

2023 CCE Written Exam Review Webinar Series

August 9, 2023, through October 11, 2023

Session #3: Service Delivery Management 1

August 23, 2023

Jenn Nichols, CCE, CHTM

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About the host/moderator



Ishtar Al-Tahir

Ishtar Al-Tahir is a Clinical Engineer working towards her Professional Engineering Certification (PEng.) at the Children's Hospital of Eastern Ontario (CHEO). She joined CHEO in the fall of 2022, however her Clinical Engineering career began at Service New Brunswick in early 2021. She has a Masters in Science in Electrical Engineering (MSc.EE) from the University of New Brunswick, where she defended her biomedical engineering research thesis at the Institute of Biomedical Engineering on myoelectric controlled prosthesis.

In her spare time, she enjoys reading, cooking, playing ultimate frisbee, and learning as much as possible about Clinical Engineering. She volunteers her time with the ACCE, the Clinical Engineering Society of Ontario, and is the publicity co-chair of the CMBEC46 conference. Her passions also lie with promoting engineering and STEM fields to women and youth. She always looks forward to meeting new people, especially if they show her pictures of their dog.

Logistics

- ❖ All attendees have their microphones muted during the presentation.
- ❖ Questions to the faculty must be submitted via the “Q&A” feature in Zoom at any time. They will be addressed at the Q&A portion.
- ❖ If there is any urgent issue, please use the “chat” feature to communicate with the host/moderator.
- ❖ Please remember to complete the webinar evaluation after attending. A link will be provided at the end.



About the faculty

Jenn Nichols, CCE, CHTM

Jenn Nichols, TRIMEDX Division Vice President of Operations, has grown her career in Clinical Engineering over the last twelve years since starting out in the industry. She has held multiple roles throughout her career at TRIMEDX including Site Manager, Regional Director, Project Director for the Integration Management Office, and most recently as Division Vice President. Her passion and drive have paved the way to grow in knowledge and skill. Over the last decade, she has obtained a certificate in biomedical medical equipment technology, obtained her CCE and CHTM certifications, and became involved in multiple industry associations to better enhance her technical abilities and leadership skills. Jenn is focused on driving operational excellence, providing outstanding customer service, and developing her people to be best in class. She holds a BS in Industrial Engineering and MS in Engineering with a Specialization in Integrated Technology Management from Cal Poly, San Luis Obispo.

Service Delivery Management 1

- Technician / Service Supervision
- Equipment Repair and Maintenance
- Equipment Acceptance
- Equipment Performance Testing
- Developing Test/Calibration/Maintenance Procedures

