

CHTM Memorization Sheet

Print this and keep it beside you. The CHTM exam rewards recall of the financial formulas, the risk tools and the laws behind them, the operations metrics a department reports, who regulates what, how training is justified and measured, and the labor laws a manager must not break. Every number and name on this sheet is fair game.

01 The exam itself

FACT	VALUE
Certifying body	The AAMI Credentials Institute (ACI), the credentialing arm of AAMI
Credential	Certified Healthcare Technology Manager (CHTM), for HTM supervisors and managers
Questions	100 multiple-choice questions
Time and rules	2 hours, closed book; an on-screen calculator and an on-screen notepad are the only tools
Delivery	Computer-based at Kryterion test centers
Testing windows	Twice a year: May 1 to 15 and November 1 to 15
Domain 1	Financial Management, 20% of the exam
Domain 2	Risk Management, 16% of the exam
Domain 3	Operations Management, 40% of the exam
Domain 4	Education and Training, 11% of the exam
Domain 5	Human Resources, 13% of the exam
Scoring method	A criterion-referenced cut score set by the modified Angoff method; the cut score is not published
Results	Reported as pass or fail, with no numeric score
Fee	\$490 member, \$565 non-member; retake \$440 member, \$515 non-member
Retake rules	Wait 60 days between attempts; at most three attempts in two years, then a one-year wait
Recertification	At least 30 continuing education units (CEUs) in a three-year cycle, with fees paid by December 31 of the year the credential expires. One CEU is one hour of qualifying activity
Other ACI credentials	CABT for associates entering the field, CBET for technicians, CRES for imaging specialists; the CHTM is the management credential. A CABT alone does not satisfy an eligibility pathway
How the questions read	They ask for the FIRST step, the BEST recommendation, the MOST appropriate report, committee, or document, and now and then the LEAST appropriate action
ELIGIBILITY PATHWAY	WHAT IT REQUIRES
1. Current technician or engineer credential	A current CCE , CBET , CRES , or CLES plus at least three years of work as an HTM supervisor or manager in the last five
2. Military training	The Department of Defense (DoD) BMET training program plus three years of military or civilian HTM supervisor or manager experience in the last five
3. Associate degree	An associate degree in biomedical technology, a related healthcare discipline, information technology, or business plus three years as an HTM supervisor or manager in the last five
4. Bachelor's degree or higher	A bachelor's degree or higher in biomedical technology, engineering, a related healthcare discipline, information technology, or business plus two years as an HTM manager in the last five
5. Experience alone	Seven years in the HTM field with three years of management experience in the last five

ELIGIBILITY PATHWAY	WHAT IT REQUIRES
Attestation rule	A pathway without the supervisor or manager title needs confirmation of management duties by self-attestation or third-party attestation

This course's official-format test uses 70%, the same bar as our **CBET** and **CRES** courses; **ACI** publishes no cut score.

02 Financial management

BUDGET OR TERM	WHAT IT MEANS TO THE MANAGER
Operating budget	Next year's spending on labor, parts, contracts, outside service, calibration, tools and minor equipment, office supplies, travel, memberships, education, and shop meetings
Capital budget	Requests above the hospital's dollar threshold for items with a long useful life: a system, test equipment, a shop expansion. It competes with every other capital request in the hospital
Who approves what	The manager builds both. The operating budget is approved up the manager's own chain with finance; the capital budget is approved by the capital or technology committee and senior leadership, because capital money is rationed across the whole hospital
When budgets are built	Three to six months before the fiscal year starts
Fiscal year	The hospital's twelve-month accounting year. It often does not match the calendar year, so know which one a request is aimed at
Cost center	The numbered account a department's costs post to. Every work order, part, and contract payment should trace to one
Chart of accounts	The hospital's list of cost centers and subaccounts. The HTM budget is reported in those subaccount numbers, not in categories HTM invents
Distributed budgeting	HTM holds only shop costs: labor, calibration, training, supplies. Contracts, parts, and outside labor stay with whichever clinical cost center owns the device, which leaves nobody able to see total maintenance cost or hold a vendor to terms
Consolidated budgeting	Every equipment dollar is moved under the HTM cost center, then allocated back to the clinical cost centers from CMMS reports. This is the better model, because the department that pays can withhold payment until service reports arrive
The irregular-cost trap	A large cost that recurs on a long interval, such as an eighteen-month part, must be budgeted on its interval. Last year's spend may not contain it at all
Purchase order cost	Raising one purchase order carries roughly \$100 of hospital overhead, so many small orders waste more than the lower part price ever saves
Fiscal agreement	Consolidation only works with a written understanding among HTM , the clinical departments, and the chief financial officer on priorities and on how a repair that exceeds the budget still gets done

WHAT YOU SPEND MONEY ON	WHERE IT POSTS IN THE GENERAL LEDGER
Technician and supervisor wages	Salaries, the payroll line
Overtime and on-call pay	Salaries. Track it as its own line: rising overtime is the first sign of understaffing
Repair parts bought by HTM	Maintenance and repairs
Service contracts and vendor labor	Purchased maintenance and repair
Shop consumables and small supplies	Office supplies or medical and surgical inventory, by what the item is
Test equipment calibration	Maintenance and repairs, or a calibration line if the hospital has one
Training tuition, travel, and lodging	Travel and education. Training is an expense because it cannot be depreciated

WHAT YOU SPEND MONEY ON	WHERE IT POSTS IN THE GENERAL LEDGER
A replacement monitoring system	Capital, not operating. It is depreciated over its useful life rather than expensed this year

FORMULA	STATEMENT AND WORKED EXAMPLE
Budget variance	Variance = actual minus budget. \$112,000 actual against a \$100,000 budget is a \$12,000 variance
Variance percent	Variance / budget x 100. \$12,000 / \$100,000 x 100 = 12%. Accounting usually wants a written explanation once a month lands 5% or 10% off its budget
Favorable or unfavorable	An expense that comes in under budget is favorable; over budget is unfavorable. Over-expenditure is what gets the attention
ROI percent	$ROI = (\text{gain minus cost}) / \text{cost} \times 100$. A \$25,000 school that avoids \$90,000 of contract cost: $(90,000 \text{ minus } 25,000) / 25,000 \times 100 = 260\%$
Payback period	Payback = cost / annual savings. A \$100,000 project returning \$20,000 a year pays back in five years. Shorter is better
Total cost of ownership	TCO = purchase plus installation plus service plus parts plus training plus disposal, across the life of the device. Compare TCO, never the sticker price
Straight-line depreciation	$(\text{Cost minus salvage value}) / \text{useful life, per year}$. A \$1,000,000 system over ten years with no salvage depreciates \$100,000 a year
Book value	Book value = cost minus accumulated depreciation. After three years that system books at \$700,000, and that number says nothing about remaining useful life or resale value
Cost of service ratio	COSR = annual service cost / acquisition cost x 100. \$5,000 a year on a \$125,000 system is 4%
Reading a COSR	Across a hospital, 4% to 25% is the normal band. Manufacturer service typically runs 10% to 25%; full in-house service can reach 4% to 6%
COSR on a quoted contract	Divide the contract's annual price by the device's purchase price, then compare it with the department's COSR. A \$180,000 contract on a \$1,000,000 system is 18% against a department running 6%: three times the cost

