MODULE 11 | EQUIPMENT, MAINTENANCE, ASSETS AND DISPOSAL

Equipment Maintenance, Safety and Service Continuity

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LECTURE

Practical hospital governance in Punjab, Pakistan

Keep equipment safe and usable.
Keep patient care running when it fails.

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SELF-STUDY PDF

Maintenance protects the service, not only the machine

The Medical Superintendent needs evidence that equipment is safe, maintained and supported by a workable alternative when it is unavailable.

- Separate maintenance, testing and calibration.
- Assign work to competent people.
- Check service contracts and completed work.
- Measure downtime and protect patient care.

OFFICIAL SOURCE

A principle tied to a named law, standard or official guidance.

WORKING METHOD

A practical control or teaching format to adapt to the authorised system.

TEACHING CASE

An invented hospital example, used to practise applying the correct process.

Study output

A maintenance review for one service, with checked records, a continuity plan and decisions requiring approval.

Module 11 | Presentation 2 of 3. Allow 45-60 minutes with exercises. All explanations are on the pages; check the cited sources before live use.

Know the requirement behind the maintenance plan

Use the applicable Punjab standards, device requirements and signed contract. International guidance supports the working method.

Punjab Healthcare Commission

- Indicator 124 requires suitable qualifications, experience and training for equipment users and maintenance staff, with detailed arrangements for outsourced work.
- Indicator 125 requires a written schedule based at least on original equipment manufacturer (OEM) guidance and documented implementation.

Institutional application

- Match every device to its instructions, service history, licence conditions and any applicable specialist inspection requirements.
- Approve named responsibilities, resources and escalation routes. A maintenance budget does not authorise an unqualified person to repair equipment.

An OEM interval is not replaced by a general instruction to service every machine once a year.

Sources: **M1**: indicators 122, 124-125

The medical-device rules require an organised system

Medical Devices Rules, 2017, rule 55 links safe use with an active maintenance and reporting system in the healthcare facility.

Requirement	What to establish
Use and acceptance	Intended use and manufacturer instructions; verification of safety and performance before acceptance.
Inventory and maintenance	Current inventory and procedures for proper maintenance and calibration.
Safety response	Timely response to alerts, recalls, defects and adverse events.
Adverse-event reporting	A procedure to report device adverse events to the relevant manufacturer and Medical Device Board (MDB).

This is a summary of selected duties. Read the full rule with later amendments and the conditions relevant to the device.

Sources: **M9**: rule 55(1)-(3)

Give each decision an accountable owner

The exact posts follow the institution’s approved structure. Responsibility for clinical care and responsibility for technical release must both be clear.

Role	Main responsibility	Evidence
MS / executive	Resolve risks, resources and authority gaps.	Decisions, owners and follow-up dates.
Clinical / nursing lead	Safe use, patient alternatives and user checks.	Competence records and continuity plan.
Biomedical / technical lead	Assess faults, plan work and verify technical safety.	Work orders, tests and release record.
Procurement / finance	Contract, approval and payment controls.	Sanction, agreement and checked bill.

The contractor’s visit does not transfer the hospital’s responsibility for safe service delivery.

WORKING METHOD | Illustrative material is identified in the text.

Different maintenance terms answer different questions

Ask what was done and what the result proves. A label saying “serviced” does not answer every question.

Activity	Meaning	Question for the MS
Preventive maintenance	Planned work intended to reduce failures.	Was the specified work completed on time?
Corrective maintenance	Finding and correcting an identified fault.	Was the cause corrected and the repair tested?
Performance inspection	Checking operation against stated specifications.	Does the device perform as required?
Safety inspection	Checking relevant risks to patients and staff.	Have the required safety checks passed?
Calibration	Comparison with an appropriate measurement reference.	Are results acceptable for the intended use?

Calibration, adjustment and repair are different activities. Ask for actual results and the acceptance criteria.

Sources: **M2**: section 3

Start from a checked maintenance inventory

The financial asset register and the technical equipment record should refer to the same physical item.

01 Identity

Asset tag, manufacturer, model and serial number.

