintenance and calibration log, IQ, OQ documents
- Process equipment(s) details – equipment make, capacity, automation / manual operations, and controls
- Critical process parameters, ranges, and proven acceptable ranges
- Critical Quality Attributes
- Standard Operating Procedures – manufacturing processes, analytical test methods, typical manufacturing plan and schedule
- Recipe, Bill of Materials, Manufacturing record (MFR)
- Product specifications – DS, intermediates, formulated bulk, filled vials, DP
- Raw material – specifications, acceptance criteria, test and release acceptance criteria, Material Safety data sheets (MSDS)
- Raw material supply – preferred vendors, vendor qualification report, audit report, back up vendor qualification details
- In-process control parameters
- Sampling techniques during manufacturing process. Sample quantity requirements for testing and stability studies
- Facility operations – personnel, materials, waste movement flow paths. Preparation of materials before manufacturing – e.g., preparations of materials for sterilization in autoclave, transfer of autoclaved materials post sterilization to process area. Utility requirements (heating, ventilation, air conditioning (HVAC), pure steam, Water for Injection (WFI), purified water (PW), compressed air). Facility area temperature, classification, humidity, and differential pressure
- Analytical test methods validation reports, test methods, specifications, and acceptance criteria at release and for stability end of shelf life
- Validation documents – process validation, cleaning validation, changeover process (optional in case of multiproduct facility), equipment validation, Extractables and leachable risk assessment and study reports, filter validation report, buffer and media mixing and homogeneity studies
- Stability data – drug substance, intermediate hold time, drug product
- Annual product quality reports and history
- Process risk assessment – recommended actions / mitigation plan
- Team member skills, specific gowning qualification approach / details

To aid in technology transfer, sending unit shall prepare description of the technology. It is encouraged that sending site, wherever possible captures and document technical knowledge which is in tacit nature.

Changes in the project scope shall be presented by tech transfer lead to JSC for endorsement. Examples of major scope changes are mentioned below -

- If there is major delay in project timelines (by >10% of overall timeline),
- Major change in the transfer strategy (e.g., change in the target 1st country of licensure, CMC strategy for registration package)
- Request for additional budget or resources (by >10% of overall timeline)

4.2.2 Control strategy

As defined in ICH Q10, control strategy is:

"A planned set of controls, derived from current product and process understanding that assures process performance and product quality (ICH Q10). Every drug substance manufacturing process, whether developed through a traditional or an enhanced approach (or some combination thereof), has an associated control strategy".

A control strategy can include, but is not limited to, the following:

- Understanding the relation between CPPs, CQA's, material attributes, and in process controls
- Controls on material attributes (including raw materials, starting materials, intermediates, reagents, primary packaging materials for the drug substance, etc.)

- Controls implicit in the design of the manufacturing process (e.g., sequence of purification steps (Biotechnological/Biological Products), or order of addition of reagents (Chemical Products))
- In-process controls (including in-process tests and process parameters)
- Controls on drug substance (e.g., release testing), process intermediates and drug product

It is not the role of technology transfer team to identify quality attributes, process parameters and their relationship, that is the basis of control strategy that is developed during product development. However, it is important that control strategy is made available to RU. It shall help to understand the background and scientific rationale of interlinking of CPPs, CQAs, KPPs, in process control testing and other control mechanisms. Furthermore, the Tech Transfer Team shall adapt the CPPs, CQAs and KPPs as more process knowledge becomes available during tech transfer and process start up activities.
Risk assessment can be used to identify control strategy. Fishbone analysis can be used within tech transfer team as a tool to collect parameters to be further assessed in control strategy. The six M's in fishbone analysis are as follows: 1. Machine 2. Methods 3 Material 4 Mother nature 5 Manpower 6 Measurement.