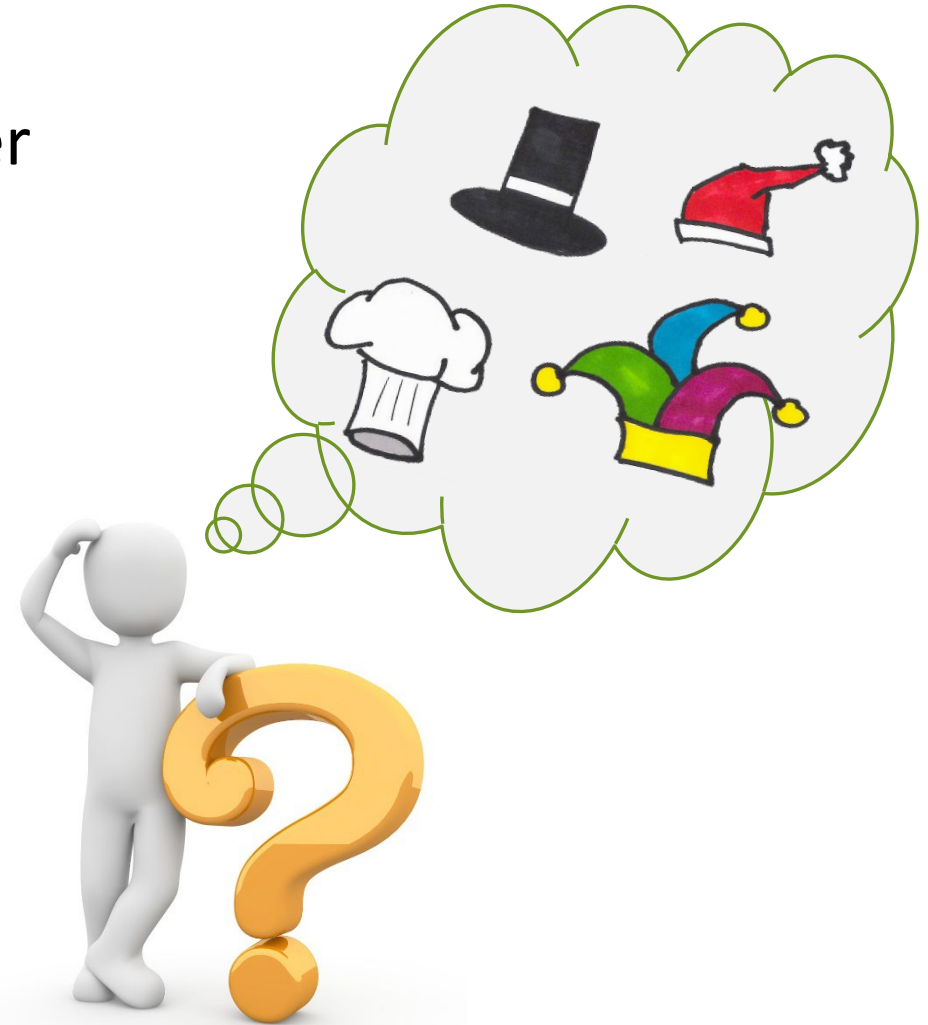
Technician/Service Supervision

Technician / Service Supervision- Department Structure

- Clinical Engineering Manager/Director
 - CE Supervisor
 - BMET I, II, III
 - ISE I, II, III
 - LSE I, II III
 - Cybersecurity Engineer
 - System Engineer/ Clinical Engineering IT
 - Admin

Technician / Service Supervision- Roles & Responsibilities

- Roles & Responsibilities of Clinical Engineer
 - Lead
 - Motivate
 - Elevate
 - Hold Accountable
 - Train
 - Coach
 - Solve Problems
 - Communicate



Technician / Service Supervision- Recruiting

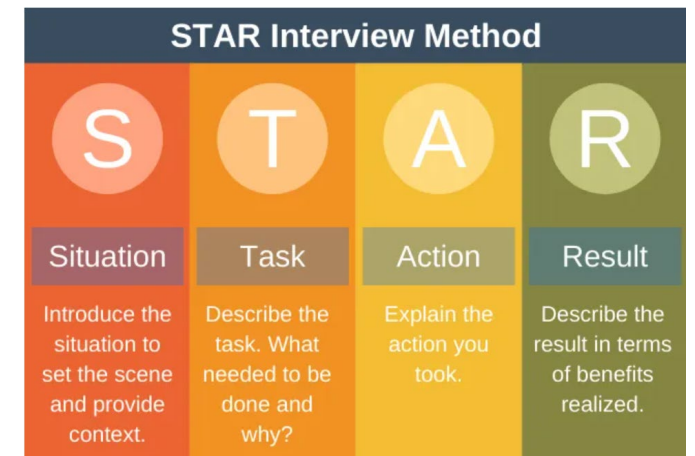
- Recruiting
 - High Schools/Trade Schools/Community Colleges
 - Career Counselors
 - AAMI
 - Industry Publications
 - Indeed/Zip/LinkedIn/Monster
 - Recruiting Firms



Technician / Service Supervision- Interviewing

○ Interviewing

- Work with TA/HR
- At least two people conduct interview
- Standard Set of Interview Questions
- STAR Method (Situation, Task, Action, Result)
- Be timely in scheduling interviews and providing feedback
- Review expectations of positions prior to offer
 - 30-60-90 days plan
 - Performance Indicators



Technician / Service Supervision- New Hire Plan

- New Hire Set associate up for success
 - New Hire Packet/Training Schedule
 - Schedule for the first 1-2 months
 - CMMS Training
 - Policy & Procedures Review and Acknowledgement
 - Annual Compliance Training
 - Performance Indicators
 - Timecards
 - Shadow Schedule/Mentor
 - Competencies
 - Associate Assessment
 - Manager Assessment
 - Performance Review Process & Elements
 - Salary increases and timing
 - Expectations