STATEMENT OR ACCOUNTING TERM	WHAT IT HOLDS
Balance sheet	A snapshot on one day: assets, liabilities, and owner's equity. Assets equal liabilities plus equity
Income statement	Also called the profit and loss statement. It covers a period of a month, quarter, or year: revenue minus expenses equals net income
Cash flow statement	Cash in and cash out over a period, split into operating, investing, and financing. Reported profit is not money in the bank
GAAP	Generally accepted accounting principles: the standards, conventions, and rules accountants follow when recording transactions and preparing statements
Accounts payable	AP is what the hospital owes its vendors. Unpaid service invoices and parts orders sit here
Accounts receivable	AR is what the hospital is owed. Revenue from servicing outside clinics sits here until it is collected
Accrual versus cash basis	Accrual records an expense when it is incurred; cash basis records it when the payment clears. Hospitals budget on accrual, so a part ordered in June is June's expense
Capital versus expense	A capital item is depreciated over its useful life; an expense lands entirely in this year's budget
Who to know by name	The chief financial officer and the cost accountant for your cost center. The CFO decides how large irregular costs are carried in the budget

A business justification is written in one order and never another: the problem, the options, the costs, the benefits, the risks, then the recommendation. Say what happens if nothing is funded.

03 Procurement, contracts, and the lifecycle

LIFE EXPECTANCY QUESTION	HOW THE MANAGER ANSWERS IT	
How is useful life set	Manufacturer guidance, the AHA useful-life schedule for hospital assets, the department's own failure trends, parts availability, and the declared end of support	
What the AHA schedule is	An industry average life expectancy by asset type, widely used to set depreciation. It is an average, not a verdict on the device in front of you	
What end of life means	The manufacturer has decided to stop supporting the model. It does not mean the device is unsafe, unrepairable, or finished	
Is support guaranteed	No. No law requires a manufacturer to supply parts or support for any number of years after it declares EOL	
What triggers replacement	Support withdrawn, parts no longer available, failure rates climbing, calibration that will not hold, technology overtaken by something safer or more capable, or an annual maintenance cost that has outgrown the device's value	
How replacement is forecast	Rising annual cost per device in the CMMS plus the manufacturer's EOL notices, read years ahead, because replacement runs into millions	
SERVICE ARRANGEMENT	WHAT IT COVERS	WHO CARRIES THE RISK
Full service contract	Parts, labor, travel, scheduled maintenance, often software support	The vendor, at a fixed and usually high price
Parts only	Parts at an agreed price; no labor	Shared: in-house staff do the work
Time and materials	Nothing in advance. You pay per call for labor, parts, and travel	The hospital, which is self-insurance. Managed well it can cut cost by as much as 60% against a contract
Shared risk	A spending pool or a cap, with savings or overruns divided by formula	Shared. Read the formula before you sign it
First look	In-house staff respond first; the vendor is called only when they cannot finish	The hospital on routine calls, the vendor on the hard ones
Preventive only	Scheduled maintenance; repairs are billed separately	The hospital on every failure
Software support	Updates, patches, remote diagnostics, license renewal	The vendor, but only for what the license actually lists
Point-of-sale or extended warranty	Service sold at the moment of purchase, usually with no HTM input	The hospital, which overpays. The seller's margin on one can run as high as 90%, and they rarely allow cancellation without a penalty
Equipment insurance or asset management	A premium covers scheduled and unscheduled work; you file claims	The insurer, but the administrative load of claims lands on HTM
In-house service	Your own staff, tools, test equipment, and parts	The hospital. Usually the lowest cost given volume, training, and stable staff
CONTRACT TERM	WHAT TO PIN DOWN BEFORE SIGNING	
Scope	Exactly which devices, systems, modules, and accessories are covered, by serial or asset number, and during what hours	
Cost	The annual price, what it buys against the alternatives priced over the same years, and the COSR it works out to on this device	
Compliance	Whether the vendor's people are qualified and will supply training and competency records, whether their work will be documented in the CMMS , and whether their intervals meet the plan and the accreditor	
Response time	Time to a phone response and time to on-site arrival, stated separately, with what happens when they are missed	

CONTRACT TERM	WHAT TO PIN DOWN BEFORE SIGNING
Uptime guarantee	The promised availability, how it is measured, and the remedy when it is not met
Parts	Whether parts are included, whether glassware and major assemblies are included, and whether they are new, refurbished, or exchange
Loaners	Whether a loaner or backup unit is provided, how fast, and at whose cost
Training	Seats, level, location, and whether service literature and passwords come with them
Exclusions	The list that decides your real cost: batteries, accessories, probes, abuse, after-hours maintenance, software, travel
Termination	How the hospital gets out, how much notice is required, and what penalty applies
Renewal and escalation	Whether it renews automatically and how much the price may rise each year
Indemnity and liability	Who answers for injury, data loss, and damage caused during service
Entire-agreement clause	The signed contract is the whole deal, and a term can run as long as ten years. Nothing said in a meeting or an email survives it
Where the leverage is	Before signing, and before the capital purchase closes. After the sale the hospital has none

In-house or vendor: the factors that decide

- Volume: how many of this model the hospital owns, and whether the hours justify a trained technician
- Skills: who on staff already works at this level, and what happens when that one person is on leave
- Training cost: tuition, travel, lodging, and the weeks of productivity lost while a technician is away
- Test equipment: what the model requires, what it costs, and who calibrates it
- Parts access: whether the manufacturer sells parts, service keys, and software to equipment owners at all
- Risk: the consequence of a long outage on this device, and whether a backup unit exists
- Response time: how long a vendor takes to arrive against how long your own staff take to walk down the hall

ACQUISITION OR DISPOSAL CHOICE	WHAT THE MANAGER DOES WITH IT
Purchase	Capital money, depreciated over the useful life. The hospital owns the asset and all of its downstream cost
Lease	Operating money spread over the term. Read who maintains it, who insures it, and what happens at the end
Fair market value	What a willing buyer would pay today. It is not book value and not replacement cost, and policy should say who determines it
Trade-in	Convenient, and usually the lowest value the hospital can get. Price the open market before accepting it
Resale	Used-equipment companies and broker sites will bid. After the labor to list, negotiate, and load, it is often close to break-even
Donation	A charity may deploy the device abroad. Policy must say who selects the charity and who may donate instead of sell
Environmental disposal	Batteries, mercury, sealed sources, refrigerants, and electronics follow environmental rules, not the loading dock
Data wiping before disposal	Any device that stored patient information is wiped or has its media destroyed before it leaves. Selling or donating a device holding PHI is a HIPAA violation, and often only HTM knows the data is there
Documentation	A disposal record naming the asset, the method, the date, the wipe, and the signature closes the asset out of the inventory and the ledger
Order of preference	Redistribute inside the organization or to a simulation center, then sell, then donate, then recycle. Disposing of an asset still being depreciated takes a hit for the remaining book value, so finance agrees first

