After completing this module, you will be able to:

- Discuss the organizational requirements related to Quality Management System of ISO 13485.
- Summarize all the requirements of auditable Clause 4.
- Study the requirements on medical software validation and how are these maintained.
- Outline the specific documentation requirements for medical devices' QMS.
- Explain the management process of medical device files.
- Describe the elements of medical device files
- Express the requirements of Clause 5 for top management in medical devices company along with the ins and outs of management reviews.
- List all the requirements of Clause 6 and clause 7 regarding resource management and Product Realization.
- Communicate considerations for the processes related to work environment and contamination controls
- Discuss how the requirements of design and development are managed, the need of process validation and requirements of sterile medical devices.

QMS - Organizational Requirements (Clause - 4.1)

Organization requirements are expressed in six different clauses. The crux of these clauses are:

Develop a QMS (Clause - 4.1.1)

This clause is related with the developing elements of the QMS. Requirements are:

- Develop organization's quality management system (QMS).
- Document company's quality management system.
- Keep the effectiveness of quality management system.
- Identify organization's QMS documentation requirements.
- List the documents that regulators expect company to maintain.
- Figure out the medical device regulations that apply to one's organization.
- Recognize the roles that medical device regulators need your organization to perform.
- List the documents that ISO 13485 needs your organization to maintain.
- Identity the procedures that ISO 13485 needs your organization to document.
- Identity the activities that ISO 13485 needs your organization to document.
- Identity the management activities that ISO 13485 needs your organization to document.
- Identity the requirements that ISO 13485 needs your organization to document.

Clarify Roles and Application of QMS (Clause - 4.1.2)

This clause is related with the clarification of roles in the application of the QMS. Requirements are:

• Consider the roles that regulators need your organization to perform.
• Determine the processes that Quality Management System (QMS) needs from your organization.
• Explain how QMS processes are implemented within your organization.
• State how organization's processes are interrelated.
• Employ a risk based approach to manage your organization's QMS processes.

Support Processes (Clause - 4.1.3)

This clause is related with the support of processes in the QMS. Requirements are:

• Assist every QMS process.
• Assist QMS process operations.
• Assist QMS process monitoring.
• Assist QMS process measuring.
• Assist QMS process analysis.
• Assist QMS process record keeping.

The difference on monitoring, measurement and analysis, is taught in the third module Topic 2.

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The difference on monitoring, measurement and analysis, is taught in the third module Topic 2.

Manage Changes and Control Outsourcing (Clauses - 4.1.4 & 4.1.5)

Manage changes (Clause - 4.1.4)

This clause is related to management of change. Requirements are:

• Manage organization's QMS processes efficiently.
• Fulfill ISO 13485 process management requirements.

• Effective handle changes to company's QMS processes.
• Fulfill requirements related regulatory process management.
• Manage regulatory change control requirements.

Control outsourcing (Clause - 4.1.5)

This clause is related to controls relevant to outsourcing. Requirements are:

• Monitor outsourced processes which influence product conformity.
• Control the outsourced processes which influence product conformity.
• Keep responsibility for processes which influence product conformity.

Validate Software (Clause - 4.1.6)

This clause is related with the validation of software used in the QMS or for manufacturing of medical device. Requirements are:

• Establish procedures to validate and re-validate QMS software (if any).
• Establish a methodology which is appropriate to the risk involved in the validation of software.
• Employ organization's procedures to validate and re-validate software applications.
• Validate computer software applications for its purpose of use.
• Validate software whenever there is a change in purpose of use (as relevant).
• Keep records of organization's software validation and re-validation activities.

Validation of Software (Clause - 4.1.6)

Document procedures for validation of computer software

The organization should make a procedure that elaborates the validation of computer software utilized in production of medical devices and associated services. The procedure should define responsibilities well. The procedure can include the frequency of software validation, which is based on the level of risk that may affect the ability of the product to meet the desired specifications.

Records of Software Validation

Records of the software validation results shall be maintained, along with a conclusion and, if needed, necessary actions from the validation.

Records of validation results can have screenshots of software inputs

and outputs throughout validation testing and an action items list resulting from validation results.

QMS - Documentation Requirements (Clause - 4.2)

Requirements on documentation for Quality management system have been addressed in five different sub-clauses:

Incorporate Information (Clause - 4.2.1)

• Incorporate all required documents and records in organization's document management system.
• Incorporate all documents and records that are needed by regulations.
• Incorporate all the documents and records that are needed by ISO 13485.
• Incorporate all the documents and records that are needed by your organization's products and processes.

Create Manual (Clause - 4.2.2)

• Create a quality manual for organization's QMS.
• Explicate the scope of organization's QMS.
• Outline the structure of your QMS documentation.
• Incorporate QMS procedures or reference those while discussing different elements on QMS in manual.
• Describe how organization's QMS processes interrelate with each other.