Technician / Service Supervision- Communication

- Communication
 - Timely, Specific, Clear, Succinct
 - No Surprises
 - Often
 - Positive to Improvement Ratio
 - Know each associate on your team as a person

Technician / Service Supervision- Communication

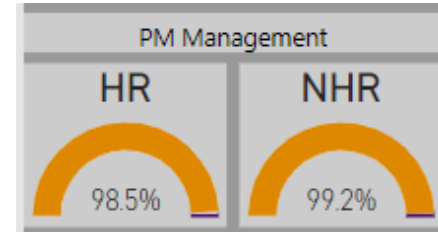
- Daily Huddles

- Associates report on PM/Repair progress
- Hurdles
- High Visibility Issues/Updates



Technician / Service Supervision- Communication

- Weekly Team Meetings
 - Set Agenda
 - Wins/Celebrations
 - Performance Indicators
 - PM Status for Current Month
 - PM Status for Managed/Unmanaged from Previous Months
 - Repairs Open more than XX Days
 - Frequency of notes updated on WO
 - Alert
 - Status
 - Next Steps & Timing
 - Cybersecurity
 - Is Documentation Updated in CMMS to Support Verbal Report?
 - Projects
 - PTO
 - Training Date



Technician / Service Supervision- Communication

- Weekly 1:1s with Each Associate
 - PMs Completed
 - PMs Scheduled
 - PMs Not Completed
 - PMs Overcoming Hurdles
 - Open Repairs
 - Other Open Workorders
 - Training Plans
 - Individual Performance
 - Individual Development
 - Next career move



Technician / Service Supervision- Performance Reviews

- Performance Reviews

- SMART (Specific, Measurable, Attainable, Realistic, Timely)
- Mid- Year Reviews
- Build into weekly 1:1 so associate gets constant feedback
- Refine # of Goals- Don't overwhelm



Technician / Service Supervision- Strategic

- Strategic
 - Annual Job Description Reviews
 - Current & Relevant?
 - Responsibilities Accurate?
 - Skills?
 - Certifications?
 - Talent
 - Community College Partnership
 - Biomed/HTM Association involvement





Technician / Service Supervision- Determining Staffing Levels

- Determining Correct Staffing Levels
 - Staffing Levels
 - No accepted standardized way to calculate
 - Tech: Bed
 - Tech: Piece Count
 - Tech: PM Hours
 - Tech: Patient Census
 - Consider
 - Annual Total PM Hours
 - Annual Average Repair Hours
 - On Call
 - Hours of Operation
 - PTO/Training

Technician / Service Supervision- Determining Staffing Levels

Assigning Work

- Primary Technician
- Secondary Technician
- PM Technician
- On Call Rotation

Distribution of Work

- Skill
- Department
- Location (Onsite vs Off Site Clinics)
- Day/Month
- Patient Schedules

Technician / Service Supervision- Strategic



- Strategic
 - Create a business case to support NET new hires
 - Additional responsibilities
 - Cyber
 - IT/Networking
 - Additional equipment
 - Additional campus/clinics
 - Reduction of contracts
 - Be creative
 - PT
 - As Needed
 - Intern/Co-op
 - Work Schedules
 - Staggered Starts/Days

Technician / Service Supervision- Succession Plans

- Succession Plan

- Promote from Within
- Training plan for development
 - Create a plan for a rolling 18 months
 - Solicit associate input on needs/cost reduction opportunities
- Clearly share with associates
 - Areas of success
 - Areas of Opportunities
 - Next steps for development
 - Skills/Requirements for promotion



Technician / Service Supervision

The Joint Commission (TJC)

- EC.03.01.01 EP 1 Staff responsible for the maintenance, inspection, testing, and use of medical equipment, utility systems and equipment, fire safety systems and equipment, and safe handling of hazardous materials are competent and receive continuing education and training.

Equipment Repair and Maintenance

Equipment Repair and Maintenance- Key Definitions

Medical Equipment – Fixed and portable equipment used for the diagnosis, treatment, monitoring, and direct care of individuals.