4.2.3 Facility and layout considerations

Tech transfer may involve transfer from non-GMP to GMP location. When the product is developed in R&D and/or pilot plant, it is required to assess the proposed process from GMP requirements. E.g. Product manufacturing in commercial manufacturing requires facility to perform process operations in area following cleanroom classifications as defined in the applicable guidelines of e.g. WHO, EMA, US-FDA etc. . In another case, product development may have been done using plant steam or non-sterile steam, comparatively, in GMP setup it is mandatory to install pure steam wherever it comes it direct contact with product.
Gap assessment with respect to GMP requirements shall be included in the process risk assessment. For multiproduct facility, it is required to demonstrate changeover procedure and validation. It is required that tech transfer team defines equipment train with product specific and common items.
In another scenario, tech transfer may involve transfer from GMP environment to newly built manufacturing building (greenfield / brownfield GMP location), in this situation receiving unit shall integrate process requirements in the User requirement specifications (URS). SU shall involve in preparation of layout design of the new facility, procurement strategy of CAPEX items such as process vessels, purification skids, filtration units, analytical equipment etc. Due considerations shall be given while designing process equipment, capacity e.g., working volume of process vessels as well as the digitalization and IT validation and IT security strategy. Although facility construction and commissioning are independent projects, Global project manager shall maintain interface and track project progress to assess impact on tech transfer project activities. Generally, for new facility creation projects, handover to commercial manufacturing or tech transfer team is after facility commissioning (includes IQ and OQ). Facility fit report may be prepared to facilitate handover to the tech transfer team. Process Performance qualification shall be performed as part of the tech transfer project scope.

4.2.4 Site Validation Master Plan

The site Validation Master Plan (VMP) includes high level strategy for all the qualification and validation activities. Technical Services may prepare one or more subordinate VMPs to address validation and qualification activities associated with transfer of a new process. These plans may cover facilities, equipment, cleaning, viral clearance, bio-safety and process. Qualification studies may be added to address gaps that involve equipment to be operated outside the original qualification ranges. The VMPs will provide approaches and paths to validation and supportive studies such as container/closure integrity, aseptic simulation, hold time studies, filter validation, shipping validation, etc. It is a common best practice to also have a project specific Validation Master Plan for all Tech Transfers.

4.2.5 Considerations for analytical methods transfer

Analytical methods are used for release testing, in-process, characterization, stability studies, raw material release, environmental monitoring. Test methods are either developed in-house, transferred from 3rd party or performed based on the standard pharmacopoeial methods. Generally, test methods shall be based on the international reference standards, if international reference standard is not available, in-house reference standard calibrated against international standard may be used.
In general, 'Replacement, Reduction and Refinement' (3R) principles shall be followed wherever applicable. Consideration shall be given to develop and start collecting data from early development stages, for additional methods which could replace and be used as alternative for release testing or stability testing. E.g., *in vitro* methods can be used as an alternative to *in vivo* potency assays. *in vivo* – in vitro correlation factor can be established to replace *in vivo* methods during routine testing.SU shall prepare following documents

- Testing procedures, standards and reagents
- Method validation report
- Specification
- Test data sheets / validated excel spreadsheets/ LIMS data capture validation report or template
- Equipment calibration procedures
- Stability report and trends analysis

Different approaches can be considered for transfer of analytical methods. For a new method validation, among others, following parameters shall be assessed – range, linearity, precision, accuracy, specificity, intermediate precision, LOD and LOQ in line with ICH Q2(R)

a. Method Suitability – SU and SU both performs testing on fixed number of samples using similar test methods. Testing should be performed based on method suitability protocol with clearly defined acceptance criteria. In the report document data shall be analysed along with conclusion.
b. Co-validation – SU and RU both performs test analysis as per method validation protocol, test data shall assess to conclude if it meets the acceptance criteria
c. Re-validation – Receiving unit performs validation of the analytical methods for complete or partial set of parameters
d. Transfer waiver – Test methods which are compendial in the nature or the methods which are already in place at RU. Assessment shall be performed if the analytical method is product non-specific

SU shall assess and recommend analytical method transfer plan and protocols for each the test method. Similar test methods can be combined into a single protocol. Execution of the testing validation involves testing fixed number of samples from different batches by same or different analysts. Overall testing validation and transfer strategy shall be summarized in the analytical transfer strategy document. This document including transfer plan shall be endorsed by tech transfer leader. Analytical methods should be transferred and validated by receiving unit before manufacturing process is in the stage of process validation. All the test methods for release testing shall be validated at RU with approved report before start of the phase III and process validation batches manufacturing.