02 Location

Department, current room and responsible custodian.

03 Status

In use, reserve, under repair or withdrawn from service.

04 Support

Warranty, contractor, manuals and support end date.

05 Work plan

Required tasks, intervals, last work and next due date.

06 History

Faults, parts, test results, costs and safety actions.

Reconcile the record to the equipment in the ward. Include loan, donated and backup equipment within the relevant control system.

Sources: **M3**: chapters 4-5

Prioritise according to patient and service risk

Use a documented local assessment. A high purchase price alone does not identify the most urgent maintenance task.

Assess the consequence

- Could a failure harm a patient, give an incorrect result or interrupt a time-critical service?
- Is there a suitable backup, trained staff and a route to another service? How long can care safely continue?

Assess the likelihood and control

- Review age, use, environment, repeated faults, safety notices and overdue tasks with the technical lead.
- Give urgent hazards immediate action. Record priorities, temporary controls and the person who can approve the next decision.

Prioritisation helps allocate resources; it does not cancel a required test, manufacturer instruction or safety restriction.

WORKING METHOD | Illustrative material is identified in the text.

Set a schedule that can actually be completed

Planned preventive maintenance (PPM) needs a written basis, resources and access to the equipment.

1	**Define the task**	Use applicable OEM instructions, regulatory conditions and the equipment’s operating needs.
2	**Plan the interval**	Record the basis. PHC indicator 125 expects the schedule to be based at least on OEM guidance.
3	**Reserve the resources**	Arrange competent staff, test tools, parts, clinical access and a safe alternative service.
4	**Close each task**	Record the work and results. Escalate missed tasks with a risk assessment and a new action date.

Clinical workload is a reason to arrange safe access; it is not evidence that overdue maintenance has been completed.

Sources: **M1**: indicator 125 | **M2**: sections 5.3, 6.1

User checks do not replace technical maintenance

Users need an equipment-specific checklist within their training and the approved instructions for use.

Before and during use

- Check the required accessories, visible condition, supplies, battery or power status and specified self-tests.
- Report damage, abnormal readings, alarms or repeated restarts. Record the device identity and the time of the problem.

Limits of the user’s role

- Do not bypass alarms, open protected components or make unauthorised changes to keep a service moving.
- Activate the clinical alternative when safety is uncertain. The trained technical team decides the required investigation and tests.

The checklist must fit the device. There is no universal daily test that proves every item is safe.

WORKING METHOD | Illustrative material is identified in the text.

Match competence and tools to the task

In-house maintenance and outsourced maintenance can both be appropriate when the necessary competence and resources are available.

Before assigning work

- Rules 57-58 require training for users and those installing, testing, maintaining or calibrating a device. Check competence for the actual model and task.
- Confirm access to suitable test equipment, reference standards, tools and compatible parts. Check their status before use.

When work is outsourced

- Check service-provider authorisation from the manufacturer or its authorised agent under rule 55(4), as well as competence, covered models and tasks.
- Retain service records in the hospital. Plan for leave, contract expiry and gaps in after-hours support.

Check rule 55(4) for anyone acting as a service provider; employment status alone does not establish authority or competence.

Sources: **M1**: indicators 124-125 | **M9**: rules 55(4), 57-58

Use one work order from report to closure

A work order is the record of the problem, the work authorised, the results and the decision to return the item to use.

1	**Identify and report**	Record asset identity, location, symptoms, time, patient impact and the person reporting.
2	**Assess and authorise**	Record risk, priority, diagnosis, approval route and the safe arrangement while work is pending.
3	**Perform and verify**	Record who worked, parts fitted, settings changed, test method, results and unresolved faults.
4	**Release and close**	Record technical release, clinical handover, dates, costs and the next maintenance requirement.

One device may have several visits. Keep them linked to the same fault so repeated failures remain visible.

Sources: **M3**: chapter 5

Respond to a breakdown without losing evidence

Patient protection comes first. The clinical and technical leads should act together.