High-Risk Equipment (Life Support & Critical Equipment) - Equipment that is critical to patient health and safety. At a minimum, such critical equipment includes, but is not limited to, life-support devices, key resuscitation devices, critical monitoring devices, and other devices whose failure may result in serious injury to or death of patients or associates.

Temporary Equipment – Equipment brought into the facility and intended for short-term use. Typically, the length of time the equipment resides in the facility is not to exceed the duration of one Default PM cycle or one year. Temporary equipment can be classified as loaner, rental, trial, patient-owned, or physician-owned.

Equipment Repair and Maintenance

- Code of Federal Regulations

§ 482.41 Condition of participation: Physical environment.

The hospital must be constructed, arranged, and maintained to ensure the safety of the patient, and to provide facilities for diagnosis and treatment and for special hospital services appropriate to the needs of the community.

(d) **Standard: Facilities.** The hospital must maintain adequate facilities for its services.

(2) Facilities, supplies, and equipment must be maintained to ensure an acceptable level of safety and quality.

Equipment Repair and Maintenance



The Joint Commission (TJC)

- EC.02.04.01 EP 3 The hospital identifies high-risk medical equipment on the inventory for which there is a risk of serious injury or death to a patient or staff member should the equipment fail. Note: High-risk equipment includes life-support equipment.
- EC.02.04.01 EP 4 The hospital identifies the activities and associated frequencies, in writing, for maintaining, inspecting, and testing all medical equipment on the inventory. These activities and associated frequencies are in accordance with manufacturers' recommendations or with strategies of an alternative equipment maintenance ("AEM") program.
- EC.02.04.01 EP 5 The hospital's activities and frequencies for inspecting, testing, and maintaining the following items must be in accordance with manufacturers' recommendations: Equipment subject to federal or state law or Medicare Conditions of Participation in which inspecting, testing, and maintaining must be in accordance with the manufacturers' recommendations, or otherwise establishes more stringent maintenance requirements. Medical Laser Devices Imaging and Radiologic equipment (whether used for diagnostic or therapeutic purposes). New Medical equipment with insufficient maintenance history to support the use of alternative maintenance strategies.

Equipment Repair and Maintenance

The Joint Commission (TJC)

- EC.02.04.01 EP 6 A qualified individual(s) uses written criteria to support the determination whether it is safe to permit medical equipment to be maintained in an alternate manner that includes the following:
How equipment is used, including the seriousness and prevalence of harm during normal use, Likely consequences of equipment failure or malfunction, including seriousness of and prevalence of harm, Availability of alternative or back-up equipment in the event the equipment fails or malfunctions, Incident history of identical or similar equipment, Maintenance requirements of the equipment.
- EC.02.04.01 EP 7 The hospital identifies medical equipment on its inventory that is included in an alternative equipment maintenance program.
- EC.02.04.01 EP 9 The hospital has written procedures to follow when medical equipment fails, including using emergency clinical interventions and backup equipment.

Equipment Repair and Maintenance

The Joint Commission (TJC)

- EC.02.04.03 The hospital inspects, tests, and maintains medical equipment.
- EC.02.06.01 EP 26 The hospital keeps furnishings and equipment safe and in good repair
- EC.03.01.01 EP 1 Staff responsible for the maintenance, inspection, testing, and use of medical equipment, utility systems and equipment, fire safety systems and equipment, and safe handling of hazardous materials are competent and receive continuing education and training.

Equipment Repair and Maintenance- DNV

- **PE.7 SR.6 The Medical Equipment Management System shall address a process for determining timing and complexity of medical equipment maintenance.**

Note: The hospital identifies the activities and associated frequencies, in writing, for maintaining, inspecting, and testing all medical equipment on the inventory. These activities and associated frequencies are in accordance with manufacturers' recommendations or with strategies of an alternative equipment maintenance ("AEM") program. Based on risk review devices are assigned to the MFR or AEM program. Criteria used to review medical equipment includes; the intended function of the equipment, the physical risks related to the use and/or failure of the equipment, the manufacturer's recommendations, the applicable codes and standards, the repair history of the device, and the patient safety history related to the equipment. For AEM eligible equipment, frequencies are set at a corporate level and are supplemented at a local level to accommodate varying conditions. The hospital's activities and frequencies for inspecting, testing, and maintaining the following items must be in accordance with manufacturers' recommendations:

- Equipment subject to federal or state law or Medicare Conditions of Participation in which inspecting, testing, and maintaining be in accordance with the manufacturers' recommendations, or otherwise establishes more stringent maintenance requirements.
- Medical Laser Device
- Imaging and Radiologic equipment (whether used for diagnostic or therapeutic purposes)
- New Medical equipment with insufficient maintenance history to support the use of alternative maintenance strategies.

