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Increasing Awareness of Improper Equipment Cleaning

Michael Heusser, MS, CCE
Supervisor of Clinical Engineering
Middlesex Health

Bianca Wyman, BS
Clinical Engineer
Middlesex Health

Middlesex Health is dedicated to providing patients a high quality of care.

The Health System is a Mayo Clinic Care Network Member and consists of:

- 229 Bed Hospital
  - Magnet designation five times in a row
- 3 Urgent Care Offices
- 3 Family Practice Offices
- 9 Primary Care Offices
- 2 Offsite Emergency Departments with lab and radiology services
- 2 Cancer Centers
- Outpatient Radiology and Surgery Center
- 7 Physical Rehabilitation Offices
- Nearly 11,000 unique medical device assets across all facilities

Poll Question 1

Have any of your devices been damaged by incorrect chemical use?

- Yes
- No
- Unsure

Poll Question 2

Have you found manufacturer’s recommendations for cleaning to conflict with those recommended by your infection control department?

- Yes
- No
- Unsure

Poll Question 3

Do the users know which chemical is correct for use on a device?

- Yes
- No
- Unsure

Poll Question 4

Do the users know who is responsible for cleaning a device?

- Yes
- No
- Unsure

Poll Question 5

How do you educate your staff on the correct cleaning method to use on a device?

- Labels ie: Bleach Only
- Education at install
- Ongoing education
- Compatibility Charts

Objectives

- Provide information on hazards of incorrect cleaning methods and potential outcome on patient safety and cost implications
- Discuss effective interdisciplinary collaboration
- Demonstrate how an equipment labeling system can aid in communication to improve cleaning practices.

Summary of Initiative

Situation	Background	Assessment	Recommendations	Post Go Live Results
Reduction of healthcare associated infections	Equipment damage	Multi Disciplinary Team Created	Stickers and equipment	Challenges overcome
Correct chemical required to prevent equipment damage	Potential Inventory at Risk	Inventory Gathered and Reviewed	Purchase appropriate chemicals	
Need clear assignment of group responsible		End Users Consulted	Staff education	
			Continued audits	
			Ongoing process	
			Go-Live strategy	

Situation

- Reduction of healthcare associated infections (HAI)
- Correct chemical required to prevent equipment damage
- Need clear assignment of group responsible

Hospital-Acquired Conditions Reduction Program requires worst 25% of hospitals lose a percentage of Medicare payments even if improvement is seen for an individual hospital from the previous year.

Reasons to Clean

- CT nursing homes fined by DPH for improper cleaning of equipment.
  - Glucometers only cleaned with alcohol wipes after patient use. Site fined $10,000 [9].

Reasons to Clean Correctly

- Multiple alerts and articles have been written overtime. Detail the hazards of using the incorrect chemicals from device failures to fires.
    - CDC Article in 2007
    - ECRI Top 10 Health Technology Hazards 2017, 2018, and 2019
    - Multiple Manufacturer Alerts and Addendums updating the approved cleaning chemicals for various devices.
    - Magazine Articles
    - Conference Presentations

Risk of HAIs

- 20-40% of HAIs result from transmission of infections through healthcare workers hands [5].
  - After contamination from touching medical equipment and patients.
  - Medical equipment has been found to not be cleaned properly due to irregular surfaces and poor cleaning guidelines.

Risk of HAIs

- MRSA in multiple studies [5] found on :
  - Blood pressure cuffs
  - Ventilator buttons and circuit
  - Suction systems
  - Ultrasound machines

Risk of HAIs

- Staphylococcal bacteria display ability to survive in environments of varying temperature, humidity, and sunlight.
  - Can survive for weeks on dry surfaces.
  - If mixed with dust, can survive up to a year and can transfer to new host [1],[2],[4].

Risk of HAIs

- 10%- 50% of the surfaces in patient rooms that are colonized or infected with *C difficile*, MRSA, and VRE are contaminated with these pathogens.
  - Not thoroughly cleaning contaminated surfaces in patient rooms (mean 32% of objects cleaned) has been linked to an overall 120% increased risk of infection to the next occupant in that room [1], [2],[4].

How long can pathogens survive on surfaces?