4.2.5.1 Environmental monitoring and in process testing

Test methods for Environmental monitoring does not require tech transfer. Assessment shall be performed by sending unit to confirm requirements for transfer. If required, sending unit should share relevant documents as mentioned above. Also, it shall be included in the testing validation strategy and master plan. For implementation of compendial methods, detailed guidelines and steps are generally provided in the applicable pharmacopoeia

4.2.5.2 In process testing

Based on the complexity of the test method, criticality (e.g., impact on the CPPs), product specificity or non-specificity; strategy can be made to decide which methods can be waived from transfer. SU should propose in-process testing methodologies such as additional resource requirements, equipment required in the process area, e.g., pH meter, spectrophotometer.

Provision shall be made in the tech transfer protocol for the sampling requirements. Sampling methodology shall be built in the process development. Analytical team member / leader shall provide with the sampling plan – number of samples required, volume of each sample and sampling container.

4.2.6 Tech transfer protocol

Tech transfer strategy shall be captured as part of the validation master plan (VMP) or tech transfer strategy plan. Critical input to the tech transfer plan is the regulatory strategy, facility readiness plan and facility and process risk assessment and mitigation plan to address the gaps. Separate VMP document can be prepared for the DS, DP and analytical methods. VMP or strategy shall include

- Project key milestones
- GANTT chart
- key risks and mitigation plan
- List of equipment(s)
- Process flow diagram with critical process parameters, in process testing, control parameters and range
- Sampling plan – to suffice requirements for stability testing, release testing and in process testing, additional characterization, process development studies etc.
- Resource management plan – RACI matrix, production schedule, analysts availability based on the testing parameters (accuracy, intermediate precision etc.)
- Reference to quality management system – change control document, impact on current documents e.g., SOPs etc.
- Expected project deliverables
- Operational plan for batch manufacturing execution e.g., dry runs, engineering runs, aseptic simulations studies, process validation and analytical qualification
- Plan for Product dependent studies – Cleaning validation, mixing and homogeneity studies (RPM, duration etc), hold time duration studies, samples management, E & L assessment, filter validation studies, viral clearance study, assessment of product direct contact parts and risk assessment.
- Full list of all documents which will be generated during the Tech Transfer, both for SU and RU

There shall be independent protocol for each study / evaluation e.g., process validation protocol each for DS, formulation and aseptic filling. Protocol for product dependent studies is prepared based on the level of complexity, interdependence of the activities involved e.g., for each analytical method co-validation, a method validation protocol is prepared.
Sending unit leader and receiving unit leader should agree and sign on the technology transfer master plan (also called VMP).

4.3 Technology transfer implementation

SU and RU shall prepare a training plan including process and analytical methods. Training matrix shall be prepared and shall encompass process and analytical procedures. Training modality shall be including on the job training, SOP training, train the trainer, gowning qualification, aseptic practices, clean room behaviour etc.

4.3.1 PPQ / Process validation batches

Process performance qualification (PPQ) a.k.a. Validation batches, are manufactured to evaluate process performance at commercial scale in the actual commercial manufacturing environment. Process validation is evidence that defined manufacturing process can consistently deliver desired product without any technical issues, meeting cGMP standards and meeting CQAs. Process validation shall be based on the guideline from NRA of target country/ies of registration. At minimum, pre-requisites for WHO pre-qualification shall be met for PPQ studies. Prior to PPQ lots, SU and RU shall align on the requirement and number of dry runs, engineering lots, aseptic process simulation with media etc. Based on the gap assessment, prior knowledge and platform technology following set of parameters along with criticality (e.g. critical, major and minor) shall be defined. Critical quality attributes (CQAs), Critical Process Parameters (CPPs), Key Process Parameters (KPPs), in-process control (IPCs), shall be defined along with acceptance criteria or range.