If the manufacturers' recommendations are not available, recommendations from like-and-kind equipment are utilized or generic procedures are created by qualified personnel

Equipment Repair and Maintenance

- PMs/Preventive Maintenance
 - Ultimate Goal- Equipment is Reliable, Safe, and Reduce Risk
 - Maintenance does not guarantee patient safety or prevent failure
 - More Maintenance doesn't mean Better Results
 - Regular maintenance prevents premature equipment replacement
 - PM Planning and Continuous Refinement
 - Maintain library (virtual or physical) of service manuals
 - Balance Workload
 - Between Months
 - Consider Seasons/Holidays/High PTO
 - Between Associates
 - Skill/Departments/High Risk



Equipment Repair and Maintenance



- PM Schedules
 - Manufacturer
 - Alternate Equipment Maintenance (AEM) -Evidence Based Maintenance
 - Determined based on risk score
 - Equipment Risk Rating
 - Consequence of Failure Rating
 - Significant data to support position including
 - Manufacturer recommendations
 - National Recognized Sources
 - Other hospital systems data
 - Decision can be applied to group of equipment of like make/model or specific device
 - Reviewed decisions annually
 - PM Frequency could be MORE Frequent
 - Even when using AEM Program, Radiology, Laboratory, Laser, and devices without history must have PM Schedule per Manufacturer

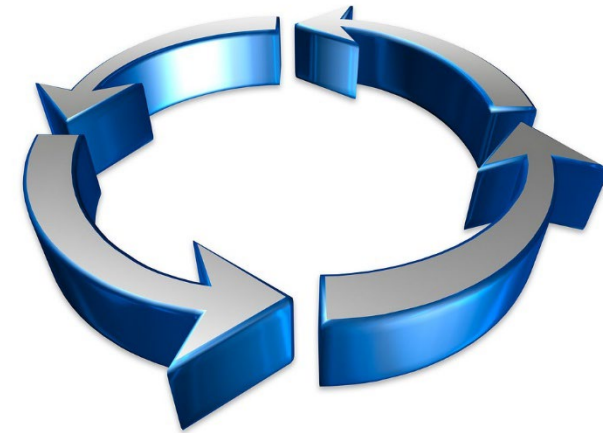
Equipment Repair and Maintenance

- Repairs/Corrective Maintenance
 - Patient Safety First and Foremost
 - Problem Solver
 - Root Cause
 - Don't stop at the first answer
- Documentation
 - Involved in Patient Incident?
 - Troubleshooting Process
 - Replicate Issue?
 - Error Logs?
 - Identify Issue
 - Include Error Codes in Notes
 - Key Indicators
 - Parts Ordered & Timing of Parts Arrival (if Needed)
 - Interim Solution?
 - Duplication?
 - Ok for Use or Out of Service?
 - Communicate to Clinical Staff!!



Equipment Repair and Maintenance

- Completing Repair
 - Correct root issue
 - Complete performance testing and/or Preventive Maintenance
 - Complete electrical safety
 - Complete Documentation
 - Communicate to Clinical Staff
- Follow Up
 - Cannot Duplicate
 - User Error
 - Can anything be done to prevent?
 - Additional Training
 - Labeling
 - Applications
 - Damage
 - Reporting Issue to ECRI



Equipment Repair and Maintenance

- Before Attempting Repair, does associate have
 - Sufficient Training
 - Technical Information
 - Tools
 - Service Keys
 - Test Equipment
 - Software
 - Ability to Order Parts



Equipment Acceptance

Equipment Acceptance

The Joint Commission (TJC)

- EC.02.04.01 EP 2 The hospital maintains either a written inventory of all medical equipment or a written inventory of selected equipment categorized by physical risk associated with use (including all life-support equipment) and equipment incident history. The hospital evaluates new types of equipment before initial use to determine whether they should be included in the inventory.