Develop Medical Device files (Clause - 4.2.3)

• Develop a file for each medical device type or each family of medical devices.
• Incorporate or reference documents exhibiting that organization's comply with relevant regulations.
• Incorporate or reference documents exhibiting that organization's comply with ISO 13485.
• Keep a file for each medical device type or each family of medical devices.
• Incorporate documents for each medical device type or family of medical devices.
• Incorporate a description of each medical device type or medical device family.
• Incorporate different procedures for medical device types or medical device families.
• Incorporate specification documents for medical device types or families.
• Incorporate records for each medical device types or each medical

device family.

Control documents (Clause - 4.2.4)

• Develop a procedure to manage QMS documents.
• Document organization's QMS document control procedure.
• Implement organization's QMS document control procedure.
• Control organization's QMS documents.
• Review and approve documents before documents are issued.
• Ensure the correct version of documents where it is needed to be used.
• Protect the identity and legibility of organization's QMS documents.
• Recognize and control the distribution of external QMS documents.
• Avoid the unplanned or unmeant use of obsolete documents.
• Keep obsolete documents for any reference in future use.

Maintain records (Clause - 4.2.5)

• Create records for company's QMS.
• Create procedures to manage QMS records.
• Document organization's record control procedures.
• Apply record control procedures throughout the organization.
• Explicate methods to protect QMS health records.

Medical Device Files

As already discussed in documentation requirements, the incorporation of medical device files in the latest version of ISO 13485:2016 is mandatory. This is done in order to make a consistent work flow for manufacturers and suppliers in the medical devices industry. With this change in the standard Quality Management System, it becomes vigilant and it is required to help organisations to meet the regulatory requirements as well, since similar requirements have been stated by regulatory bodies.

Facts about Medical Device Files

Medical device files were not required in the earlier edition of the international standard, i.e. ISO 13485:2003. However, it was a regulatory obligation in many countries, such as **Medical Devices Directive 93/42/EEC** in Europe, and **FDA 21 CFR Section 820** in the United States. With the incorporation of Clause 4.2.3 on the subject of medical device files in ISO 13485:2016, the standard has offered improved value for organizations (who opts the implementation of standard).

The basis for production, distribution and application of medical

devices

The idea and elements of medical device files work as the basis for the production processes, distribution and application of medical devices, as they feature all design, manufacturing and application aspects of the medical product life-cycle. Before the prerequisite of the file in ISO 13485, organisations had to observe separate sets of documentation for every aspect of the device life-cycle or they had to consolidate somewhat similar to the medical device file.

The files optimize the production time, avoid processes' duplication, and curtail shipment damage throughout the manufacturing and shipment processes. It can happen due to vague or confusing production models. Organisations can efficiently manage their production and delivery processes with the help of vibrant, documented procedures that are all centrally consolidated, controlled and integrated in a medical device file for each medical device family.

Elements of Medical Device Files

The files are documented guidelines which contain a collection of design records, production processes, medical device specifications, product application guidelines, quality acceptance criteria, compliance status of regulatory, quality standards, and, if needed, servicing and installation records, and their guidelines. Organisations must institute and retain a medical device file for each medical device family or product type. Clause 4.2.3 of ISO 13485:2016 provides requirements for several parts that should be maintained in the file. These elements comprise of following:

Create & retain a file for each device family

It is important to recognize a medical device family. For example Rochester Ochsner forceps, this could be taken as a medical device family. Within this family there are numerous kinds of forceps that can differ in dimensions, clamping, ratchet, handle, serration, material, surface finish, or other design specifications. But, the fundamental of design specifications can be banded together as single medical device family. So, for each set of devices that is reflected to be a family, there must be a medical device file.

Maintain reference documents proving conformity

For every medical device file, the organisation must keep references with their Certificate of Conformity to ISO 13485 and relevant regulatory obligations.

This means that the medical device file should either have the certificate of conformity, or it should mention any document that shows that all

processes in the design, production, packing, storage, and handling suffice the requirements of ISO 13485, relevant regulatory and legal requirements. The reference can be a Quality System Manual that is established on ISO 13485 and related compliance and regulatory requirements.

Establish & maintain description and procedures for the medical device family

The file of all medical device families should include a general description of the medical device, along with its designed application or subject of its use. It should have the approved and documented IFUs, for example; instructions for use. The description contains out of incorporated issues related to labelling, such as device code, name, classification status, bar code and CE requirement.

Every file must include established procedures, or reference to production procedures and all related manufacturing processes, for instance; packaging, inventory maintenance, safe handling, and shipment protocols of packed finished products. All manufacturing process flows, covering the quality inspection points, for every medical device family must be documented clearly.