1	**Protect the patient**	Use the approved clinical alternative; obtain urgent clinical support where needed.
2	**Control the device**	Prevent unintended reuse. Label and segregate it when safe, with its accessories and identity.
3	**Preserve the record**	Keep relevant logs, settings, parts and event details. Avoid unnecessary resetting or alteration.
4	**Investigate and escalate**	Open the work order and incident record. Check reporting duties, related devices and wider service impact.

For an incident involving harm or a suspected device defect, a repair record alone is not a complete investigation.

WORKING METHOD | Illustrative material is identified in the text.

Require evidence before return to service

Release follows the device-specific procedure, risk and work performed. A power-on check may not be enough.

Check	Evidence expected
Work completed	Fault, action, parts and remaining limitations are stated.
Tests passed	Relevant performance and safety tests have recorded results and acceptance criteria.
Safe handover	Cleaning, accessories, settings and user information are checked as applicable.
Release recorded	A competent authorised person signs the technical release; the receiving service acknowledges handover.

If a result is outside the allowed limit, keep the item controlled and escalate. A signature cannot make a failed test acceptable.

WORKING METHOD | Illustrative material is identified in the text.

Close the loop on incidents and safety notices

A field safety notice communicates a device safety action. The action may involve a recall, modification, exchange or changed instructions.

Identify the affected equipment

- Check the notice against manufacturer, model, serial number, software version and affected accessories.
- Find every matching device, including ward, reserve, loan and recently transferred equipment. Preserve the search record.

Complete and verify the action

- Assign an owner for restriction, correction, communication and follow-up. Follow the actual notice and applicable reporting route.
- Confirm completion for each affected item, train users on changed instructions and retain evidence before closing the action.

Rule 55(2)(g) requires a procedure to report device adverse events to the relevant manufacturer and Medical Device Board (MDB).

Sources: **M5**: safety notices | **M6**: sections 2.3-2.5 | **M9**: rule 55(2)

Read the maintenance contract beyond its title

AMC commonly means Annual Maintenance Contract; CMC commonly means Comprehensive Maintenance Contract. The signed wording determines the coverage.

01 Equipment

Exact models, serial numbers, sites and accessories.

02 Planned work

Tasks, visits, tests, reports and access arrangements.

03 Repairs

Labour, travel, call-outs and specialist support.

04 Parts

Included parts, exclusions and approval for extras.

05 Software

Licences, updates, data access and support periods.

06 Service limits

Operating hours, response, restoration and remedies.

“Comprehensive” does not prove that probes, tubes, batteries, consumables or every software update are included.

Sources: **M8**: applicable rules and contract

Define the clock before measuring compliance

Response, attendance, diagnosis and restoration are separate events. Use the definitions in the signed contract.

Term	What must be agreed
Start time	Which report starts the clock, through which channel and with what evidence?
Time counted	Calendar hours or working hours? Which days, holidays and service hours apply?
Response / attendance	Is acknowledgement sufficient, or must a competent engineer attend?
Restoration / remedy	What counts as restoration, which exclusions apply, and what remedy is authorised?

Do not invent a standard response time, uptime guarantee, penalty or extension after a failure has occurred.

WORKING METHOD | Illustrative material is identified in the text.

Worked example: one fault, three different times

Invented contract: response means acknowledgement within 2 calendar hours; restoration within 24 calendar hours. No exclusions.

Fault reported	Monday 08:00, through the agreed reporting channel.
Acknowledged	Monday 09:30: 1 hour 30 minutes after reporting. The response target is met.
Engineer attends	Monday 12:00: 4 hours after reporting. This is not the response time unless the contract defines it so.
Service restored	Tuesday 14:00: 30 hours after reporting. The restoration target is exceeded by 6 hours.
Administrative action	Verify technical release and timestamps; apply only the signed contract’s notice and remedy provisions.

The example does not establish a Punjab-wide deadline or an automatic financial deduction.

TEACHING CASE | Illustrative material is identified in the text.

Manage spare parts without creating unsafe stock

Part availability affects downtime. Uncontrolled substitution can create a new fault or safety risk.