During scale up tech transfer, impact on technical parameters caused by scale change shall be assessed e.g., scale independent parameter such as pH, temperature, while scale dependent parameters such as stirring rate, column volume etc.
It is recommended to align with target NRAs or WHO regarding request for waiver from the regulatory requirements of PPQ. Examples of request for waiver are as follows:

- Waiver for decoupling DS and DP process validation
- Process validation to be demonstrated as a post approval change
- Process validation at a smaller scale than the target commercial manufacturing scale

Process validation protocols can be simplified based on risk assessments where there is appropriate platform/prior knowledge (e.g., a focus on validation of critical steps only) and a suitable control strategy, supported by continuous process verification where appropriate.
PPQ lots may also be used to perform supportive validation studies or provide materials for other supportive validation studies such as:

- Process optimization studies
- Mixing studies
- Manufacturing hold time studies
- Cleaning validation
- Equipment performance qualification
- Filter validation
- Extractables and leachable risk assessment
- Product stability studies
- Container/closure integrity studies
- Shipping studies
- Process Robustness studies

Information obtained from the execution of the Demonstration Lots will yield a process validation report describing results and observations. Process validation report shall be written together between SU and RU. It should contain details of the tests performed, their results. PV report should have a discussion if test results meet pre-defined acceptance criteria. PV report should also have a recommendation for parameters to be monitored as part of continuous process verification. It should also contain a summary of any deviations / non-conformities that have occurred including an assessment on the impact and any further work that was completed.

4.3.2 Vaccine Manufacturing Modalities:

This guideline shall apply to all types of vaccine development and manufacturing platforms.

- Viral vectors, which include Adenoviral vectors and Measles vectors
- Live attenuated virus vaccines
- Inactivated whole virus vaccines
- Virus-Like Particles
- Bacterial vectors
- mRNA, siRNA, plasmid DNA
- Protein subunit vaccines - with and without adjuvants
- Adjuvants

While not all these modalities are currently within the CEPI portfolio, however, the Tech Transfer strategy should be suitable and applicable for all modalities which prove to be successful vaccines.

4.4 Project closure

After successful demonstration of process validation and approval of process validation report, technology transfer closure report should be prepared. The report should contain status of the mitigation plan (mainly prepared as an outcome of risk assessment), summary of various studies and list of the study reports generated, list of deviations and reference to investigation and CAPA, list of eventual rejected lots, documents, remaining actions from change control. Lessons learnt exercise shall be documented.

Post mitigation risk assessment shall be performed to assess whether risks are mitigated, or risk criticality reduced to a lower Risk Prioritization Number (RPN).
Follow up or ongoing actions must be summarized and mechanism for tracking those activities shall be agreed upon. After approval of transfer closure report, project team may be dissolved or team size may be reduced to required team members to support remaining activities such as troubleshooting during routine manufacturing, Pre-Approval Inspection (PAI) support etc.

4.4.1 PAI Support

The Tech Transfer (TT) Team may be required to support for preparation of the Pre-Approval Inspection (PAI). The members of the TT Team can facilitate and support regulatory affairs function to prepare the Module 3, Common Technical Document (CTD) - Chemistry, Manufacturing, and Controls (CMC) sections. The TT Team facilitates preparation and support for the PAI to ensure that experts from all required functional areas are available to support the inspection. Typical material found in the TT Report that would support the PAI would be:

- Regulatory module 3 dossier
- Specific manufacturing instructions for the full-scale commercial process including in-process / product specification.
- Batch genealogy for pivotal clinical studies and other developmental batches
- Raw materials (quantities, sources, testing)
- Laboratory (equipment, procedures, methods validation)
- Equipment qualification / Cleaning validation
- SOP's (process change, cleaning, QA/QC investigations)
- Other reports and records (Process validation protocols / reports, failure investigation, validation reports for stability, assay and impurity tests, microbiological data)
- Additional records (media fill results, environmental monitoring reports and investigations, SOPs of WFI and Environmental monitoring)
- Development Data: development report

5. Transfer from Development to Manufacturing

The technology transfer from Development to Manufacturing is generally performed once the vaccine candidate reaches late-stage development. The Table 3 and Table 4 describes link between CEPI work package and suggested interface with technology transfer project and team.