Establish and keep specifications & procedures for measurement of products

The medical device file should include or state reference to documents containing specifications (such as; product critical dimensions, approved raw material grades, production specifications, and surface finishing specifications) for each unique product type. This means, that all products within a medical device family has their own separated specifications documents. Normally technical drawings contain all this information and each unique product type has its own unique drawing.

These documents should also state the procedure for quality control of devices in a family, the points of inspection in the processes, the critical factors of the products, and type of instruments which will be allocated to check critical points of the product.

Establish procedures for servicing & installation

This is a conditional element of the file; it is for devices, which need servicing or installation. Examples are infusion pumps, MRI Scanners, etc. The medical device file should include, where needed, documentation for installation and should state the procedure for servicing. Documentation for installation of a device may have steps, guidelines or installation troubleshooting and can contain records. The procedure for servicing can incorporate the

schedule of routine maintenance, qualification of personals doing servicing, checklists for servicing and the flow charts for preventive maintenance and repairs.

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Top Management Requirements (Clause - 5)

Requirements related to top management are discussed in Clause 5. There are six sub-clauses in this clause. Five of the sub-clauses are:

Leadership Commitment Requirements (Clause - 5.1)

Leadership should demonstrate ongoing commitment:

- Assist the development of organization's QMS.
- Assist the implementation of organization's QMS.
- Assist the maintenance of organization's QMS.

External Requirements (Clause - 5.2)

- Ascertain to determine external requirements.
- Ascertain that external requirements are being met.

Policy Requirements (Clause - 5.3)

- Plan company's quality policy.
- Draft company's quality policy.
- Apply company's quality policy.
- Review company's quality policy.

Planning Requirements (Clause - 5.4)

Establish quality objectives (Clause - 5.4.1)

- Develop quality objectives throughout the organization.
- Make objectives needed to comply product requirements.
- Make objectives needed to comply regulatory requirements.

Carry out quality planning (Clause - 5.4.2)

• Plan how is your organization going to develop QMS.
• Plan how is your organization going to document QMS.
• Plan how is your organization going to structure QMS.
• Plan how is your organization going to manage QMS.
• Plan how is your organization going to monitor QMS.
• Plan how is your organization going to control QMS.
• Plan how is your organization going to implement QMS.
• Plan how is your organization going to maintain QMS.

Managerial Requirements (Clause - 5.5)

Clarify responsibility and authority (Clause - 5.5.1)

• Explicate QMS responsibilities and authorities:
  • Document QMS responsibilities and authorities.
• Document interrelationship of QMS folks. (Such as Organo-gram)

Appoint management representative (Clause - 5.5.2)

• Hire a member of management to supervise organization's QMS.
• Offer management representative with both authority and responsibility:
  • Allocate authority and responsibility for documenting organization's QMS.
  • Allocate authority and responsibility for reporting to top management.
  • Allocate authority and responsibility for promoting corporate awareness.

Establish internal communications (Clause - 5.5.3)

• Develop relevant internal communication processes:
  • Boost communication about the effectiveness of organization's QMS.

Management Review Requirements (Clause - 5.6)

Perform Regular Management Reviews (Clause - 5.6.1)

• Develop management review procedures.
• Plan organization's management reviews after fixed intervals.
• Review organization's QMS at fixed intervals.
• Maintain a record of management reviews.

Study Management Review Inputs (Clause - 5.6.2)

• Study information about organization's QMS (inputs):
  • Review precedent management reviews and the status of action

items from those reviews.
• Review the results of preceding audits.
• Review organization's complaint handling issues.
• Review organization's monitoring and measurement activities.
• Review new or revised regulatory requirements that are relevant with your organization.
• Review past corrective and preventive actions.
• Review improvement activities and associated recommendation.
• Review changes that could influence the QMS.

Generate Management Review Outputs (Clause - 5.6.3)

• Develop organization's management review outputs.
• Make decisions and actions to improve organization's QMS.
• Make decisions and actions to improve medical products.
• Make decisions and actions to upgrade QMS with regulatory changes.
• Make decisions and actions to fulfill applicable resource needs.
• Develop a record of organization's management reviews.

Resource Requirements (Clause - 6)

Allocation Requirements (Clause - 6.1)

• Find out the resources that organization's QMS needs.
• Offer the resources that organization's QMS requires.
• Offer the resources required to implement organization's QMS.
• Offer the resources required to meet regulatory requirements.
• Offer the resources required to fulfill customer requirements.

Personnel Requirements (Clause - 6.2)

• Recognize personnel and assess work that could influence product quality.
• Develop a process to look after the competence of medical device workers.
• Employ organization's process to manage the competence of company's medical device workers.
• Choose effective methods for evaluating organization's training and awareness activities.
• Keep records that show the competence of medical device workers.

