

Technical Support Fundamentals - Carlos Villafañe – Adjunct Instructor

General Class Review for Final Exam

- Course Dates: August 18-December 1, 2015

Learning Outcomes and Objectives:

- Students will be able to apply appropriate communication methods when presenting data and information.
- Students will identify resources and documentation needed to install, configure, upgrade and troubleshoot Operating Systems.
- Students will, using online resources and research skills, be able to identify part costs and replacement parts.
- Using online resources and research skills, students will be able to locate service manuals and vendor/service numbers.
- Students will understand the process of hospital equipment managing.
- Students will demonstrate ability to recognize and effectively use customer service fundamentals needed for a hospital environment.

Weeks 1 & 2: Introduction to Computer Literacy

- During the first 2 weeks we defined the following terms, identified the components and learned about their functions in the system:
 - Computer
 - Hardware
 - Input and output hardware
 - Keyboard
 - Mouse
 - Microphone
 - Display
 - Printer
 - Speakers
 - Power Supply
 - Motherboard
 - Hard drive
 - Microprocessor or CPU
 - Memory (RAM)
 - Difference between memory and storage
 - Floppy drives, cd drives, dvd drives
 - Thumbdrives, external hard drives
 - Serial/parallel/USB connections
 - Ethernet

- Software
 - Mentioned various Operating Systems and basic differences between them
 - Microsoft Windows (various versions)
 - Mac OS X (various versions)
 - Linux
 - Unix
 - iOS (for iPhones & iPads)
 - Android
 - Others
 - Mentioned well-known software packages and apps
 - Microsoft Office
 - Word
 - Excel
 - Power Point
 - Etc.
 - Applications or “Apps”
 - Explained the difference between Operating Systems and Software programs
 - Discussed various Browsers (Internet Explorer, Firefox, Safari, Google Chrome, etc.) and Internet basics.

Weeks 3 & 4: Computer Operating Systems in a Healthcare Setting

- Discussed basic troubleshooting methods and tools
 - Installing, configuring and updating Windows
 - Formatting a Hard Drive
 - FDISK and FORMAT commands in DOS prompt (C:\)
 - Upgrading memory
 - Use of online tools to identify memory needed
 - Crucial.com
 - Kingston.com
 - Discussed various Tools in the Operating System to check and fix your computer (Make sure you understand the use and importance of each one of these tools while troubleshooting!)
 - System Information
 - Disk Cleanup
 - Disk Defragmenter
 - Task Manager
 - Safe Mode
 - System Restore

*** Review and remember the various ways of finding these tools we discussed in class:

- Start-Programs-Accessories-System Tools
- Using the search box
- Right-click on the bar for Task Manager
- Right-click on the Computer icon – Properties – Tools
- Other methods (Check your class notes).
 - Other 3rd party tools and software
 - Antivirus
 - AntiSpyware

Weeks 5-8: Databases for the Documentation of Medical Device Technology Management and Data Collection, Analysis and Research

- Medical Device Management Software
- Other Databases & Excel Spreadsheets
- Medical Device related Information
- Online Manuals
- Preventative Maintenance Records
- Links used for the class:
 - <http://www.liquidweb.com/blog/index.php/ten-ways-databases-run-your-life/>
 -
 - http://dotatmac.mcmaster.ca/db_basics/db_01_home.htm
 -
 - <http://searchsqlserver.techtarget.com/definition/database>
 -
 - <http://study.com/academy/lesson/what-are-databases-examples-types-quiz.html>

I. Medical Device Management Software

Concept:

Asset management, broadly defined, refers to any system that monitors and maintains things of value to an entity or group. It may apply to both tangible assets such as buildings and to intangible concepts such as intellectual property and goodwill. Asset management is a systematic process of deploying, operating, maintaining, upgrading, and disposing of assets cost-effectively. (http://en.wikipedia.org/wiki/Asset_management)

As medical devices are *assets* of the Healthcare Providers (as hospitals, clinics, etc.), we need a way to keep track of all the information about each medical device. Why?