Table 3: CEPI work packages for developmental products

WP no.	Description of the activities
WP 1	Antigen design (WP1.1) Preclinical proof of concept (WP1.2) Preclinical toxicity (WP1.3) Preclinical challenge (WP1.4) CMC development (WP1.5) Regulatory activities (WP1.6)
WP 2	CTM development plan (WP2.1) Phase I (WP2.2) Immunological assessment (WP2.3) Regulatory activities (WP2.4) Enabling science activities (WP2.5)
WP 3	Phase I CT follow-up activities (WP3.1) Phase II/III CTM production (WP3.2) Phase II (WP3.3) Regulatory activities (WP3.4) Enabling science activities (WP3.5)
WP 4	Scale-up development (WP4.1) Phase III CT (WP4.2) Scale out (WP4.3) Regulatory activities (WP4.4) Enabling science activities (WP4.5)

Table 4: Interface between of vaccine of development project stage gate and tech transfer project

Product development Description	CEPI project Work Package	Tech transfer project interface (Yes / No)
Manufacturing processes are developed at small scale and batches manufactured for pre-clinical studies	WP 1	N
Scale up to clinical manufacturing scale. Phase I Clinical supplies are manufactured, and clinical studies are conducted. The process used for the manufacture of the pivotal clinical lots becomes the basis for the final commercial scale product	WP 2	N Y – for early-stage tech transfer
A preliminary commercial process design is developed to define unit operations and equipment requirements	WP 2	N
Phase II / III clinical material manufacturing. Selection of a commercial manufacturing site	WP 3	Y
If necessary, new equipment is installed and/or existing equipment qualification studies are supplemented for new requirements	WP 4	Y
Quality system documentation is drafted and demonstration lots are conducted at commercial scale to evaluate process performance and provide samples for supplemental validation studies	WP 4	Y
Quality system documentation is finalized, and process validation is carried out at commercial scale to support the regulatory filing	WP 4	Y
Applications are submitted to governmental agencies to request approval to market and distribution of the product	WP 4	Y
Pre-Approval Inspections are conducted	WP 4	Y
The product is approved and distributed to the market	WP 5	Y
Post-Approval changes/variations.	WP 6	N

6. References

1. ICH guideline Q10 on pharmaceutical quality system. https://www.ema.europa.eu/en/documents/scientific-guideline/international-conference-harmonisation-technical-requirements-registration-pharmaceuticals-human_en.pdf
2. Handbook of technology transfer https://www.genscriptprobio.com/gsfiles/techfiles/handbook-technology-transfer.pdf
3. ICH guideline Q9 on quality risk management https://www.ema.europa.eu/en/documents/scientific-guideline/international-conference-harmonisation-technical-requirements-registration-pharmaceuticals-human-use_en-3.pdf
4. WHO guideline on transfer of technology in pharmaceutical manufacturing, WHO Technical Report Series, No. 961, 2011 https://www.who.int/docs/default-source/medicines/norms-and-standards/guidelines/production/trs961-annex7-transfer-technology-pharmaceutical-manufacturing.pdf?sfvrsn=2e302838_0
5. ISPE, Good practice guide: Technology transfer, 3rd edition
6. PDA, Technical report no. 65, technology transfer