Infrastructure Requirements (Clause - 6.3)

• Document organization's QMS infrastructure requirements.
• Offer the infrastructure that company's QMS needs.
• Recognize maintenance activities that could influence quality.

• Keep the infrastructure that organization's QMS needs to have.

Environmental Requirements (Clause - 6.4)

Control your working conditions (Clause - 6.4.1)

• Recognize the work environment required to fulfill product requirements.
• Document company's organization's requirements for work environment.
• Recognize the working conditions that affects the quality of medical products.
• Document company's requirements for these working conditions.
• Document procedures to monitor and control these working conditions.
• Recognize personnel who could influence medical device safety or performance.
• Recognize those who come into contact with products or concerning environments.
• Develop health, cleanliness, and clothing requirements for these personnel.
• Control those who work temporarily under special environmental conditions.

Plan your contamination controls (Clause - 6.4.2)

• Plan how is your organization going to control products that are or may be contaminated.
• Plan how is your organization going to control the contamination of sterile medical devices.

Work Environment and Contamination Control

ISO 13485:2016 offers requirements for work environment and contamination control. The organization is needed to control work conditions. The organization must identify and document the work environment, work conditions, and contamination controls which can affect the quality of surgical instruments.

For instance, in an area where instruments are belt-grinded, debris of the grinded material remains in the environment, with the product, and on the floors. The neighboring stations can be influenced and contaminated from such process. Hence, the organization should barricade such stations, improve floor cleaning frequency, wash and dry products before moving them to other processes, and ascertain robust

containment of the source with a dust collector.

Procedure for Monitoring Working Conditions

A procedure must be developed to examine and monitor the working conditions. The organization must list all personnel who affect the quality of medical devices, along with their health, cleanliness, and clothing requirements. These requirements can be met through daily monitoring of work conditions by the production leader, and workers wearing special clothing provided by the company.

Controls for Contractors and Temporary Workers

Those who work temporarily with these medical devices should also be monitored and provided with adequate guidance. The supervisors should be adequately trained to ensure working conditions are suitable and controlled. This can be done with the help of a contractor guide developed for each work station listing the specific requirements of that station. Moreover, supervisors and managers must issue a work permit (ensures control of temporary workers) for personnel who interact with these devices on a temporary basis.

Contamination Controls after Sterilization

The whole process of sterilization is in vain if there is contamination during the post-sterilization processes. Manufacturing and supplying companies must document requirements for control of contamination with microorganisms and particulate substances in the work environment, along with maintaining the mandatory cleanliness throughout the assembly and packaging processes after sterilization.

This can be managed with the help of proper ventilation systems, for example, dust collectors, and monitored through air quality tests (based on frequency) on processes after sterilization. Moreover, engineering controls should be in place for containment of sources resulting in contamination.

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to-iso-134852016/. [Accessed 02 May 2019].

Product Realization (Clause - 7)

Clause - 7 is one the main clause of ISO 13485:2016. This Clause is divided into six sub-clauses. In this topic, Clauses from 7.1 to 7.3 are discussed. The six sub-clauses are:

- Planning of Product Realization (Clause - 7.1)
- Customer-Related Processes (Clause - 7.2)
- Design and Development (Clause - 7.3)
- Purchasing (Clause - 7.4)
- Production and Service Provision (Clause - 7.5)
- Control of Monitoring and Measuring Equipment (Clause - 7.6)

Planning Requirements (Clause - 7.1)

Requirements stated in Clause - 7.1 are:

- Plan the QMS processes that are required to realize products.
- Develop the processes that organization needs to realize products.
-
- Establish a risk management process for product realization.
- Plan how is your organization is going to realize each product.
- Devise quality objectives for medical products.
- Explain particular product realization requirements.
- Produce product realization planning outputs.
- Maintain records of product realization activities.

Customer-Related Processes (Clause - 7.2)

Customer related processes are important for organization producing and supplying medical devices. ISO 13485:2016 standard now adds a new requirement unlike the previous version. The new requirement is related to communication with regulatory authorities.Clause 7.2 is divided into three sub-clauses, which are:

- Determination of requirements related to product (Clause - 7.2.1)
- Communication (Clause - 7.2.3)
- Review of requirements related to product (Clause - 7.2.2)

Customer Requirements (Clause - 7.1)

(Clause - 7.2.1)

• Explain organization's product requirements by:
  • Recognize requirements provided by customers.
  • Recognize requirements specified by product's intended use.
  • Recognize requirements enforced by regulatory bodies.
  • Recognize requirements explicated by organization.

(Clause - 7.2.2)

• Assess product requirements before organization accepts orders.
  • Review product requirements before organization supplies products.
  • Verify product requirements before organization agrees to make orders.
  • Confirm that product requirements can be fulfilled before organization proceeds.

• Keep a record of organization's product requirement reviews.