Some information we keep track of:

- Cost of equipment – We want to know: *what is the cost of replacing a medical device?*
 - Devices can be broken, stolen, become obsolete, etc. How do we know if it's *cost-effective to repair or replace a device?*
 - Every Department has an assigned budget, and some CES Depts. budgets are assigned as a *percentage of the total value* of all the medical equipment hospital-wide. Having the correct costs improves your budget!
- Inventory - To know how much equipment you have, and to determine what other equipment is needed (per the departments necessity)
- PM schedule - For compliance with regulations (FDA, JCAHO, NFPA, etc.)– To know when the device needs to be PM'd, or if there is a Recall from the Manufacturer

A. What information we need from each medical device?

- Brand/Manufacturer
 - Model Number
 - Model Name
 - Serial #
 - Equipment Type (EX. Infusion Pump, ESU unit, Defibrillator, etc.)
 - Department assigned to
 - Location of the unit
 - PM requirements
 - PM Cycle (Once a year? 6 months? Quarterly?)
 - PM Due dates
 - PM instructions – Per MFG or Hospital policy
 - Manufacturer's Warranty – (Very important!! Wrong information in the system is costly!)
 - Installation date (Warranty period usually starts the install date)
 - Cost of the equipment
 - Actual cost vs. List Price – Do you see any advantage?
-
- Explained the *crucial importance of entering the correct data:*
 - “Garbage in = Garbage out”
 - If the info is not correct, any report created will be “junk”.

Discussed some well-known Medical Asset programs

- a. "AIMS" from Phoenix Data Systems
- b. HarvestCEMS from Harvest Data Systems
- c. MediMizer
- d. CMS

- a. **AIMS** - Web application software, enabling the data to be stored centrally and accessed via a web-browser; there is no client software to install. (www.goaims.com)
- b. **HarvestCEMS - Harvest Data Systems, Inc.** - <http://www.harvestdatasystems.com/Products/HarvestCEMS.aspx>
- c. **MediMizer** - <http://medimizer.com>
- d. **CMS** – Computerized Management System – www.facilitiesurvey.com



I. Ways to determine how often a PM should be performed

- Manufacturer instructions
- Hospital Policies and Procedures
- Discussed "Risk Factors" –
 - With "Risk/Inclusion Factors" you can establish a risk-based prioritization system. These factors become the basis to determine which equipment should be included in your equipment management program and when to schedule periodic PM inspections.
 - You can use Risk categories to categorize your equipment by the risk factors that contribute to how often a PM should be performed

Baycare policy Examples: Clinical Engineering policy details the written criteria used to identify risks associated with medical equipment. This process examines criteria specific to the equipment type, such as equipment function, patient risk, maintenance requirements, corrective maintenance repeat frequency averages and equipment environment. The identified risks are used to assist in determining the strategies for maintenance, testing and inspection of medical equipment and to guide the development of training and education programs for clinical staff.

POLICIES AND PROCEDURES

TITLE: PLANNED MAINTENANCE INSPECTIONS		
ISSUED FOR: III All BayCare Facilities		POLICY NUMBER: CES-03 PAGE: 1 of 9
Original Issue Date: 05/10/06	Revision Date: 1 / 15	Review Date: 11/15
Sponsored By: Clinical Engineering Originator Title: Director, Clinical Engineering	Approved by: Walter Barrionuevo, Director Clinical Engineering	

POLICY:

To define the types of equipment supported by the Clinical Engineering Services department and to establish responsibilities for equipment maintenance and support.

PURPOSE:

To provide a quality oriented clinical equipment service program which meets operational, regulatory and financial requirements.

PROCEDURE:

The criteria used to determine if a medical device is included in the Medical Equipment Management Program (MEMP) is based on manufacturer recommendations, risk criterion, local accreditation or regulatory requirements and local operational experience. This process examines criteria specific to the equipment type such as equipment function, risk to the patient, and maintenance requirements.

LIFE SUPPORT:

All Life Support medical devices are included in the MEMP. The Joint Commission defines Life-Support equipment as any device used for the purpose of sustaining life and whose failure to perform its primary function, when used according to manufacturer's instructions and clinical protocol, will lead to patient death in the absence of immediate intervention (examples include ventilators, anesthesia machines, and heart-lung transplant machines).

All Life Support devices are assigned an Equipment Status of Life Support and a Risk Inclusion Factor of 40.