Equipment Acceptance

DNV

- **PE.7 SR.2 The Medical Equipment Management System shall address issues related to the organization's initial service inspection, the orientation, and the demonstration of use for rental or physician owned equipment.**
- Note: Before initial use and after repairs or upgrades of medical equipment on the medical equipment inventory, the hospital performs safety, operational, and functional checks.

Equipment Acceptance

- Establish a policy
- Some equipment arrives ready to use out of the box, others need to be installed
- Installation performed by qualified personal before use
- Documentation in CMMS
 - Inventory Inspection Work Order
 - Document findings including electrical safety results
 - New Asset Tag, Serial Number, Manufacturer, Model, Description, Site ID (if applicable), Operating System, MAC address, RFID, Warranty Period, Install Date, Acceptance Date
 - Distribute paperwork to finance for proper depreciation
- Validate
 - Operators' manual and service manual present
 - All accessories and consumable included in RFP
 - Clinical/Applications Training
 - Copy of Software/Licenses
- Release of payment held until everything confirmed



Equipment Performance Testing

Equipment Performance Testing

- The Joint Commission (TJC)
 - EC.02.04.03 The hospital inspects, tests, and maintains medical equipment.
 - EC.02.04.03 EP 1 Before initial use and after repairs or upgrades of medical equipment on the medical equipment inventory, the hospital performs safety, operational, and functional checks.
 - EC.02.04.03 EP 27 The hospital meets NFPA 99-2012: HealthCare Facilities Code requirements related to electrical equipment in the patient care vicinity.

Equipment Performance Testing

- DNV

- **PE.7 SR.1 The organization shall establish a Medical Equipment Management System that provides processes for the acquisition, safe use, and the appropriate selection of equipment.**

- Note: Clinical Engineering establishes and maintains a current inventory of medical equipment. In accordance with applicable policies and procedures, the manager of the MEMP will keep the inventory up-to-date as medical equipment is acquired or retired. The hospital evaluates new types of equipment before initial use to determine whether they should be included in the inventory based on contractual or scope of service terms.

- **PE.7 SR.3 The Medical Equipment Management System shall address criteria for the selection of equipment.**

- Note: The hospital maintains either a written inventory of all medical equipment or a written inventory of selected equipment categorized by physical risk associated with use (including all life-support equipment) and equipment incident history. The hospital evaluates new types of equipment before initial use to determine whether they should be included in the inventory.

Equipment Performance Testing

- New equipment inspection regardless of ownership
 - Hospital Owned
 - Patient Owned
 - Rental
 - Leased
 - Research
- New equipment can fail
 - But why?
 - Shipping (Sensors/Battery misalign)
 - Improper Storage
 - Quality Control Issues



Equipment Performance Testing

- Verification of equipment conforms to codes, regulations, and standards
 - Underwriter Laboratories (UL)
 - National Fire Protection Agency (NFPA) 99
 - Standards for Health Care Facilities
 - Electrical, Gas, Vacuum, Environmental, Electrical Equipment
 - The Joint Commission
 - Manufacturer Procedures
 - If manufacturer procedure not available, use generic
 - ECRI
 - ASHE
- When to Perform?
 - Upon Arrival, before First Use
 - After every repair and PM
 - After upgrade
- Document results in Work Order



Recommended Test Equipment

- Electrical Safety Analyzer
- Physiological Simulator
- Defibrillator Analyzer
- Pacemaker Analyzer
- Electrosurgery Analyzer
- Ventilator and air flow test system
- Test lung
- Tachometer
- Oxygen Analyzer
- Non-invasive blood pressure monitor tester
- Digital voltmeter
- Oscilloscope
- Infusion pump analyzer
- Pulse Oximeter Analyzer
- Laser Power meter
- Ultrasound Imaging Phantoms
- Radiographic measurement system
- Radiological and MRI phantoms
- Dialysis test equipment including conductivity meter
- Electronic balance and weights for scale testing
- Test jigs, fixtures, cables, hand tools