(Clause - 7.2.3)

• Plan arrangements to communicate with customers.
  • Document organization's customer communication arrangements.

• Implement organization's customer communication arrangements.
  • Keep organization's customer communication arrangements.

• Develop arrangements to communicate with regulatory authorities.
  • Employ organization's arrangements to communicate with regulatory authorities.

Design and Development (Clause - 7.3)

Clause - 7.3 is on design and development. It specifies the requirements of design and development of medical devices. It is further divided in ten different sub-clauses:

- General (Clause - 7.3.1)
- Design and development planning (Clause - 7.3.2)

- Design and development inputs (Clause - 7.3.3)
- Design and development outputs (Clause - 7.3.4)
- Design and development review (Clause - 7.3.5)
- Design and development verification (Clause - 7.3.6)
- Design and development validation (Clause - 7.3.7)
- Design and development transfer (Clause - 7.3.8)
- Control of design and development changes Clause - 7.3.9)
- Design and development files (Clause - 7.3.10)

Prepare design and development procedures (Clause - 7.3.1)

The organization is required to document all the logical phases in design and development in a well-structured procedure, defining responsibilities for different activities, including approving authorities.

The requirements of the standard are:
• Develop procedures for design and development.
• Document procedures for design and development.

Organize and plan design and development activities (Clause - 7.3.2)

The planning phase is the most important phase of design and development, because proper planning can prevent unnecessary delays. In the planning phase the organization should identify the goal and objectives of the design and development of the product, the breakdown of major activities including risk management activities, the timeline of single activities and the whole project, and the allocation of resources needed in each phase of design and development (e.g., human resources needed in the review phase, i.e., review teams, devices that will be used for measurement and monitoring, etc.).

The requirements of the standard are:
• Plan the design and development of organization's medical products.
• Document organization's product design and development plans.
• Maintain organization's design and development planning documents.
• Control the design and development of organization's medical products.

Determine design and development inputs (Clause - 7.3.3)

As usual, it's "garbage in – garbage out"; therefore, the quality of design and development inputs are crucial for producing the right outputs. What the organization should include as inputs are as follows:

- Intended application
- Usability requirements, for example, its application, preservation, handling, and maintenance
- Customer and end user requirements
- Physical features, attributes, and manufacturing feasibility
- Ergonomics and safety factors
- Risk control and risk mitigation techniques
- Past complaints, failure reports, and adverse events of similar products
- Relevant regulatory, legal, and statutory needs and appropriate standards
- Sterilization requirements and servicing needs
- Economic study and costing feasibility

The requirements of the standard are:

- List all product design and development inputs.
- Review organization's product design and development inputs.
- Approve organization's product design and development inputs.
- Keep a record of design and development inputs.

Generate design and development outputs (Clause -7.3.4)

The organization can produce design outputs in the following forms:

- Raw materials, component parts, sub-assemblies, and finished device specifications in drawings
- Manufacturing process and environmental specifications
- Procedure for quality assurance that explains acceptance criteria
- Product identification, traceability, manufacturing, packaging, and inspection procedures
- Documentation for submission to the regulatory authorities where devices will be marketed
- Design history file to demonstrate design was verified and validated

The requirements of the standard are:

- Make relevant design and development outputs.
- Verify organization's product design and development outputs.
- Approve organization's product design and development outputs.
- Keep records of design and development outputs.

Carry out design and development reviews (Clause - 7.3.5)

The design review is a detailed step that addresses a number of manufacturing and customer concerns. For example, the organization needs to demonstrate whether the design meets product requirements or not, whether the device design exhibits compatibility with processing capabilities or not, whether safety concerns are addressed or not, whether it is environmentally friendly or not, and whether materials, facilities, components, and service elements are adequate or not. Design reviews are normally done in a meeting, and minutes should be maintained.

The requirements of the standard are:

- Plan organization's design and development reviews.
- Perform reviews in accordance with planned arrangements.
- Maintain records of organization's design and development reviews.

Design and Development Requirements

Perform design and development verification (Clause - 7.3.6)

Design verification is a mandatory requirement. It ensures that design outputs meet the specified requirements of inputs. The organization can verify designs with the help of tests (lab tests, chemical analysis, etc.), substitute calculations, comparing proven designs, inspections, and reviews of documents like specifications records, drawings, procedures, plans, reports, etc.

The requirements of the standard are:

- Plan organization's design and development verification activities.
- Document organization's design and development verification plans.
- Perform verifications in accordance with planned arrangements.
- Maintain records of organization's design and development verification activities.

Conduct design and development validations (Clause - 7.3.7)

Design validation is a step that comes after design verification. It is a phase that makes sure that the medical device conforms to end user requirements and the application. Validation is done on samples from initially produced lots. The product is validated in simulated conditions where its actual performance is tested (e.g., clinical testing of medical devices). Records of design validation must be maintained.