7. Abbreviations

- 3R - Replacement, Reduction and Refinement
- CAPA - Corrective and Preventive Action
- CDMO – Contract Development and Manufacturing Organization
- cGMP - current Good Manufacturing Practices
- CMC - Chemistry, Manufacturing and Control
- CPPs - Critical Process Parameters
- CPV - Continuous Process Verification
- CQA - Critical Quality Attributes
- CQAs - Critical Quality Attributes
- CTD - Common Technical Document
- DP - Drug Product
- DS - Drug Substance
- E & L – Extractables and Leachables
- ERP – Enterprise Resource Planning
- FAT - Factory Acceptance Test
- FFP - Formulation, Filling and Packaging
- FMEA - Failure Modes and Effects Analysis
- GDP - Good Documentation Practices
- HAZOP - Hazard and Operability Analysis
- HVAC - Heating, Ventilation, Air Conditioning
- ICH – International Council on Harmonization
- IPCs - In-Process Control
- IQ - Installation Qualification
- IQ – Installation Qualification,
- JSC - Joint Steering Committee
- KPPs - Key Process Parameters
- LIMS – Laboratory Information Management System
- LOD - Limit of Detection
- LOQ - Limit of Quantification
- M&SN – Manufacturing and Supply Chain Networks
- MFR - Manufacturing Record
- MSAT - Manufacturing Science and Technology
- MSDS - Material Safety Data Sheets
- NRA - National Regulatory Authority
- NRA – National Regulatory Authority
- OQ - Operational Qualification
- OQ – Operational Qualification
- PAI - Pre-Approval Inspection
- PMBOK – Project Management Body of Knowledge
- PMI - Project Management Institute
- PPQ - Process Performance Qualification
- PQS - Pharmaceutical Quality System
- PV - Process Validation
- PW - Purified Water
- QA - Quality Assurance
- QMS - Quality Management System
- QRM - Quality Risk Management
- RA - Regulatory Affairs
- RACI – Responsible, Accountable, Consulted, Informed
- RPN - Risk Prioritization Number
- RU - Receiving Unit
- SAT - Site Acceptance Test
- SOP - Standard Operating Procedures

- SU - Sending Unit
- URB - User Requirement Brief
- URS - User Requirement Specification
- VMP - Validation Master Plan
- WFI - Water for Injection
- WHO – World Health Organization

8. Annexures

Annexure 1 checklist for information and documents for tech transfer

This checklist is for general guidance. Applicability shall be evaluated individually per project. For early-stage tech transfers involving small developers, academic groups to phase I and Phase II clinical stage manufacturers, as a starting point for tech transfer needs evaluation, a list of "must haves" (marked as 'Y') items have been identified in the last column of below table.

Description of the Item	Available / shared by SU / Activity Completed (Y/N)	Late-stage tech transfer - Phase III, commercial stage (Comment)	Applicability for Early stage * (Y/N)
1. General			
a. Approved Change Control			-
b. Tech transfer agreement			
c. Project team in place			Y
d. Project Charter			-
e. Tech Transfer protocol			Y
f. Risk Assessments			Y
• Process FMEA, Project, Assay Method FMEAs			-
g. Technology Transfer Summary Report			Y
h. Lessons Learnt			-
2. Materials			
a. Bill of Materials			N
b. Starting Materials			Y
c. Excipients & Critical Materials			Y
d. Current Suppliers			Y
e. Cell bank			Y
f. Current Specifications and CQAs (+CMAs)			-
g. Material Certificates of Analysis/Release Data			-
h. Storage Requirements			Y
i. Raw Materials Qualification Reports			-
j. TSE / BSE certificates for applicable RM			Y
3. Single Use Systems			
a. Vendor data – including E&L			Y
• Manifold drawings			-
• Extractable/Leachable/Adsorption Data e.g. Pall Corp. ACMS dossiers			-
b. E&L Risk Assessments			-
• Extractable/Leachable/Adsorption Study Reports			-
c. List of acceptable alternative components			-
4. Product			
a. Development Reports			-
b. Development Run Data			Y
c. Historical Product Data			Y
d. CQA assessment			-
e. Physicochemical data			
• Particle size, solubility, toxicology of product & excipients			Y
f. Extractables and Leachables data			-
g. Stability Studies			Y
• Protocol, report, benchmark data			Y
• Ongoing stability			Y
h. Cleaning			-
• Cleaning Batch Record/SOP			-
• Cleaning Limits			-
5. Process			
a. Process Flow Diagrams			-