Table 4. Pathogen Survival on Dry Inanimate Surfaces	
Bacteria	**Survival**
• **Acinetobacter**	3d to 5mo
• **Clostridium difficile (spores)**	≥5mo
• **Escherichia coli**	1.5h to 16mo
• **Enterococcus Including VRE**	5d to 4mo
• **Haemophilus influenza**	12d
• **Klebsiella spp.**	2h to >30mo
• **Mycobacterium tuberculosis**	1d to 4mo
• **Pseudomonas aeruginosa**	6h to 16mo; 5wk on dry floors
• **Staphylococcus aureus (including MRSA)**	7d to 7mo
• **Streptococcus pneumoniae**	1-20d
• **Streptococcus pyogenes**	3d to 6.5mo
Fungi & Yeast	
• **Aspergillus conidia (spores)**	several mo to >yr
• **Candida albicans**	1-120d
Viruses	
• **Adenovirus**	7d to 3mo
• **Coronavirus (SARS, GI infections, cold)**	3-28d
• **Coxsackie virus**	>2wk
• **Cytomegalovirus**	8h
• **HBV**	2h to 60d
• **HIV**	>7d
• **Influenza virus**	1-2d
• **Norovirus**	CDC: Stable in environment
• **Papillomavirus 16**	>7d
• **Respiratory syncytial virus (RSV)**	Up to 6h
• **Rotavirus**	2d to 2mo
h=hour(s); d=day(s); wk=weeks; mo=month(s). adapted from Kramer 2006 & Casanova 2010	

Patient Safety Concern

- Example: Surgical instrument used for cataract surgery.
  - High level liquid chemical disinfectant was used that is known to irritate eye.
  - Manufacturer recommendations were to steam sterilize.
  - Patient developed severe eye infection after procedure.
- Result: Increased patient's risk for infection and blindness [1].

Reasons to Clean Correctly

- Most chemical disinfectants made of: alcohols, peroxides, aldehydes, quaternary compounds, alkyl amines and chlorine releasing compounds.
- All of these can create residual stress called environmental stress cracking in plastics.

Reasons to Clean Correctly

- Environmental stress cracking is caused by two simultaneous means of degradation.
  - Stress - Normal use of the device that should not normally cause damage
  - Chemical - Speeds up the creation of macroscopic brittle-crack formations.
- Leads to weak points and cracking on external housings of medical devices.
- A study was done to replicate damage seen in field [8].

Example of Cleaning Instructions

The disinfectant was wiped off with a cloth moistened with a solvent-free detergent or

Please Note immersion of the in fluid is strictly prohibited and could lead to serious damage

Grove Collaborative Ultra-Concentrated Liquid Laundry Detergent - Free & Clear (24 Oz)

$9.95 from Grove Collaborative **98%** positive (544) $20 minimum order

★★★★☆ 38 product reviews

Meet our Ultra-Concentrated Liquid Laundry, a dye-**free detergent** powerful enough to take on any stain without taking on the ...

Liquid · 24 fl oz · High Efficiency · Unscented

Dynamo Liquid Detergent, Free & Clear by Essendant - PBC48116

$54.99 from Lions Deal **95%** positive (2,494)

Time-tested **detergent** provides mighty cleaning power. Ultra formula is hard on soil but gentle on fabric. Light, fresh scent ...

Liquid · 100 fl oz

Reasons to Delegate Responsibility

- Device Cleaning is Situational
  - Mobile devices vs fixed in room devices
- Staff Assumptions and Doubts
- Staff Concerns
  - Fear of damaging device

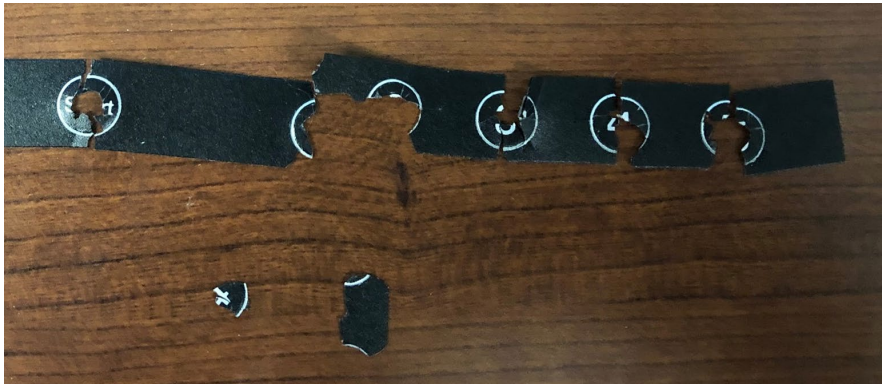
Background

- Our Experience With This Damage
  - Infusion Pump Example
- Potential Inventory at Risk
  - Large number of unique device types

Experience with Chemical Damage

- Common Devices Seen With Damage:
  - Vital Signs Monitors and Stands
  - OR Monitor Shields
  - Touchscreens
  - Corroded Contacts on Various Devices
  - Infusion Pumps

Phone Sterilizer Button Damage



- Damage after using one type of cleaner on the device for 1.5 years

Vital Signs Housing Damage

- Damage after use of cleaning chemicals that were not aligned with manufacturer’s instructions

Infusion Pump Investigation

- Symptoms began at 10 months of age.
- Cracks at the seams of device.
- Worked with the manufacturer to determine cause.
- Root cause pointed to Environmental Stress Cracking.