04 Risk management

RISK CATEGORY	WHAT IT LOOKS LIKE IN AN HTM DEPARTMENT
Patient safety risk	A device that shocks, burns, delivers the wrong dose, or reads out of calibration and leads to a misdiagnosis
Operations risk	Downtime on the only device of its kind; a procedure canceled; a surgeon who takes cases to another hospital
Financial risk	Unplanned repairs that blow the budget, a contract signed without review, regulatory fines, the cost of a lawsuit
Emergency preparedness risk	A utility failure, a network outage, or a disaster that leaves clinicians without working equipment and no documented workaround
Regulatory risk	A survey finding on maintenance records, an unreported adverse event, equipment in an alternative program that is not eligible for it
How risk and cost trade	Risk and cost move in opposite directions. Almost any risk can be driven near zero if the hospital pays enough, and cost comes down only by accepting more risk. The hospital's risk management department decides how much is acceptable
SCORING INPUT	HOW IT SHAPES THE MAINTENANCE STRATEGY
Equipment function	What the device does: life support, therapeutic, diagnostic, analytical, or support. Life support scores highest
Physical risk	The harm a failure could cause: death, injury, a wrong diagnosis, or an inconvenience
Likelihood of failure	How often this model actually fails, from the hospital's own history or credible outside data
Maintenance requirement	How much scheduled work the device truly needs: filters, batteries, calibration, moving parts, or almost nothing
Incident history	The number, frequency, and nature of past failures and service requests on identical or very similar equipment
How the score is used	The inputs combine into one number. High scores get full scheduled maintenance at the manufacturer's interval; low scores get a longer interval or less work
Run to failure	A low-risk, inexpensive device whose failure harms nobody may be repaired or replaced only when it fails, under a documented alternative equipment maintenance program
RISK TOOL	THE STEPS, IN ORDER
Root cause analysis	Define the event, gather the facts, ask why until the causes stop being symptoms (the five whys), map contributing causes on a fishbone, agree corrective actions with owners and dates, then verify the fix held
What RCA is for	Events that already happened. It works backward from the nearest cause to the root, which is often the organization rather than the person at the bedside
FMEA	Pick the process, list every step, list how each step can fail, score severity, occurrence, and detection, multiply them into a risk priority number, act on the highest, then rescore. Use it on failures that have not happened yet
Risk priority number	$RPN = \text{severity} \times \text{occurrence} \times \text{detection}$. Severity 8 x occurrence 3 x detection 5 = 120. Rank the list and work from the top
Incident investigation	Secure the device, its accessories, and its disposables where they are; preserve settings and switch positions; photograph everything; interview the witnesses; pull error logs; document names, dates, and sequence; then report
What not to do	Do not clean, repair, re-calibrate, update, or return the device to service, and do not let the trash be emptied: lot numbers of disposables live in it
Where the report goes	The complete report goes to the risk manager, which is what makes it work product. Discuss its contents with no one else. A near miss is investigated the same way

LAW, PROGRAM, OR REPORT	WHAT IT OBLIGATES
Safe Medical Devices Act of 1990 (SMDA)	Made adverse-event reporting mandatory for device user facilities: hospitals, ambulatory surgical facilities, nursing homes, and outpatient diagnostic and treatment facilities
Death	Report to the FDA and to the manufacturer no later than 10 work days after becoming aware. Where the manufacturer cannot be identified, the report goes to the agency alone
Serious injury	Report to the manufacturer no later than 10 work days, or to the agency instead when the manufacturer cannot be identified. Copying the agency on every suspected serious injury is recommended practice
Serious injury, defined	Life-threatening, or causing permanent impairment of a body function or permanent damage to a body structure, or requiring medical or surgical intervention to prevent that permanent harm
Annual user facility report	Submitted to the FDA on Form FDA 3419 by January 1 of each year, identifying the facility and the reports it filed
MDR event files	A user facility must keep written reporting procedures and must retain the event file for 2 years from the date of the event, available to an FDA investigator
How reports are filed	Mandatory reports go in on Form FDA 3500A through MedWatch. Form FDA 3500 is the voluntary form for clinicians and the public
MAUDE	The public database of device reports. Search it before buying and during an investigation to see whether others have reported the same failure
Sentinel event	A patient safety event that reaches a patient and results in death, permanent harm, or severe temporary harm. It triggers a full root cause analysis and an action plan, and accrediting bodies publish alerts on the patterns they see
Recall classification	The FDA assigns a recall the numeral I, II, or III to show the relative degree of health hazard the violative product presents
Class I recall	The worst case: there is a reasonable probability that using or being exposed to the product will cause serious harm to health, or death. Act on it immediately
Class II recall	Using or being exposed to the product may cause health consequences that are temporary or medically reversible, or the chance of serious harm is remote
Class III recall	Using or being exposed to the product is not likely to harm health at all, but it still breaks a requirement and must be corrected
Recall workflow	Receive the notice, locate every affected asset in the CMMS by model and serial range, quarantine or correct, notify the users and the committee, document each unit, verify the vendor's correction, then close the recall with a record
Hazard and safety advisories	Manufacturer notices, ECRI alerts, and FDA safety communications. Someone must own the inbox, log each notice, and record the action taken even when the action is none
DATA AND CYBERSECURITY TOPIC	WHAT THE MANAGER MUST HOLD
PACS	Stores and moves images with patient identifiers. Treat the archive as patient data, not as a file server
EMR and EHR	The record inside one organization and the record shared across organizations. Networked devices feed them directly or through middleware
HITECH	Extended the HIPAA rules: breach notification, direct obligations on business associates, and stronger enforcement
Integrity	Data that arrives at the record unchanged and attached to the right patient. A wrong-patient vital sign is a safety event, not a clerical error
Backups	Scheduled, verified, stored away from the system they protect, and restored in a test before you need them in anger
Access control	Unique named accounts, least privilege, multi-factor authentication where it is supported, and shared service passwords retired

DATA AND CYBERSECURITY TOPIC	WHAT THE MANAGER MUST HOLD
Encryption	Protect data at rest on the device and in transit across the network, by the manufacturer's supported method
Patching and updates	Only on the manufacturer's validated schedule. An unvalidated patch can take a cleared device out of its cleared configuration
Hardening	Turn off unused ports and services, change default credentials, and remove software the clinical function does not need
Segmentation	Put devices that cannot be patched on their own network segment with tight rules, and document who approves exceptions
Antivirus	Only where the manufacturer allows it, and only with the exclusions they specify
MDS2	The manufacturer disclosure statement for medical device security. Require it before purchase; it is the inventory of what the device can and cannot protect
Operating system life expectancy	Ask how long the embedded operating system will be supported. A device with a long clinical life running an operating system whose support ends far sooner is a known future problem, not a surprise
Wireless Medical Telemetry Service	Protected spectrum for patient telemetry, licensed and coordinated under FCC rules. Someone must register the hospital's WMTS use and keep other transmitters out of the band
Why the FCC matters	It licenses and manages the radio spectrum. An unmanaged transmitter in a telemetry band means dropped waveforms on monitored patients

Emergency preparedness

- Downtime procedures in writing for every clinical system: what staff do when the network, the record, or the device is gone, and who declares downtime
- Utility failure: know what is on emergency power, which outlets are on the generator, and which devices must be moved when they are not
- Generator and **UPS** inventory: which devices have internal batteries, how long they last, and when each battery was last tested and replaced
- Critical equipment lists: the devices whose failure threatens life, maintained whether or not they sit in an alternative maintenance program
- Disaster plans: surge capacity, where reserve equipment is stored, how it is kept charged and tested, and who releases it