Description of the Item	Available / shared by SU / Activity Completed (Y/N)	Late-stage tech transfer - Phase III, commercial stage (Comment)	Applicability for Early stage * (Y/N)
b. Physical Property Data			Y
c. Mass Balances			-
d. Yields			-
e. Cycle Times and Capacity Analyses			-
f. Master batch records			-
g. Stability trend analysis reports			-
h. Hold time data / intermediates stability			-
i. In process samples			-
j. CPP assessment			Y
• Key Parameters & ranges			Y
k. Process Validation Reports			-
• Sending Unit Global VMP			-
• Receiving Unit PVMP, Protocols			-
6. HSE			
a. Materials/ Biological Safety Classifications			Y
• MSDS, ATEX data			Y
b. Process Hazard Risk Analysis			Y
• PPE requirements, Containment			Y
c. Permits & Licences			Y
7. Facility & Equipment			
a. URS/Design Specifications			Y
b. Utilities Requirements			Y
c. Automation & Control			-
• Specifications			-
• Data reporting templates			-
• GAMP and CFR compliance			-
• Data security measures			-
d. Material Compatibility			Y
e. Environmental & Microbial Control			Y
• Sampling details (location, frequency, methods)			-
f. Qualification			-
8. Quality			
a. Quality Agreements (Technical, Materials, Product)			-
b. Supplier Audits			-
c. Process Deviations/CAPAs			Y
d. Change Controls			Y
e. Product Out of Specification Investigations			Y
f. Annual product reviews			-
9. Regulatory			
a. Regulatory Filing			Y
• IMPD			Y
b. Other Licence Applications			Y
c. Inspection Reports			Y
10. Shipping & Logistics			
a. Qualification			-

* Early-stage tech transfer is considered for transfer during preclinical / Phase I / II stages of development

Annexure 2 Tech transfer document register template

Below table provides a template for documentation record template that can be used by RU to request the documents to SU. This format can be used and build further to create documentation management system including the numbering format.

Description	Column Header	Description/ instruction
Material	Doc #	The clients internal document number, of the document describing the materials
	Material name	The name of the material, as identified by manufacturer
	Manufacturer	The manufacturer of the material
	Vendor	The vendors of the material (multiple vendors may be entered)
	Article #	The article number used to order the material at the specified vendor
	Testing required for release	Identify if prior to the use of the material, it is released by CofA, or inhouse testing (i.e., growth promotion)
	Critical	An auto populated field defining the criticality as Y or N based on the Risk magnitude
Equipment & IT systems	Number (#)	A sequential numbering for tracking the amount of equipment
	Department	Identify the department where the equipment should be
	Manufacturer	The manufacturer of the equipment
	Vendor	The vendors of the equipment (multiple vendors may be entered)
	Article code	The article number used to order the material at the specified vendor
	Amount required	The amount of equipment units needed
	Critical	Define if the equipment has a direct impact to the quality of the final product with a Y or N
	Identical equipment required	Define if adherence to the identical equipment is required, or if a comparable equipment may be used with Y or N
	URS	List the client document number of the User Requirement Specification (URS) if present
	IQ/OQ	List the client document number of the Installation Qualification/Operational Qualification (IQ/OQ) if present
	PQ	List the client document number of the Performance qualification (PQ) if present, mainly validation protocol and report
	Maintenance contract type	Specify which maintenance contract is required for the equipment. (i.e. 24 hour replacement contract)
Documentation	Number (#)	A sequential numbering for tracking the number of documents
	Department	The department who is the owner of the document
	Client doc #	The clients internal document number
	Client revision #	The client's revision number of the document
	Document title	The document title at the client site and data on approval
	Document type	List the document type as; - SOP: Standard operating procedure - Form: Forms for information accompanying an SOP - Part spec: Material specifications, for raw or patient material - Study protocol: Protocol describing a study (i.e Process validation) - Production protocol: Batch records describing production steps for the manufacture of product - Testing protocol: Testing record describing the tests and test methods required for a product - IQ/OQ/PQ protocol: Protocol defining the qualification tests for equipment - Risk assessment - Flow chart (block flow diagram or process flow chart) - URS: User requirement specification describes all the requirements