Before ordering or fitting

- Check the exact part and revision, compatibility, traceable source, warranty effect and technical approval.
- Assess lead time, criticality, shelf-life and storage needs. Record the reason for holding an expensive spare.

After replacement

- Link the part to the asset and work order. Record the removed part’s condition and any warranty-return obligation.
- Keep removed parts under custody. Reuse, transfer, disposal or vendor return needs the relevant technical and administrative authority.

Do not cannibalise another asset informally. Its identity, value, future use and technical safety must remain traceable.

WORKING METHOD | Illustrative material is identified in the text.

Separate attendance, acceptance and payment

A signed attendance sheet proves a visit. It does not, by itself, prove that the contractual service was completed.

1	**Check the obligation**	Match the claim to the contract, approved order, covered period and equipment list.
2	**Check the evidence**	Compare work orders, service reports, parts and test results with the work claimed.
3	**Record acceptance**	The authorised reviewer records satisfactory work, exclusions, defects and any unresolved claim.
4	**Process the bill**	Finance checks authority, budget, contract terms, applicable deductions and absence of duplicate payment.

Use the lawful approval and dispute process. Technical staff verify work; payment is made only through the authorised financial process.

WORKING METHOD | Illustrative material is identified in the text.

Write a continuity plan for the service

A spare device is useful only if it is ready, suitable and supported by trained staff.

01 Trigger

Define who declares the service restricted or unavailable.

02 Alternative

Identify a tested backup, safe workflow or referral route.

03 Capacity

Check staff, supplies, transport and receiving capacity.

04 Communication

Tell clinical teams, scheduling staff and patients as needed.

05 Recovery

Set the checks and authority for restarting the service.

06 Review

Record delayed care, lessons and corrective actions.

Test the plan with a practical exercise. Include loss of power, network access and essential supporting systems.

WORKING METHOD | Illustrative material is identified in the text.

Worked example: equipment availability

Teaching definition: available hours divided by the hours the device was required for service. All figures are invented.

Required service	30 days × 8 scheduled hours per day = 240 required hours.
Unavailability	A fault causes 18 hours of lost service during those required hours. No other downtime occurs.
Available hours	240 − 18 = 222 hours.
Availability	222 ÷ 240 × 100 = 92.5% for this defined service window.
Interpretation	Count all downtime within the stated window. Do not replace 240 with 720 calendar hours to improve the result.

This is a local operational measure, not a universal pass mark or a substitute for the contract’s uptime formula.

TEACHING CASE | Illustrative material is identified in the text.

Worked example: maintenance completion

Teaching definition: tasks completed by their due date divided by tasks due in the period. Count tasks consistently.

Tasks due	40 maintenance tasks are due during the month.
Completed on time	34 are completed by their due date: 34 ÷ 40 × 100 = 85% on-time completion.
Completed late	4 more finish late by month-end: 38 ÷ 40 × 100 = 95% completed by month-end.
Still outstanding	2 remain incomplete. The 95% figure must not be described as 95% on time.
Risk review	Show the overdue high-risk items and reasons separately. Completing many low-risk tasks can hide one dangerous gap.

Do not remove an overdue task from the denominator because access or parts were unavailable.

TEACHING CASE | Illustrative material is identified in the text.

Keep records usable, whether on paper or in software

An inventory and maintenance management information system links equipment identity, planned work, faults and service history.

Data that can be trusted

- Use a unique identifier, defined status fields, dated entries and links to original work and test records.
- Reconcile moved and retired items, separate open from closed work, and retain the reason for corrected entries.

Information that can be used

- Control access, back up records and test recovery. Keep a practical recording method for periods when the system is unavailable.
- Produce lists of overdue work, unresolved faults and repeated failures. A dashboard should lead to a named decision or action.

Software does not replace inspection of the equipment or verification that recorded work occurred.

Sources: **M3**: chapters 4-5, 8

Treat connected equipment as a shared responsibility

Clinical teams, biomedical staff, information technology staff and the supplier must manage changes together.

Before a software or network change

- Identify the device version, approved configuration, data links and manufacturer support status.
- Assess compatibility and patient risk; plan the update, relevant tests, backup and recovery arrangements.