Description	Life Support Definition	Score
Life Support	Devices include: Anesthesia Ventilators, Anesthesia Units, Heart-Lung Bypass units, Defibrillators, Intra-Aortic Balloon Pumps, Pacemakers, Surgical Robotic and Ventilators.	40

Planned Maintenance will consist of scheduled functional tests, calibrations, and electrical safety inspections where applicable in accordance with Original Equipment Manufacturer (OEM) recommendations or Alternative Equipment Maintenance strategies (AEM).

NON-LIFE SUPPORT:

For all other medical devices not identified as Life Support, the formula $F+R+[(M+S+E)/3]$ is used to determine its Risk

Inclusion Factor:

$(F, Equipment Function) + (R, Risk) + [(M, Maintenance Requirement) + (S, Service Experience) + (E, Environment)/3]$

Description	Definition	Score
	treatment of patients. <i>core</i>	9
Therapy	Equipment used in physical therapy and other non-critical care units for the treatment of patients.	
Diagnostic Imaging	Diagnostic Imaging Equipment (i.e. radiology, nuclear medicine, CT, MRI, ultrasound, etc.) and Diagnostic Patient Monitoring (i.e. ECG, EEG, EMG, etc.)	
Monitoring	Monitoring equipment used to measure a patient's physiology and/or the output of gases, medication, or energy delivered to a patient.	
	Sterilizing devices	
	Equipment used in the lab for analyzing, counting and/or identifying specimens	
Automated/Non-patient Related	Includes automated and self-calibrating lab analyzers that specify no routine maintenance interaction that are used for counting and/or identifying specimens. Also includes computer equipment, microscopes and lab accessories used to analyze	
Patient Related	Any equipment that comes into contact with patients that does not meet any of the above criteria	
Non-Patient	Any equipment that does not come into contact with patients and does not meet any of the above criteria	

Risk (R)		
Description	Definition	Score
Major Injury	Any device that has the potential to cause major injury if it malfunctions. This includes all devices that deliver "energy" or delivers medication intravenously.	III
Inappropriate Therapy or Misdiagnosis	Any device that has the potential to deliver radiation, magnetic energy, electrical energy or nuclear energy if it malfunctions.	
No Significant Risk to Patient	Any device that does not have the potential to cause major injury if it malfunctions.	

Maintenance Requirements (M) – Based on planned maintenance needs of equipment		
Description	Definition	Score
Mandatory	One or more of the following conditions apply: <ul style="list-style-type: none"> Requires non-durable parts/consumables replacement at scheduled intervals, i.e. chemicals, valves, filters, etc. Manufacturer requires cleaning & calibrating at scheduled intervals 	15
Safety Inspection	One or more of the following conditions apply: <ul style="list-style-type: none"> Equipment is a Patient-Care-Related Electrical Appliance* and typically located in a Patient Care Vicinity** Equipment has regulatory requirements of documented performance testing at scheduled intervals, i.e. centrifuge 	12
No Planned Maintenance Required	None of the conditions above apply	1
*** Manufacturer/Model Lower Requirements	The following condition applies: The manufacturer specifically states that this model device requires fewer inspections than the Device Type Risk Factor requires.	1
*** Manufacturer/Model Higher Requirements	The following condition applies: The manufacturer specifically states that this model device requires more inspections than the Device Type Risk Factor requires.	12

* Per NFPA 99 2005, Patient-Care-Related Electrical Appliances are any electrical appliance that is intended to be used for diagnostic, therapeutic, or monitoring purposes in patient care vicinity.

** Patient Care Vicinity is a space, within a location intended for the examination and treatment of patients, extending 6 ft. beyond the normal location of the bed, chair, table, treadmill, or other device that supports the patient during examination and treatment. A patient care vicinity extends vertically to 7.5 feet above the floor.

*** These scoring elements are to be used in Manufacturer Model specific Risk Inclusion calculations only. They are not to be used in the Equipment Type Risk Factor calculations.

Equipment Service Experience (S) - based on Corrective Maintenance (CM) Repeat Request Frequency Averages in a 24 month period		
Description	Definition	Score
Extensive	Average of 90 days or less between repeat CMs	5
Above Average	Average of between 91 and 180 days between repeat CMs	4
Average	Average of between 181 and 365 days between repeat CMs	3
Below Average	Average of 366 days or greater between repeat CMs	2

Fact: Interesting FDA Requirement

Audit Trail - (per <http://www.etq.com/regulatory-compliance-software/>)

“The Audit Trail includes the field's old value, new value, name of the user who made the change, and date and time”. The program logs every change made to any field. That means that in case of an audit, there is a time stamp with the name of the person that makes any change! This prevents the falsifying of records.