05 Service operations and metrics

WORK ORDER STAGE	WHAT HAS TO HAPPEN
Request	Captured once, with the device asset number, location, caller, and the problem in the caller's words
Triage	Ranked by clinical impact, not by order of arrival. A life-support device beats a convenience item every time
Assignment	To a technician with the competency and the parts, with the clinical user told who is coming and when
Repair	The work itself, with time and parts recorded as they happen rather than from memory at the end of the week
Verification	Performance and safety checks that prove the device meets specification before it goes back to the patient
Closure	Problem code, cause, action, parts, labor hours, and the condition on return, all in the CMMS
Customer feedback	Tell the user what was wrong and what was done, then measure satisfaction on a survey you do not change year to year, so the numbers compare
What a complete record holds	Asset number, date and time in and out, who did the work, the reported problem, what was found, what was done, parts used with cost, labor hours, test results, and the return-to-service decision
Problem codes that matter	Use error and cannot duplicate. Both are real work and neither is an equipment failure. Trend them or you will mistake a training problem for a reliability problem

WORK ORDER STAGE	WHAT HAS TO HAPPEN
Outside vendors	Every visit by a vendor or manufacturer is logged in the CMMS too. Make check-in and a service report within 24 hours a condition of payment
CMMS CONTENT	WHY IT IS THERE
Asset inventory	Every medical device in the building, whether the hospital bought it, leases it, rents it, has it on loan, or borrowed it, and regardless of who maintains it
Standard nomenclature	One agreed name per device type, manufacturer, and model, so like items can be compared. UMDNS from ECRI is the common free standard
Granularity rule	Inventory anything carrying a serial number, because serial ranges are what recalls name. Give one shared number to the cheap, numerous, low-consequence items nobody would track one by one
Original cost	Price paid for every asset. Without it no cost of service ratio can be calculated and no cost can be fairly allocated to a cost center
Work orders	Every scheduled and unscheduled job, open and closed, with hours and parts against the asset
Service history	The full life of the asset, including work done by vendors, so trends and repeat problems are visible
Parts	What is on the shelf, what it cost, what it fits, and what is on order
Recalls and advisories	Which notice hit which asset, what was done, and when it closed
End of life and support dates	So replacement planning starts years before the device stops being serviceable
MAINTENANCE TERM OR TASK	WHAT IT MEANS
Preventive maintenance	Scheduled work on parts that wear: filters, fans, lubrication, batteries, and components with a known life
Performance verification	Confirming the device still meets specification. If it does, nothing is changed
Safety testing	Measuring leakage current, ground resistance, and where applicable isolation, with a safety analyzer
Scheduled maintenance	The umbrella term: any mix of safety testing, performance verification, and preventive maintenance done on a schedule
How PM is scheduled	By month. Each asset lands in one of the twelve months of the year, and the year is balanced around a short February, summer vacations, and the holidays
The flexibility window	The Joint Commission allows 30 days either side of the scheduled date for annual scheduled maintenance, which is what makes the plan workable
PM completion rate	Completed / due x 100. Monitor it daily, not at month end, because at month end it is too late to fix
The compliance report	Completion rate by month and by department, the list of misses, the reason for each, and the date each was completed
Documenting a missed PM	Name the asset, why it was missed, where the device was, what the clinical risk was, and when it was finished. A missed PM with a documented reason is a finding you can answer
What a surveyor asks for	The inventory, the plan, the completion rate, the misses and their explanations, the critical equipment list, which assets sit in an alternative program, and the evidence behind putting them there
METRIC THE DEPARTMENT REPORTS	HOW IT IS READ
PM completion rate	Completed / due x 100. The number a surveyor asks for first and the one administration understands
Repeat repairs	Repairs that come back within 30 days of the first one. A falling count means the fixes are holding; a rising one points at a bad device, a bad part, or a technician who needs training

METRIC THE DEPARTMENT REPORTS	HOW IT IS READ
Mean time to repair	MTTR is the average hands-on repair time. It measures the technician and the parts supply
Total time to repair	The clock the clinician feels: from the call to return to service, including waiting for parts, vendors, and access. Always longer than MTTR, and the one to report
Uptime	The share of time a device was available for use. Report it on critical devices, where downtime cancels cases
Customer satisfaction	A periodic survey of contactability, response speed, completion, technical competence, communication, and overall effectiveness, kept unchanged so results compare across years
Cost of service ratio	COSR by hospital, department, modality, equipment type, and manufacturer. The drill-down is where the savings are found
Labor hours per device	Total documented hours divided by assets supported. Useful inside one hospital and dangerous as a comparison between hospitals
Overtime	Hours and dollars. Sustained overtime is a staffing request waiting to be written
Backlog	Open work orders and overdue scheduled maintenance, with age. A growing backlog is the earliest honest warning
Which KPIs leadership sees	A short monthly set: completion rate, backlog, total time to repair, satisfaction, and cost. Pick the KPI set once and keep reporting the same one

STAFFING QUESTION	HOW TO ANSWER IT
Devices per technician	Historically one technician per roughly 1,200 to 2,000 inventoried items. It ignores complexity, contracts, and how the inventory was counted
Hours per device	Build the workload from the bottom up: scheduled hours per model times quantity, plus historical unscheduled hours, plus travel
Workload by risk	Life-support and critical devices need more hours per unit than support equipment. Weight the count, do not just take it
Full-time equivalent	One FTE is one full-time position of roughly 2,080 paid hours a year. Express partial coverage in tenths
A worked case	A system leaves warranty. The quoted contract is \$60,000 a year; a junior technician costs less than that. The new position absorbs 0.4 FTE of the system and returns 0.6 FTE to the maintenance schedule
Scheduling	Cover the hours clinicians work, not the hours the shop prefers. A second shift beats overtime when the volume is steady
On-call	A written rotation, a defined response time, documented pay, and a rule about who may be called and for what

Resources the department has to keep current

- PPE and the training to use it: gloves, eye protection, hearing protection, lockout devices, and whatever the hazard assessment for each area requires
- Hand tools and specialty tools per equipment type, accounted for and replaced when worn
- Test equipment: safety analyzers, simulators, meters, and gas and flow analyzers matched to the inventory
- Calibration of test equipment on a schedule, traceable to the national standards kept by NIST, with certificates on file
- Supplies and PM kits ordered before the month they are needed, so work is not held waiting on parts
- Technical information: service manuals, operator manuals, software, passwords, and updates, obtained in writing at purchase
- Training: model-specific schools, refreshers, and the competency records that prove them

Data management the department owns

- Backups of the CMMS and of device configurations, on a schedule, stored away from the machine they protect
- Restore tests, performed and documented, because a backup nobody has restored is a hope and not a plan
- Security of the CMMS: named accounts, role-based rights, and removal of accounts when people leave
- Patching on the manufacturer's validated schedule, recorded against the asset

- Updates and software versions tracked in the inventory, so a recall or a vulnerability can be matched to real devices