During a security incident

- Use the incident response plan to protect care and control access. Preserve logs and involve the appropriate technical specialists.
- Test restoration before returning the full service. Record any continuing restrictions and the decision on unsupported systems.

Apply device-specific security controls. An unplanned update or disconnection can itself interrupt essential care.

Sources: **M4**: sections 6.1, 6.4-6.6

Specialist systems need specialist controls

Equipment safety depends on supporting services and the rules relevant to the particular installation.

Radiation facilities

- Check the Pakistan Nuclear Regulatory Authority (PNRA) licence, conditions and applicable regulations for the facility and relevant service provider.
- Involve the responsible radiation-protection and technical personnel before repair, modification, relocation or return to service.

Other technical systems

- Electrical distribution, medical gases, lifts, pressure systems and fire protection need appropriately competent personnel and applicable approvals.
- Identify each system’s regulator or inspecting authority, certificate, next required action and service-continuity arrangement.

A general equipment service report does not replace a specialist certificate, licence condition or required inspection.

Sources: **M7**: radiation framework

Use faults to improve training and system design

A failure labelled “user error” still needs an explanation of how the system allowed it to occur.

Questions for the review

- Was the user trained on this model and task? Were instructions, accessories and supervision available?
- Did labelling, a confusing control, poor storage, an unsuitable environment or an overdue task contribute?

Actions that can be checked

- Provide targeted training with a practical competence check; retain evidence and cover all relevant shifts.
- Change the process or equipment arrangement where justified. Check whether the same fault recurs after the action.

Use fair fact-finding. Protect patient safety immediately, while any individual accountability follows the applicable service process.

WORKING METHOD | Illustrative material is identified in the text.

Ask for a short dashboard with decisions attached

These are suggested local measures. Define each denominator and do not use a single percentage to hide an urgent risk.

Measure	Question for action
Safety restrictions	Which devices or services remain unsafe or restricted, and who owns the next decision?
Overdue work	Which required tasks are late, for how long, and with what patient risk?
Downtime / recurrence	Where are delays and repeat failures occurring, and is the backup working?
Support and spending	Which contracts, parts or support periods are ending, and what approval is needed?

Track action owner, due date, evidence of completion and residual risk. Close an action only when its outcome is verified.

WORKING METHOD | Illustrative material is identified in the text.

Teaching case: the only scanner has failed

An invented hospital reports a scanner failure. The contractor has attended, but the replacement part will take five days.

Clinical question	Which patients need urgent alternative imaging, and can the receiving service accept them?
Technical question	What is the diagnosed fault, the part specification, the repair plan and the required release testing?
Contract question	What does the agreement cover, which clock is running, and what evidence supports the claim?
MS decision	Approve or seek the required authority for the continuity arrangements. Record owners, deadlines and escalation.
Closure	Verify safe restoration, patient follow-up, the bill and the cause of the delay. Update the contingency plan.

The supplier’s attendance closes neither the service disruption nor the hospital’s responsibility to affected patients.

TEACHING CASE | Illustrative material is identified in the text.

Three decisions to practise

Write your answer and the reason before turning to the next page.

1. “Yearly is enough”

A manager changes every device to annual servicing to simplify the schedule. Some OEM instructions require a shorter interval.

What must be checked before adopting the schedule?

2. “The device is on”

After a repair, a machine powers on. No relevant test results or signed technical release are available.

What is required before routine return to use?

3. “95% completed”

40 tasks were due. 34 finished on time, 4 late and 2 remain open. The report claims 95% on-time completion.

Calculate the correct figure and identify the missing risk information.

Give the reason for each answer. A sound decision should identify the evidence required and the responsible person.

TEACHING CASE | Illustrative material is identified in the text.

Answers and reasons

Use the evidence, the calculation and the cited source.

1. Check the actual required intervals.

Review applicable OEM instructions, specialist conditions and PHC indicator 125. Arrange resources and clinical access; a convenient common interval is not the required basis.