Note: Review the notes from the 3 Lessons and the assignment for those weeks (Contacting Manufacturers for software Information)

Weeks 9-10 : Internet Resources for Biomedical Information Systems

- Discussed how to use the Manufacturer's website to search for information, parts and service
- Performed a real exercise in class: Searched the GE website (www.gehealthcare.com) for a specific part needed to repair a Dash3000 Patient Monitor
 - Accessed Support section for Dash3000 Service Manual ○ Service manual link:
http://www3.gehealthcare.com/~media/downloads/us/services/equipment%20services/support-center/daylight-savings-time/patient-monitoring/monitors/gehc-service-manual_dash-3000-4000-5000-patient-monitor_v7.pdf
 - Located pictorial view to identify part number
 - Searched GE Customer Service number for cost and availability
- Discussed some useful tools, websites and links:

MFGRs:

- <http://www3.gehealthcare.com/en>
- <http://www.healthcare.philips.com/>
- <http://www.medtronic.com> (Covidien/Medtronic/Valleylab)
- <http://www.spacelabshealthcare.com/>
- <http://mindraynorthamerica.com/> (Datascope/Mindray)

Technical Help:

- <http://www.frankshospitalworkshop.com/>
- www.AAMI.org
- www.BMET.wikia.com
- Discussed the use of a Forum and its value
 - www.Biomedtalk.com
 - www.Ebme.co.uk/forums
- Discussed the use Blogs and personal websites and its value
 - Patrick Lynch Biomed blog (GMI)
 - www.AAMIblog.org
 - www.biomedtechnicians.com

Social Media

- Use of Facebook, LinkedIn and Tweeter – Explained differences and use

Magazines:

- www.24x7mag.com
- www.1technation.com
- <http://medicaldealer.com/>
- <http://www.dotmed.com/>

Biomed Associations Websites:

- www.AAMI.org (national)
- www.baami.org (Local)
- www.FBSOnline.net (State)

Weeks 12 -13: Needs Analysis and Process Documentation

- Needs Analysis – defined as a process or tool to determine what is needed.
- Discussed various types of “need analysis”:
 - o Organizational
 - o Personal (Individual)
 - o Work or Task Analysis
 - o Performance Analysis
 - o Content Analysis
 - o Training Analysis
 - o Cost-benefit Analysis
- Discussed what are the needs of a Clinical Engineering department
 - o PM’s
 - Test Equipment
 - Manuals
 - WO Software
 - Training
 - o Repairs
 - Tools
 - Parts
 - Test Equipment
 - Manuals
 - Training
 - o Installations
 - Literature
 - Knowledge
 - Tools
- Explained the importance of understanding the needs of the Department, even if we are not involved in Management

- Links used in class (Videos and information):
 - https://www.youtube.com/watch?feature=player_embedded&v=77tYsoFEI2k
 - <http://www.hr-guide.com/data/G510.htm>
 - <http://www.hr-guide.com/Training/Checklist.htm>
 - <https://www.linkedin.com/pulse/20140625083758-6939498-a-basic-guide-to-training-needs-analysis>
 - http://www.who.int/medical_devices/global_forum/D09.pdf

Weeks 14 – 15: Effective Customer Service for Healthcare Environments

- Discussed *who is your customer* in the Healthcare Environment
 - Doctors
 - Nurses
 - Patients
 - Techs
 - Visitors
 - Coworkers
 - **Everybody!**
- Discussed the difference between Customer Service and *Excellent* Customer Service
 - Expected Service
 - Exceeded Expectations
- Discussed some Customer Service Skills we all should develop as BMETs and why
 - Politeness
 - Knowledgeable
 - Efficient
 - Empathy
 - Communications skills
 - Good Listeners – listen to *understand*, not to answer only
 - Use of Positive Language – Example: Instead of saying “I don’t know how to fix this”, it’s better to say “I’ve exhausted all my resources and I’ll need to escalate the call”
- Discussed various scenarios or incidents the students had in the past with problematic customers, and what was done to solve the situation.

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