ALTERNATIVE EQUIPMENT MAINTENANCE QUESTION	THE ANSWER
What an AEM program is	A program that changes how often maintenance, inspection, and testing happen and what they include, away from the manufacturer's recommendations, on the strength of a risk assessment by qualified personnel
What CMS allows	The change itself, where no other federal or state law and no condition of participation requires the manufacturer's schedule
What may NOT be included	Imaging and radiologic equipment, whether diagnostic or therapeutic; medical laser devices; and new equipment without enough maintenance history to support a risk-based decision
New equipment	Maintained to the manufacturer's recommendations until there is enough history, from the hospital, its contractor, or nationally recognized sources, to support a change
Who may make the decision	Qualified personnel, hospital employees or contractors. The hospital must be able to show how it assures that contractors use qualified people
Evidence required	The equipment's function and the consequences of failure, how serious the likely harm is, likelihood of failure, maintenance requirements, availability of alternative or backup devices, and documented incident history of identical or very similar equipment
Documentation	Written policies and procedures, the risk methodology, the evidence held per equipment type, and the activities and frequencies chosen
Adherence	A hospital must follow the alternative activities and frequencies it set, strictly. An AEM program is not permission to improvise
Identification	Equipment in the program must be readily identifiable as such, and so must critical equipment. Surveyors focus on the critical equipment inside the program

06 Policy, regulators, and accreditation

MEDICAL EQUIPMENT MANAGEMENT PLAN SECTION	WHAT IT MUST SAY
Scope	Which equipment and which locations the plan covers, and who maintains what between HTM , clinical staff, contractors, and manufacturers
Inventory criteria	What gets an asset number, what is grouped, what is excluded, and how leased, rented, loaned, and patient-owned equipment is handled
Risk and maintenance strategies	How risk is scored, which strategies exist, and how each equipment type is assigned to one
Scheduled maintenance and inspection	Intervals, procedures, who performs them, and the flexibility window the plan uses
Incident response	How a device involved in an event is secured, investigated, reported, and released
Recalls and advisories	Who receives notices, how affected assets are found, and how actions are documented and closed
Emergency procedures	Clinical downtime procedures, utility failures, and how staff get a replacement device
Training	Who trains HTM staff, who trains operators, and how competency is assessed and recorded
Performance monitoring	The metrics the plan reports, to whom, and how often
Annual evaluation	A yearly review of the plan's scope, objectives, performance, and effectiveness, with the findings reported to the committee

MEDICAL EQUIPMENT MANAGEMENT PLAN SECTION	WHAT IT MUST SAY
Compliance statement	The plan must stand up against federal, state, and local requirements, be specific enough to show how each equipment type is maintained, and reference the organization's other policies rather than repeat them

The policy library a department needs

- A copy of the organization's **MEMP**, with the department's own procedures written to support it rather than contradict it
- Inventory procedures: what is inventoried, incoming inspection of new equipment, and removal from inventory
- Scheduled maintenance: assigning procedures, the risk-based or alternative strategy, frequencies, responsibility, and workload balancing
- Work order documentation, including scheduled, unscheduled, use error, and non-HTM work
- Repair parts, purchase orders, service contracts, and the escalation policy
- Safety: electrical, radiological, biological, and **OSHA** requirements, plus infection control for devices
- Information security and patient privacy, telemetry and wireless spectrum management, and coordination with **IT**
- The environment of care manual: the organization's binder of plans, which holds the **MEMP** beside safety, security, hazardous materials, fire, and utilities
- **SOPs** are living documents. They are updated as scope changes, used to orient new staff, and referenced in daily work rather than filed and forgotten

COMMITTEE	WHAT HTM BRINGS TO IT
Environment of care committee (EOC)	Equipment inventory and completion rates, incidents and recalls, the annual plan evaluation, and utility and construction impacts
Patient safety	Device-related events and near misses, use error trends, alarm issues, and the actions taken
Risk management	Incident investigation reports, device holds, exposure from pending claims, and reportable events
Performance improvement	Metrics with targets and trends, improvement projects, and the results of corrective actions
Radiation safety	Imaging and therapy equipment performance, service records, survey results, and the radiation-producing device inventory
Infection control	Device cleaning and disinfection between patients and before service, water systems, sterilizers, and loaner handling
How to report to any of them	A short written report with the number, the trend, what caused it, what is being done, and what you need from the committee

REGULATOR OR BODY	WHAT IT CONTROLS
CMS	The Centers for Medicare and Medicaid Services pays for most hospital care and sets the conditions of participation a hospital must meet to be paid
Conditions of participation	The federal requirements behind hospital surveys. Several CoPs reach equipment maintenance and documentation directly
Deemed status	CMS lets approved accrediting organizations survey on its behalf, so a hospital accredited by one of them is deemed to meet the conditions
The Joint Commission (TJC)	The most common hospital accreditor, with standards for the equipment management plan, maintenance intervals, and competency assessment
DNV	An accrediting organization for hospitals whose program integrates a quality management system with the CMS requirements
AABB	Accredits blood banks and transfusion services, with equipment testing requirements often stricter than the manufacturer's
CAP and CLIA	CAP accredits laboratories against detailed checklists; CLIA is the federal program through which CMS regulates clinical laboratory testing

REGULATOR OR BODY	WHAT IT CONTROLS
FDA	Regulates medical devices: clearance for market, manufacturing and performance, medical device reporting, and recalls
CDRH	The FDA center responsible for devices and radiation-emitting products, including mandatory performance standards and recall authority
FCC	Licenses and manages the radio spectrum, including the Wireless Medical Telemetry Service bands hospitals use for patient telemetry
NRC	Licenses and inspects the use of radioactive materials, including nuclear medicine, and enforces its requirements
OSHA	Requires the employer to keep the workplace safe and healthful, with hazard communication, PPE , lockout, and electrical safety rules
HIPAA	Protects the privacy and security of identifiable health information, by rules on privacy and on administrative, physical, and technical safeguards. It reaches every device that stores or sends patient data
State agencies	The state health department and licensing bodies, plus the state's adopted building, fire, and electrical codes. State rules can be stricter than federal ones
NFPA	Publishes consensus codes that become law only where a state adopts them. NFPA 99 is the health care facilities code and NFPA 70 is the electrical code
IEC	International standards used throughout the field, including the 60601 series for medical electrical equipment and the 80001 series for risk management of networks carrying devices
ECRI	An independent nonprofit that tests devices, publishes hazard and recall alerts, and maintains the nomenclature many inventories use

Surviving a survey

- Prepare the evidence in advance and keep it current year-round: inventory, plan, completion rates, the misses with explanations, competency records, the critical equipment list, and the alternative program with its evidence
- Host the surveyor yourself: answer the question asked, show the record, and let the record speak. Do not speculate and do not volunteer problems you have not fixed
- Expect tracers: a surveyor picks a device in a unit and follows it through the inventory, the schedule, the history, and the competency of whoever serviced it
- Answer a finding with a corrective action plan: what was wrong, the root cause, the action, the owner, the completion date, and how you will show it held