2. Verify the relevant tests and release.

Ask the competent technical lead to document completed work, applicable performance and safety test results, acceptance criteria and authorised handover. Power-on alone may not establish safe function.

3. On-time completion is 85%.

34 ÷ 40 × 100 = 85%. Month-end completion is 95%, including late tasks. Identify the two open tasks, all lateness and whether any high-risk equipment is affected.

The calculation is only useful when the underlying task list, dates and evidence are reliable.

Sources: **M1**: indicator 125

Prepare one service maintenance review

Use a non-confidential real case or the invented examples in this lecture.

1. Equipment and work

Check five devices against the inventory, required work, latest tests and current status.

2. Contract and continuity

Review one service contract and explain the actual backup or referral arrangement.

3. Decision and follow-up

Prepare a short risk list with evidence, costs, authority, owners and review dates.

Review with the clinical and technical leads. Can each device be used safely, and can the service continue if it fails?

Use anonymised information for teaching. This assignment does not authorise a repair, purchase, payment or disposal.

WORKING METHOD | Illustrative material is identified in the text.

Sources and continued use | 1

Select a source title or its official-source link to open the document.

M1

Minimum Service Delivery Standards for Hospitals

PHC, 2024 cover edition; CG-01MS-Ed2-01092023. Standard 22, FMS-2, indicators 122-125: equipment planning, trained staff, maintenance schedules and implementation evidence.

Punjab Healthcare Commission | **Official source**

M2

Medical equipment maintenance programme overview

WHO, 2011; ISBN 9789241501538. Sections 3-6 address inspection, maintenance planning, resources, frequency, service providers and programme implementation. International guidance, not Punjab law.

World Health Organization | **Official source**

M3

Inventory and maintenance management information system for medical devices

WHO, 4 June 2025; ISBN 9789240111257. Chapters 4-5 and 8 address inventory, maintenance records and monitoring. Replaces the two WHO inventory and CMMS publications of 2011.

World Health Organization | **Official source**

Educational material by Dr Qurban Hussain Khan. Source editions are stated; verify later amendments and applicable institutional orders before live use.

Sources and continued use | 2

Select a source title or its official-source link to open the document.

M4

Principles and Practices for Medical Device Cybersecurity

IMDRF/CYBER WG/N60FINAL:2020. Sections 6.1, 6.4-6.6 address connected devices, updates, incident response and older systems. International technical guidance, not a Punjab legal requirement.

International Medical Device Regulators Forum | **Official source**

M5

Safety information for medical devices, including in vitro diagnostics

WHO technical webpage, accessed 5 October 2026. Explains field safety notices and actions including modification, exchange and recall. Apply the notice specific to the affected device.

World Health Organization | **Official source**

M6

Guidelines on Good Distribution Practices for Medical Devices

MDB/GD No. 2; approved 17 October 2016. Sections 2.3-2.5 address complaints, field actions and recall; section 6.1 addresses installation and servicing. Duties must be read within the document’s supply-chain scope.

Drug Regulatory Authority of Pakistan | **Official source**

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Sources and continued use | 3

Select a source title or its official-source link to open the document.

M7

Radiation protection and the regulatory framework

PNRA official radiation-protection webpage and regulations catalogue, accessed 5 October 2026. Check PAK/904, PAK/908, current amendments and the specific facility/service-provider licence conditions.

Pakistan Nuclear Regulatory Authority | **Official source** | **Regulations catalogue**

M8

Punjab Procurement Rules, 2014, with amendments

Punjab PPRA official rules catalogue. Apply the current rules, approved bidding documents and signed service contract. AMC/CMC labels do not determine included parts, response times or payment terms.

Punjab Procurement Regulatory Authority | **Official source**

M9

Medical Devices Rules, 2017

DRAP-hosted text amended through April 2022; read with later notified amendments. Rules 55, 57 and 58 address maintenance systems, incident reporting, service providers and trained users/maintainers.

Government of Pakistan; Drug Regulatory Authority of Pakistan | **Official source**

Educational material by Dr Qurban Hussain Khan. Source editions are stated; verify later amendments and applicable institutional orders before live use.