The requirements of the standard are:
• Plan organization's design and development validation activities.
• Document organization's design and development validation plans.
• Perform validations in accordance with organization's planned arrangements.
• Maintain records of design and development validation activities.

Manage design and development transfers (Clause - 7.3.8)

An organization must document a procedure to transfer design and development outputs to manufacturing. This is not just handing off and taking over of design from product development to the manufacturing department. Rather, it means that product development has made sure that the design can be translated to production and records of such transfer are maintained.

The requirements of the standard are:
• Develop procedures to control design and development transfers.
• Employ organization's procedures to control design and development transfers.
• Record design and development transfer results and conclusions.

Control design and development changes (Clause - 7.3.9)

The procedure for design and development of the medical devices should include a mechanism to control design and development changes. A design change can be needed at any time based on review, verification, validation, complaints, risk mitigation, manufacturing issues, etc. Prior to change enforcement, it should be reviewed, verified, validated, and approved against design inputs and requirements.

Engineering change order request is also used to fulfill these requirements.

The requirements of the standard are:
• Establish procedures to control design and development changes.
• Use organization's procedures to control design and development changes.
• Keep a record of medical device design and development changes.

Maintain design and development files (Clause - 7.10)

The organization should maintain a design and development file for

each medical device design. The file may include reference records of conformity to design requirements, records of review, verification, validation, and changes.

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Purchasing (Clause - 7.4)

Purchasing is divided into three sub-clauses:

Purchasing process (Clause - 7.4.1)

This clause is about establishing purchasing process.

- Develop procedures to control product purchases.
- Develop supplier evaluation and selection criteria.
- Develop supplier monitoring and re-evaluation plans.
- Monitor the performance of company's suppliers.
- Act whenever suppliers fail to meet purchasing requirements.
- Develop supplier evaluation, selection, and monitoring records.

Purchasing information (Clause - 7.4.2)

This clause is about Clarifying purchasing information, it offers three requirements:

- Plan organization's product purchases.
- Review purchase requirements before sharing them.
- Maintain organization's purchasing documents and records.

Verification of purchased product (Clause - 7.4.3)

This clause is about verification of purchased products.

• Develop methods and activities to verify purchased products.
• Make arrangements to verify the products organization plans to purchase.
• Verify that organization's purchased products meet purchase requirements.
• Consider what to do when changes are made to purchased products.
• Establish and maintain a record of purchased product verification.

Production and Service Provision (Clause - 7.5)

Clause 7.5 is divided into eleven clauses. These are:

- Control of production and service provision (Clause - 7.5.1)
- Cleanliness of product (Clause - 7.5.2)
- Installation activities (Clause - 7.5.3)
- Servicing activities (Clause - 7.5.4)
- Particular requirements for sterile medical devices (Clause - 7.5.5)
- Validation of processes for production and service provision (Clause - 7.5.6)
- Particular requirements for validation of processes for sterilization and sterile barrier systems (Clause - 7.5.7)
- Identification (Clause - 7.5.8)
- Traceability (Clause - 7.5.9)
- Customer property (Clause - 7.5.10)
- Preservation of product (Clause - 7.5.11)

Control of production and service provision (Clause - 7.5.1)

This clause is about controlling medical device production and service provision

• Plan organization's production and service provision activities.
• Carry out production and service provision activities.
• Monitor production and service provision activities.
• Control production and service provision activities.

Cleanliness of product (Clause - 7.5.2)

This clause defines requirements for cleanliness and contamination control. The requirements are:

• Identify products that organization's clean prior to sterilization or use.
• Document and maintain organization's cleanliness or contamination control requirements for products that you clean prior to sterilization or use.
• Identify products that cannot be cleaned prior to sterilization or use.
• Document and maintain organization's cleanliness or contamination control requirements for products that can't be cleaned prior to sterilization or use.
• Identify products supplied non-sterile to be cleaned before sterilization or use.
• Document and maintain cleanliness or contamination control requirements for products supplied non-sterile to be cleaned before sterilization or use.
• Identify products that must be clean when used but are supplied non-sterile.
• Document and maintain cleanliness or contamination control requirements for products that must be clean when used but are supplied non-sterile.
• Identify process agents that must be removed from product during manufacture.
• Document and maintain cleanliness or contamination control requirements for process agents that must be removed from products during manufacture.

Installation activities (Clause - 7.5.3)

This clause specifies product installation and verification requirements. The requirements are:

• Establish medical device installation requirements.
• Document organization's medical device installation requirements.
• Establish medical device installation verification requirements.
• Document organization's installation verification requirements.

Servicing activities (Clause - 7.5.4)

This clause is about developing servicing procedures and reference materials.