07 Projects, capital planning, and stakeholders

CAPITAL REQUEST ELEMENT	WHAT HTM SUPPLIES
The request itself	What is being bought, how many, for whom, and when it is needed, in the hospital's capital request format
Clinical need	The clinical problem the device solves, stated by the department that will use it, with the consequence of not funding it
Feasibility	Whether the hospital can actually run and service it: staff, skills, parts, and vendor presence
Space	Footprint, clearances, doorways and elevator access, and the room it displaces
Site preparation	Construction, shielding, floor loading, ventilation, water, gases, drains, and who pays for them
Power	Load, receptacle type, emergency versus normal branch, and whether the device needs conditioned power or a UPS
Network	Addresses, ports, segment, bandwidth, interfaces to the record, and the agreement with IT in writing
Total cost of ownership	Purchase plus installation plus service plus parts plus training plus disposal over the life, not the quoted price

CAPITAL REQUEST ELEMENT	WHAT HTM SUPPLIES
Service strategy	In-house, contract, or time and materials, priced for the life of the device, with the training and test equipment each option needs
Standardization	Whether this matches models already owned, and what a new model adds in training, parts, and procedures
Cybersecurity	The MDS2, the operating system and how long it is supported, the patching method, authentication, and encryption
The recommendation	One clear recommendation with the options compared against it, so the committee decides rather than deliberates

Can the hospital sustain this device

- Parts: are they sold to equipment owners, at what price, and for how many years
- Training: is service training available to the hospital at all, where, how long, and at what cost
- Service manuals, software, passwords, and diagnostic access, confirmed in writing before the order
- Life expectancy: how long the model is expected to serve and when the manufacturer plans to end support
- MAUDE history: what other facilities have already reported about this model
- Operating system life expectancy, and what happens to the device when that support ends

PROJECT STAGE	WHAT THE MANAGER PRODUCES
Charter	The scope, the objective, the sponsor, the budget, the deadline, and what is explicitly out of scope
Plan	Tasks, owners, dependencies, and the decisions that must be made before work starts
Schedule	Dates with the long-lead items identified: construction, shielding, network drops, and delivery windows
Budget	Capital and operating lines, with site preparation and training named rather than assumed
Stakeholders	Everyone who must be consulted or informed, named, with what each needs and when
Risks	What could delay or break the project, how likely it is, and the mitigation, reviewed as the project moves
Communication	Who reports what to whom on what day, agreed at the start so nobody learns about a change from the hallway
Acceptance testing	The incoming inspection and performance test the device must pass before the hospital accepts delivery and pays
Sustainment plan	Asset in the inventory, schedule assigned, parts stocked, service strategy live, training delivered, and support contacts recorded
Close-out	Final cost against budget, lessons learned, the old asset retired in the inventory, and the sponsor told it is done

LIFECYCLE STAGE	HTM'S JOB IN IT
Acquisition	Bring the cost history, failure data, and support-withdrawal notices, then compare total cost of ownership, serviceability, standardization, security, and clinical fit, filtering out marketing claims
Contracting	Negotiate price, training, manuals, parts discounts, response times, and exclusions while there is still leverage
Installation	Coordinate site preparation, power, network, delivery, and the pre-acceptance inspection, then inspect, test, tag, record cost and ownership, and assign the maintenance schedule
Training	Deliver operator and service training before clinical use, record competency, and keep the materials where staff can find them
Sustainment	Scheduled and unscheduled maintenance, parts, recalls, upgrades, patching, and cost tracking, with cost per year and failure rate watched so the replacement is seen coming years out
Disposal	Wipe the data, remove it from the inventory, settle the book value, and document the method

Construction, utilities, and change

- Attend the planning and design meetings. Equipment decisions made in a drawing become construction costs nobody budgeted
- Read utility interruption notices as clinical events: which rooms, which devices, how long, and what runs on battery
- Publish the downtime procedures before the interruption and confirm the clinical units have them
- Use formal change management for network changes, patches, and configuration changes to clinical devices

Stakeholders and how to stay in front of them

- Senior leadership: scheduled meetings and short written reports with the number, the trend, the cause, and the decision you need. Never a surprise
- Nursing: daily rounding in the units, a named contact, and visible follow-up on the thing they reported last week
- IT and informatics: joint ownership of networked devices, shared change windows, and an agreed incident path
- Facilities: power, water, gases, ventilation, and construction schedules that affect clinical equipment
- Materials management: purchase orders, receiving, consumables, and withholding payment when terms are not met
- Vendors: check-in and check-out, service reports within 24 hours, and a scorecard you can show them
- Technicians: shop meetings, daily huddles on the backlog, and a clear escalation path when they are blocked

08 Education and training

NEEDS ANALYSIS INPUT	THE QUESTION IT ANSWERS
Cost	What the training costs in tuition, travel, lodging, and the weeks of productivity lost while the technician is away
Return on investment	What the hospital avoids in contract, vendor labor, and downtime once the technician is trained, accumulated across four, five, and six years
Operations	Which backlog, response time, or completion problem this training actually fixes
Technical requirements	What the equipment demands: proprietary software, calibration, service keys, or a certificate to open it legally
Competency	Which assessed gaps exist today, by person and by equipment type
Customer requirements	What the clinical departments have asked for, and what they will stop calling the vendor for once staff are trained
Resources	Whether the test equipment, tools, manuals, and parts access exist to use the training once it is delivered
Asset inventory	How many of the model the hospital owns, where they are, and whether the count justifies a trained technician at all
EFFECTIVENESS MEASURE	WHAT IT SHOULD DO AFTER TRAINING
Cost	Vendor labor, contract spend, and parts cost for that equipment type should fall
Failure rates	Repeat repairs on the trained equipment should drop, because the fix is now the right fix
Total time to repair	The clinician's clock should shorten, because the first responder can finish the job
Staff competencies	Documented assessments move from gap to competent, recorded per person and per model
Skill set	More models covered in-house, with at least two people competent on every critical one
User satisfaction	Survey scores for technical competence and responsiveness should rise in the departments involved
TRAINING TYPE	WHAT IT IS AND HOW IT IS OBTAINED
Technical and model-specific	Service-level training on one model. Start with the maker of the device, then price independent trainers, who are often cheaper and sometimes teach more

TRAINING TYPE	WHAT IT IS AND HOW IT IS OBTAINED
Manufacturer-provided, negotiated	Negotiate training into the purchase: seats, level, location, travel, and lodging, delivered inside the warranty period or the warranty extended until it is. After the sale there is no leverage left
Safety	Electrical safety, lockout, radiation and laser areas, hazard communication, lifting, and infection control for device handling
Soft skills	Customer service, written communication, conflict handling, and how to explain a technical answer to a clinician
Regulatory and code compliance	What the accreditor and the conditions of participation require, how records are kept, and what a surveyor asks
Internal policy	The department's own SOPs , the CMMS , documentation standards, escalation, and on-call rules
Orientation	A new technician gets a mentor, the SOP manual, the MEMP , supervised work, and a documented sign-off before working alone
Certification	Tie steps in the career ladder to a credential and pay for achieving it. Trained, certified staff stay with employers who value them
Competency assessment	Required by the accreditor. Test, self-assessment spot-checked by the manager, observed scheduled maintenance, or review of repeat repairs, documented either way