Description	Column Header	Description/ instruction
		needed for an equipment piece, to be tested in the IQ/OQ/PQ - Report: Report of studies
	Transfer phase	Define when the document will be used for processing runs during the technology transfer. (e.g., Demonstration runs, verification runs, Method transfer, Aseptic validation, or Process validation)
Specifications	Number (#)	A sequential numbering for tracking the number of specifications
	Assay name	The name of the assay (i.e., Potency, purity, identity, sterility)
	Test method	The method used to test the assay
	Process stage	The product stage when the assay is performed. (e.g., Starting material, intermediate materials, Final product)
	Sample time	The processing step according to the processing protocol when the sample is taken
	Legislation specification	The specification according to European legislation if applicable
	Additional specifications	Specifications not related to legislation
	IMPD or MAA spec	Specifications not related to legislation, but defined in the IMPD or MAA
	Assay range	The range used in the assay as an acceptable result. (i.e., 20-30%)
	Validation status	The validation status of the assay, as None, Qualified, or validated
Logistics	Product stage	The product stage when the shipping/storage is performed. (Starting material, intermediate materials, Final product)
	Material name	The name of the material to be stored, preferable as referenced in a material specification
	Container size	The dimensions of the primary (and if applicable secondary) container
	storage temperature	The storage temperature required for the material
	Minimum storage timeframe	The minimum time required for the product to be stored or held (i.e., customs)
	Maximum storage timeframe	The maximum time required for the product to be stored or held (i.e., expiration)
	Shipment temperature	The shipping temperature required for the material
	Minimum shipment timeframe	The minimum time required for the product to be shipped or held (i.e., customs, storage at infusion site)
	Maximum shipment timeframe	The maximum time required for the product to be shipped or held (i.e., expiration)
	validation required	Is validation of the shipping or storage of the material required as Y or N
Training Documentation	Number (#)	A sequential numbering for tracking the number of documents
	Client doc #	The clients internal document number
	Document title	The document title at the client site

Description	Column Header	Description/ instruction
	Document type	List the document type as; - SOP: Standard operating procedure - Form: Forms for information accompanying an SOP - Part spec: Material specifications, for raw or patient material - Study protocol: Protocol describing a study (i.e Process validation) - Production protocol: Batch records describing production steps for the manufacture of product - Testing protocol: Testing record describing the tests and test methods required for a product - IQ/OQ/PQ protocol: Protocol defining the qualification tests for equipment - URS: User requirement specification describes all the requirements needed for an equipment piece, to be tested in the IQ/OQ/PQ - Report: Report of studies
Training On the job training	Number of repeats	The number of times the on-the-job training must be repeated per operator
	Training type	Description of the training to be done (i.e., Operator aseptic mimic, mock runs, product presentation)
Training Proof of competency	Competency level	Fixed field for operator, trainer, and supervisor
	Requirement	Describe the requirements for competence for the listed competency level.
Validation and product documents	Number (#)	A sequential numbering for tracking the number of documents
	Client Doc #	The client's internal document number
	Client revision #	The client's revision number of the document
	Document title	The document title at the client site
	Document content	Description of the document content and title

9. Revision History

Issue Ref.	Date	Reason for Issue	By Whom
0.1	22 June 2022	Internal review	Vishal Mukund Sonje, CEPI
1.0	22 July 2022	Approval	Vishal Mukund Sonje, Anna Särnefält, Ingrid Kromann