• Develop medical device servicing procedures and reference materials.
• Document organization's medical device servicing procedures and

reference materials.
• Use organization's procedures and materials to control medical device servicing activities.
• Maintain a record of organization's medical device servicing activities.
• Recognize improvement opportunities and servicing complaints.

This clause applies to organization who are involved in servicing of medical devices.

Particular requirements for sterile medical devices (Clause - 7.5.5)

This clause is about maintaining a record of sterilization process parameters.

• Develop a record of organization's sterilization process parameters.
• Record sterilization process parameters for each batch of medical devices.

Validation of processes for production and service provision (Clause - 7.5.6)

This clause is about validating processes used for production and service provision. Requirements are:

• Recognize processes that generate output that are not or cannot be verified by subsequent monitoring and measurement until it's too late.
• Develop procedures to validate production and service delivery processes and software applications that could influence products and services.
• Validate processes and software applications that could generate output deficiencies and could influence your products and services.

Particular Requirements for Sterile Medical Devices (Clause 7.5.5)

Medical sterilization is therefore critically important because, in surgery, it allows three different medically safe conditions:

• Sterilization ceases the growth of bacteria on instruments, eventually preventing the transfer of bacteria to the patient.
• Sterilization stops the spread of deadly diseases, like HIV, from instruments to patients.
• Sterilization avoids infection that may need additional surgery.

Records of process parameters of sterilization of each batch

Sterilization process parameters need to be recorded for each batch. Process parameters include pressure within sterilization unit, temperature within sterilization unit, gas flow rate in the unit, operator name, and environmental conditions like humidity, etc. All process parameters that can affect product quality, in terms of sterilization, have to be recorded.

Traceability

All batches of sterilization should be traceable. This means that you can trace back the packed, shipped, and customer-returned instruments through the sterilization records (in which they were recorded).

Process Validation in Medical Devices Industry

Quality of medical devices is verified by an inspection or some predefined quality tests, so as to demonstrate that the process has produced an output (in-process or final) that meets the product requirements.

What should we do with processes whose outputs cannot be verified (due to destructive testing, unverified product characteristics, or expensive inspection)? The solution to this problem is process validation. Thus, ISO 13485:2016, under clause 7.5.6, mandates that organizations validate those processes for which verification is not possible.

Identify Processes

The first step for organizations to validate their processes is to identify processes where outputs cannot be verified. The organization should make a list of such processes where verification is not possible.

Validation of sterilization processes

A procedure must be developed to address validation of sterilization processes. Validation will be necessary if there is a change or addition to a process or a product.

For example, you install a chlorine dioxide sterilization unit in your sterilization department. Before going into regular production, you must validate this equipment as to whether it removes microorganisms from bio-contaminated instruments, or not.

Validation of sterile barrier system

A sterile barrier system is a system that includes minimum adequate barriers to protect medical devices from microorganism contamination; this can be done with a closed controlled room containing bio-sensors

for the packaging of medical devices, sensors and alarms indicating there is bio-contamination within the room, and stoppage of the process until the room environment is compliant.

Sterile barrier systems need to be validated with a defined procedure; for example, devices are tested for micro-biological contamination after going through these systems as part of the validation process. The sterile barrier system should be validated again if there is a change to any control of the barrier system, or a change in the design of system (for example, changes to the bio-sensors).

Validation of Computer Software

Validation of computer software were already discussed in Topic 1"Quality Management System requirements" of Module 1.

Traceability (Clause - 7.5.9)

Clause 7.5.9 is divided into two clauses:

Establish suitable product traceability procedures (Clause - 7.5.9.1)

- Develop organization's product traceability procedures.
- Implement organization's product traceability procedures.
- Maintain organization's product traceability procedures.

Establish suitable records for implantable devices (Clause - 7.5.9.2)

- Establish organization's traceability records for implantable medical devices.
- Direct suppliers of distribution services to have distribution records.

Customer property (Clause - 7.5.10)

This clause is about protection of property supplied for medical devices by customers. Requirements are:

- Recognize property supplied by customers to be utilized by medical devices.
- Verify property supplied by customers to be utilized by medical devices.
- Protect property supplied by customers to be utilized by medical devices.
- Keep a record of customer property that is lost, damaged, or unsuitable.
- Communicate lost, damaged, or unsuitable customer property to

customers.

Preservation of product (Clause - 7.5.11)

This clause is about Preservation of medical device products and components. Requirements are:

• Establish procedures to preserve the conformity of products.
• Document and maintain your product preservation procedures.
• Use organization's procedures to preserve the conformity of products.
• Prevent medical device damage, alteration, and contamination.
• Protect products when exposed to hazards and expected conditions.