Operator training: when HTM teaches clinicians

- Failure trending: when a model generates work orders that are not failures, the training need is in the unit, not the shop
- Use error: identify it on the service call, code it, trend it by department, model, and shift, then take in-service education to the pattern on every shift
- New equipment: operator training before first clinical use, on every shift that will touch it, with attendance recorded
- New clinical applications: a new procedure on an old device is new training
- New staff and rotating students: a spike in use errors often follows an intake of residents or travelers
- Database management: record who was trained, on what, by whom, and when, because the accreditor will ask and the pattern tells you where to go next

Materials: what the department keeps and who keeps it current

- Service manuals per model, obtained at purchase, kept where technicians can reach them on and off shift
- Operations manuals, including the copies the clinical units need, because a unit's lost manual becomes a service call
- Software, firmware images, service keys, and passwords, stored securely and retrievable when the one person who knew them leaves
- Training media: recordings, slides, job aids, and quick reference cards made after each school, so one seat teaches the whole shop
- A written purchase requirement that manuals, software, passwords, updates, and support are supplied for as long as the device stays in service, with payment withheld until they arrive
- One named owner for the library and a review date, so superseded versions come out and nobody works from an obsolete procedure

Partners who train with you

- Infection prevention: cleaning and disinfection between patients, what HTM may handle, and how devices are decontaminated before service
- Facilities management: power, emergency branch, water, gases, ventilation, and who responds to what at two in the morning
- Materials management: purchase orders, receiving and incoming inspection, consumables, and vendor terms
- IT: addresses, segments, patching windows, interface failures, and the joint incident path

EMPLOYEE LIFECYCLE STAGE	WHAT THE MANAGER PRODUCES
Job description	Duties, required education and experience, certification expectations, physical requirements, and the pay grade. Keep a full ladder of levels and steps: nobody can be promoted into a job that does not exist, and even a two-person department needs at least eight
Selection	Screening against the written description, the same interview questions for every candidate, reference and credential verification, and a documented reason for the choice
Orientation	A mentor, the SOP manual, the MEMP , the CMMS , safety training, and supervised work with a documented sign-off before solo assignments
Evaluation	The annual review, which should contain nothing the employee is hearing for the first time. Feedback is the manager's job all year
Development plan	What the employee wants to be able to do next, the training that gets them there, and the date it is reviewed
Retention	The direct manager is the biggest single factor in whether staff stay. Interesting work, involvement, feedback, training, and respect hold people
Why turnover hurts	Recruiting and training a replacement is estimated to exceed 1.5 times annual salary, before counting the clinical cost of equipment nobody can repair
Performance improvement plan	Specific deficiencies, specific expectations, specific dates, the support offered, and a clear statement that it is an opportunity rather than an automatic exit
Termination	The last step of a documented path, done with the human resources department present and with every prior conversation already on paper
PERFORMANCE AND ENGAGEMENT TOPIC	WHAT THE MANAGER DOES
Compensation	Know the local and national market for each grade, and get a real survey done rather than relying on self-reported numbers
Organizational values	Tie department goals to the hospital's stated priorities, so the request speaks the language the budget is written in
Engagement	Bring staff into goal setting. A plan the shop helped write gets implemented; a plan dropped on the shop gets resisted
Goals	Department goals covering financial performance, scheduled maintenance completion, customer satisfaction, response time, repeat repairs, and use errors, shared with everyone
Coaching	Continuous and specific, in the moment, with the behavior named and the better alternative shown
Mentoring	Pair a new technician with an experienced one, with time protected for it rather than assumed
Recognition	Financial incentives are hard to get in a hospital. Recognition and a real say in the department's direction often matter more to technicians
What managers get wrong	Managers rank salary, bonuses, vacation, retirement, and perks first. Employees rank interesting work, involvement in decisions, feedback, training, and respect first, with the money items last
Conflict	Address it early, with the people involved, on the facts, and document what was agreed
Documenting improvement opportunities	Write it down when it happens, in neutral language, with dates and specifics, so the record exists before you need it
Recommendations to human resources	Bring human resources in before you act, not after. They own the process, the consistency, and the legal exposure

STAFFING AND PAY ITEM	THE NUMBER OR THE RULE
Staffing levels	One technician per roughly 1,200 to 2,000 inventoried items as a first pass, refined by inventory value, equipment complexity, risk mix, number of sites, and travel
Cost of a biomed	Salary / 2,080 hours plus benefits plus supervision and unproductive time. Under \$100,000 a year is under \$50 an hour, about \$72 an hour fully loaded, which is below any vendor rate and below most contract labor
Incentives	Pay differentials for certification, on-call, shift, and specialty skills, where the hospital's compensation policy allows
Overtime and on-call pay	Budgeted, tracked as its own line, and governed by a written rotation. Sustained overtime is cheaper to fix with a position than to keep paying
Pay equity	Whatever criteria the employer applies when it sets wages must be free of any influence from sex or race, and comparable work inside the department should be paid comparably. Review it regularly
Certification as a differentiator	Make certification a requirement at defined steps in the ladder and reward it. It is proof of competence and a retention tool, not a resignation risk

LAW OR AGENCY	WHAT A MANAGER MUST NOT GET WRONG
ADA	The Americans with Disabilities Act prohibits discrimination against people with disabilities and requires reasonable accommodation. A disability is a physical or mental impairment that substantially limits a major life activity, a record of one, or being regarded as having one
EEOC	The Equal Employment Opportunity Commission enforces the federal bans on discrimination by race, color, religion, sex including pregnancy, gender identity, and sexual orientation, national origin, age of 40 or older, disability, and genetic information
EEOC coverage	The rules reach most employers of 15 or more people, and 20 or more in age discrimination cases. Retaliation against someone who complains or takes part in an investigation is itself illegal
FMLA	The Family and Medical Leave Act gives eligible employees 12 workweeks of unpaid, job-protected leave in a 12-month period for a birth, an adoption or foster placement, a serious health condition of the employee or a spouse, child, or parent, or a qualifying military exigency, with group health coverage continued
FMLA military caregiver leave	Up to 26 workweeks in a single 12-month period to care for a covered servicemember with a serious injury or illness
NLRA	The National Labor Relations Act protects employees' rights to organize, to bargain collectively, and to engage in concerted activity about terms and conditions of employment, whether or not a union is present
OSHA	The employer owes every worker a workplace that is safe and healthful. For HTM that means hazard assessment, PPE , electrical safety, lockout and tagout, hazard communication, and the right to report hazards without retaliation
Hearings and investigations	Human resources present, the facts gathered the same way every time, comparable cases treated comparably, and contemporaneous documentation. The same rule applied the same way to every employee is what keeps the hospital out of court

Facilitating change: explain why before what, involve the people who will do the work, train them before the switch, measure what happened, then recognize the staff who made it work. A change explained is implemented; a change announced is resisted.

10 Acronyms

Every acronym used in this course, 72 in all. In lessons and on this sheet, hover over an acronym for the short version; click it, or click one below, for the longer explanation.

ACRONYM	STANDS FOR	MEANING
AABB	Association for the Advancement of Blood and Biotherapies	The body that accredits blood banks and transfusion services.