Developing Test/Calibration/Maintenance Procedures

Developing Test/Calibration/Maintenance Procedures

- Document Policy & Processes
 - Do What you Say, Say What you Do
 - Does your CMMS support your policies & procedures?
- Where to Start
 - Medical Equipment Management Plan (MEMP)
 - What survey agency does your hospital use? (The Joint Commission, DNV , etc)
 - Review all items mentioning medical equipment to ensure a policy addresses each topic
- EOC Approval
 - Ensure documented in minutes
- Educate Staff
- Review annually to ensure accurate and applicable



Developing Test/Calibration/Maintenance Procedures

- Follow Manufacturer Procedures for:
 - Incoming Inspection
 - Including Electrical Safety
 - Preventive Maintenance
 - Frequency
 - Process
 - Troubleshooting



Developing Test/Calibration/Maintenance Procedures

- If Modified from Manufacturer Recommendations
 - Document
 - Process
 - Data
 - CMMS History
 - Technical Knowledge
 - Potential Risk/Failure
 - Information from qualified sources
 - Conclusion
 - Frequency of Review

When deviating from
Manufacturer
Recommendations, Burden of
Responsibility Shifted to
Hospital

Developing Test/Calibration/Maintenance Procedures

Even with AEM, Follow OEM

- Imaging
- Laboratory
- Laser
- New Equipment

○ Alternative Equipment Maintenance (AEM) Program

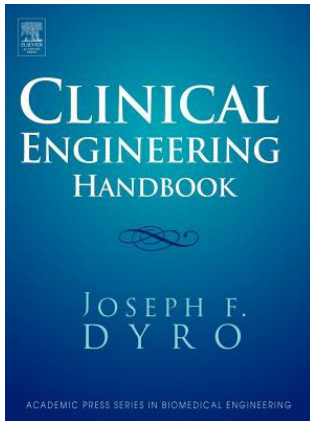
- EC.02.04.01 EP 4 The hospital identifies the activities and associated frequencies, in writing, for maintaining, inspecting, and testing all medical equipment on the inventory. These activities and associated frequencies are in accordance with manufacturers' recommendations or with strategies of an alternative equipment maintenance ("AEM") program.
 - **Note 1:** *The strategies of an AEM program must not reduce the safety of equipment and must be based on accepted standards of practice, such as the American National Standards Institute/Association for the Advancement of Medical Instrumentation handbook ANSI/AAMI EQ56:2013, Recommended Practice for a Medical Equipment Management Program.*
 - **Note 2:** *Medical equipment with activities and associated frequencies in accordance with manufacturers' recommendations must have a 100% completion rate.*
 - **Note 3:** *Scheduled maintenance activities for both high-risk and non-high risk medical equipment in an AEM program inventory must have a 100% completion rate. AEM frequency is determined by the hospital's AEM program..*

Developing Test/Calibration/Maintenance Procedures

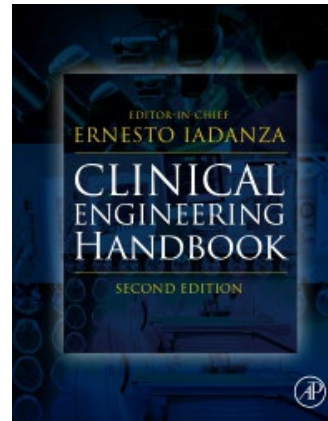
- Policies/Procedures to Establish
 - Alerts & Recall Management
 - Alternate Equipment Management (AEM)
 - Could Not Locate
 - Electrical Safety Testing
 - Equipment Repairs
 - Incoming Inspection
 - Lockout/Tagout
 - Preventative Maintenance
 - Retirement of Equipment
 - Test Equipment



References



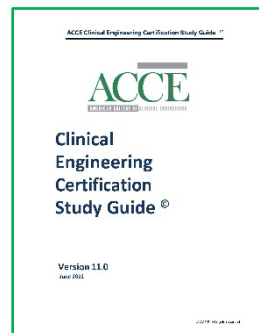
Clinical Engineering Handbook, 1st edition, 2004



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Health Care Facilities Handbook. NFPA 99 (2012). National Fire Protection Association



ACCE CCE Study Guide, v12.0, 2023



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