Control of Monitoring and Measuring Equipment (Clause - 7.6)

This clause is about measurement requirements. Requirements are:

- Identify and recognize monitoring and measurement requirement.
- Choose proper monitoring and measurement equipment.
- Develop organization's monitoring and measurement procedures.
- Prepare organization's calibration and verification plans and procedures.
- Safeguard organization's organization's monitoring and measurement equipment.
- Establish monitoring and measurement software validation procedures.

Bibliography

1 ISO. 2016. ISO 13485:2016, Third Edition: Medical devices - Quality management systems - Requirements for regulatory purposes. 3rd ed. Washington, DC 20036: American National Standards Institute (ANSI) Publications.

2 13485Academy. 2019. ISO 13485:2016 – Managing the medical device sterilization process. [ONLINE] Available at: https://advisera.com/13485academy/blog/2017/06/28/how-to-manage-the-medical-device-sterilization-process-according-to-iso-13485/. [Accessed 08 May 2019].

The key points from this module are:

Clause 4 - Organizational Requirements

Clause 4 outlines common QMS requirements such as the requirements for the Quality Manual, Control of Documents, and Control of Records, all of which are required documents in the QMS. Clause 4 consists of two sub-clauses - Clause 4.1 and 4.2.

Clause 4.1 is divided into six sub-sections:

- **Clause 4.1.1** - Develop a QMS
- **Clause 4.1.2** - Clarify Roles and Application of QMS
- **Clause 4.1.3** - Support Processes
- **Clause 4.1.4** and **4.1.5** - Manage Changes and Control Outsourcing
- **Clause 4.1.6** - Validation Software

Clause 4.2 is divided into five sub-sections:

- **Clause 4.2.1 -** Incorporate Information
- **Clause 4.2.2** - Create Manual
- **Clause 4.2.3** - Develop Medical Device files
- **Clause 4.2.4** - Control Documents
- **Clause 4.2.5** - Maintain Records

Clause 5 - Top Management Requirements

Clause 5 deals with the management responsibility requirements. It encompass the requirement for top management leadership to be active in the implementation and maintenance of the QMS. Clause 5 is divided into 5 sub-clauses:

- **Clause 5.1** - Leadership Commitment Requirements
- **Clause 5.2** - External Requirements
- **Clause 5.3** - Policy Requirements
- **Clause 5.4** - Planning Requirements
- **Clause 5.5** - Managerial Requirements
- **Clause 5.6** - Management Review Requirements- this sub-clause is divided into three sub-sections:
    - **Clause 5.6.1** - Perform Regular Management Reviews
    - **Clause 5.6.2** - Study Management Review Inputs
    - **Clause 5.6.3** - Generate Management Review Outputs

Clause 6 - Resource Requirements

Clause 6 on management of resources is brief, but encompasses all the requirements to manage various types of resources, for instance human resources, buildings, and infrastructure, equipment and technology, and the work environment. Clause 6 is divided into 4 sub-clauses:

- **Clause 6.1** - Allocation Requirements
- **Clause 6.2** - Personnel Requirements
- **Clause 6.3** - Infrastructure Requirements
- **Clause 6.4** - Environmental Requirements

Clause 7 - Product Realization

Clause 7 incorporates requirements on purchasing, planning, product requirements review, design and development. Clause 7 is divided into six sub-clauses:

- **Clause 7.1** - Planning of Product Realization
- **Clause 7.2** - Customer-Related Processes - this sub-clause is divided into three sub-sections:
    - **Clause 7.2.1** - Determination of requirements related to product
    - **Clause 7.2.2** - Review of requirements related to product
    - **Clause 7.2.3** - Communication
- **Clause 7.3** - Design and Development - this sub clause is divided into ten sub-clauses which outline the requirements of the design and development of medical devices in relation to: planning, inputs, outputs, review, verification, validation, changes and files.
- **Clause 7.4** - Purchasing - this sub-clause is divided into three sub-sections:
    - **Clause 7.4.1** - Purchasing Process
    - **Clause 7.4.2** - Purchasing Process
    - **Clause 7.4.3** - Verification of Purchased Product
- **Clause 7.5** - Production and Service Provision - this sub-clause is divided into eleven sub-sections:
    - **Clause 7.5.1** - Control of Production and Service Provision
    - **Clause 7.5.2** - Cleanliness of Product
    - **Clause 7.5.3** - Installation Activities
    - **Clause 7.5.4** - Servicing Activities
    - **Clause 7.5.5** - Particular requirements for sterile medical devices
    - **Clause 7.5.6** - Validation of processes for production and service provision
    - **Clause 7.5.7** - Particular requirements for validation of processes for sterilization and sterile barrier systems
    - **Clause 7.5.8** - Identification
    - **Clause 7.5.9** - Traceability
    - **Clause 7.5.10** - Customer Property
    - **Clause 7.5.11** - Preservation of Product