ACRONYM	STANDS FOR	MEANING
AAMI	Association for the Advancement of Medical Instrumentation	The standards body for medical equipment and the sponsor of the HTM credentials.
ACI	AAMI Credentials Institute	The body inside AAMI that writes and administers the certification exams.
ADA	Americans with Disabilities Act	The civil rights law that bars disability discrimination and requires reasonable accommodation.
AEM	Alternative equipment maintenance	A program that adjusts maintenance intervals and activities away from the manufacturer's recommendations, based on risk.
AHA	American Hospital Association	The hospital trade association that publishes the useful-life schedule for hospital assets.
AP	Accounts payable	What the organization owes its vendors and has not yet paid.
AR	Accounts receivable	What the organization is owed by others and has not yet collected.
BMET	Biomedical equipment technician	The technician who inspects, maintains, and repairs patient care equipment.
CABT	Certified Associate in Biomedical Technology	The entry-level ACI credential for people beginning a career in medical equipment service.
CAP	College of American Pathologists	The body that accredits clinical laboratories against detailed discipline-specific checklists.
CAPA	Corrective and preventive action	The paired fix: correct this cause, and prevent the same cause from acting elsewhere.
CBET	Certified Biomedical Equipment Technician	The ACI credential for technicians who service general patient care equipment.
CCE	Certified Clinical Engineer	The clinical engineering credential, awarded outside the technician certification family.
CDRH	Center for Devices and Radiological Health	The FDA center responsible for medical devices and radiation-emitting products.
CEU	Continuing education unit	One hour of qualifying educational or professional activity, counted toward recertification.
CFO	Chief financial officer	The executive who owns the hospital's finances, budgets, and capital decisions.
CHTM	Certified Healthcare Technology Manager	The ACI credential for HTM supervisors and managers: 100 questions, 2 hours, offered in May and November.
CLES	Certified Laboratory Equipment Specialist	The specialist credential for people who service clinical laboratory instruments.
CLIA	Clinical Laboratory Improvement Amendments	The federal program through which CMS regulates clinical laboratory testing on humans.
CMMS	Computerized maintenance management system	The database that holds the equipment inventory, work orders, costs, and service history.
CMS	Centers for Medicare and Medicaid Services	The federal agency that pays for most hospital care and sets the conditions of participation.
CoP	Condition of participation	A federal requirement a hospital must meet to be paid by Medicare and Medicaid.
COSR	Cost of service ratio	Annual service cost divided by acquisition cost, as a percent; the field's main cost benchmark.
CRES	Certified Radiology Equipment Specialist	The specialist credential for people who service imaging and radiologic equipment.
DNV	DNV Healthcare	An accrediting organization for hospitals whose program joins a quality management system to the CMS rules.
DoD	Department of Defense	The federal department whose biomedical equipment training program is a recognized eligibility pathway.
ECG	Electrocardiograph	The device that records the heart's electrical activity, used here only as an inventory example.
ECRI	ECRI Institute	An independent nonprofit that tests medical devices and publishes hazard and recall alerts.
EEOC	Equal Employment Opportunity Commission	The agency that enforces the federal bans on employment discrimination.
EHR	Electronic health record	The patient record shared across organizations, as opposed to the record inside one of them.
EMR	Electronic medical record	The patient record held inside one organization.
EOC	Environment of care	The accreditation program covering the physical environment, including medical equipment.
EOL	End of life	The date a manufacturer stops supporting a model, which is not the date the device stops working.
FCC	Federal Communications Commission	The agency that licenses and manages the radio spectrum, including the medical telemetry bands.
FDA	Food and Drug Administration	The agency that regulates medical devices, from market clearance through reporting and recalls.
FMEA	Failure mode and effects analysis	A forward-looking method: list how each step of a process can fail, then act on the worst.
FMLA	Family and Medical Leave Act	The law giving eligible employees unpaid, job-protected leave for family and medical reasons.
FTE	Full-time equivalent	One full-time position, roughly 2,080 paid hours a year; partial coverage is expressed in tenths.
GAAP	Generally accepted accounting principles	The standards, conventions, and rules accountants follow when recording and presenting financial statements.
HFAP	Healthcare Facilities Accreditation Program	A hospital accreditation program that has held federal authority to accredit hospitals.
HIPAA	Health Insurance Portability and Accountability Act	The law that protects the privacy and the security of identifiable health information.
HITECH	Health Information Technology for Economic and Clinical Health Act	The law that extended the HIPAA rules with breach notification and stronger enforcement.
HTM	Healthcare technology management	The profession and the department that manages a hospital's medical equipment across its whole life.
HVAC	Heating, ventilation, and air conditioning	The building system that holds temperature and humidity inside the limits equipment needs.
IEC	International Electrotechnical Commission	The international standards body behind the medical electrical equipment and network risk standards.

ACRONYM	STANDS FOR	MEANING
IT	Information technology	The group that owns the network, servers, and enterprise systems the devices depend on.
KPI	Key performance indicator	A measure a department reports to show whether it is performing.
MAUDE	Manufacturer and User Facility Device Experience	The FDA's public database of medical device adverse event reports.
MDR	Medical device reporting	The federal requirement that user facilities, manufacturers, and importers report device-related adverse events.
MDS2	Manufacturer disclosure statement for medical device security	The standard form on which a manufacturer discloses a device's security capabilities.
MEMP	Medical equipment management plan	The organization-wide written plan for how medical equipment is maintained and monitored.
MTTR	Mean time to repair	The average hands-on time to complete a repair.
NFPA	National Fire Protection Association	The nonprofit that publishes consensus codes which become law only where a state adopts them.
NIST	National Institute of Standards and Technology	The federal institute that keeps the national measurement standards test equipment is traced to.
NLRA	National Labor Relations Act	The law protecting employees' rights to organize, bargain collectively, and act together on working conditions.
NRC	Nuclear Regulatory Commission	The agency that licenses and inspects the use of radioactive materials, including nuclear medicine.
OSHA	Occupational Safety and Health Administration	The labor agency requiring employers to provide a safe and healthful workplace.
PACS	Picture archiving and communication system	The system that stores and moves medical images along with the patient identifiers attached to them.
PHI	Protected health information	Any identifiable health information, including what sits on a medical device's storage.
PM	Preventive maintenance	Scheduled work on the parts of a device that wear, done before they cause a failure.
PPE	Personal protective equipment	The gloves, eye and hearing protection, and other gear a hazard assessment requires.
RCA	Root cause analysis	A backward-looking method: work from the event to the cause underneath it, then fix that.
ROI	Return on investment	The gain from an investment minus its cost, divided by the cost, as a percent.
RPN	Risk priority number	Severity times occurrence times detection, the number that ranks failure modes in an FMEA.
SMDA	Safe Medical Devices Act of 1990	The law that made adverse event reporting mandatory for hospitals and other device user facilities.
SOP	Standard operating procedure	A written departmental procedure that says how a recurring task is actually done.
TCO	Total cost of ownership	Everything a device costs across its life, not the price on the quote.
TJC	The Joint Commission	The most common hospital accreditor in the United States.
UMDNS	Universal Medical Device Nomenclature System	A free device naming standard, widely used to keep an equipment inventory consistent.
UPS	Uninterruptible power supply	A battery-backed supply that carries a device through a power interruption.
WMTS	Wireless Medical Telemetry Service	Protected radio spectrum reserved for patient telemetry, coordinated under FCC rules.