Infusion Pump Extent of Problem

Infusion Pump Repair Strategy

- Staff on Nursing Units and Central Sterile were trained to look for damage and remove device from service.
- Central Sterile was outfitted with the appropriate chemical and trained on the importance of it.
- Additional devices purchased to avoid lack of devices for patients during repair process.

Infusion Pump Repair Strategy

- All parts were ordered immediately.
  - Manufacturer assisted in creating parts list.
    - Housing
    - Doors
    - Gaskets
- Dedicated repair stations created with all components needed.
  - Repairs started upon parts arrival, which was conveniently in line with PM month.
- Rear housings are serialized.
  - Real time locating system heavily utilized.

Infusion Pump Repair Strategy

- A dedicated team was organized for performing the service
  - 1 FTE Organizing and distributing parts
  - 2 FTE Collecting and distributing devices
  - 5 FTE Repairing Devices
    - 3 In House Staff
    - 2 OEM Staff
  - 1 FTE Performing PMs

Infusion Pump Cost

- This repair cost ~$160,000
  - OEM T & M ~$130,000
  - Additional Devices ~ $30,000
- In House Labor of ~600 hours

Inventory at Risk

- Most if not all devices are at risk of similar damage.
- Current Inventory:
  - Approximately 10,000 assets
  - Over 1,500 unique asset types

Assessment

- Multi Disciplinary Team Created
- Inventory Gathered and Reviewed
- End Users Consulted

Multi Disciplinary Approach

- Multi Disciplinary Committee Created
  - Nursing
  - Infection Control
  - Environmental Services (EVS)
  - Clinical Engineering
  - Central Sterile
  - Administration

Multi Disciplinary Approach

- Spreadsheet Created
  - Devices
  - Responsible Users
  - Chemicals available
  - Risk of Healthcare Acquired Infections Transmission

Device Research

- Device Inventory Review
  - Unique Device Models
  - Manuals
  - Manufacturer Discussions
  - Chemical Cross Reference

Cleaning Delegation

- Individuals Responsible
  - Device and Applicable Chemical Review
    - This was done to determine who has the appropriate materials and expertise available to effectively clean the device.
  - Situational Device Use
  - Open Discussion with Members
  - “Kill” Time
    - Certain chemicals need to sit on devices for a certain time before the device can be used again to effectively disinfect.
  - Education
    - This is important to ensure staff are comfortable cleaning the device.

Inventory Review with End Users

- Applicable Inventory Provided
- Responsibility Cards Created
- Open Discussion With Staff
  - End User Complaints
  - Sticker Idea Discussed
- Sticker Idea Tested

End User Complaints

- Some end user complaints were:
  - Device Unfamiliarity
  - Difficult to Read Responsibility Cards
  - Importance of Chemical
  - Time

Sticker Idea Discussed

- Based off of end user complaints
  - Device Unfamiliarity
    - Equipment should be clearly labeled it should be cleaned.
  - Difficult to Read Responsibility Cards
    - Equipment should be clearly labeled who should be cleaning it.
  - Importance of Chemical
    - Equipment should be clearly labeled what it should be cleaned with.
  - Time
    - Chemicals should be readily accessible for staff to use.

Sticker Idea Tested

- Stickers Created
- Controlled Test Group Selected
- Significant Improvements Seen
- End User Feedback Gathered

Recommendations

- Finalized Stickers
- Initial Equipment List
- Chemical Supply
- Staff Education
- Continuous Audits
- Ongoing Process
- Go-Live Strategy

Stickers Proposed

- Equipment should be clearly labeled it should be cleaned.
  - Stickers will show cleaning frequency.
- Equipment should be clearly labeled who should be cleaning it.
  - Stickers will be shaped per department.
- Equipment should be clearly labeled what it should be cleaned with.
  - Stickers will be colored per chemical.

Final Stickers

Initial Equipment List

Equipment or Item	Group Responsible	Manufacturer Recommended
IV pump	CSS	Bleach
SCD Pump	EVS	Bleach
Vital Sign Machines	User	Bleach
Wall Mounted Vital Sign Machines	EVS	Bleach
EKG Machine	User	Bleach
PCA	CSS	Bleach
Feeding Pump	EVS	Bleach
Defibrillator on Code Cart	CSS	Quaternary Ammonium
Wall Mounted Patient Monitor/Leads/Pulse Ox/Cuff	EVS	Quaternary Ammonium
Bladder Scanner	User	Quaternary Ammonium
Telemetry Pack	User	Quaternary Ammonium

Chemical Supply Review

- Current Chemicals Used
  - Bleach
    - 1 Wipe Manufacturer
    - 1 Solution Manufacturer
  - Quaternary Ammonias
    - 2 Wipe Manufacturers
    - 1 Solution Manufacturer
  - UV Disinfection
- Found some devices to be outfitted with the incorrect chemicals.

Education

- Educational Methods Used
  - Flyers
  - Department Meetings
  - Shift Huddles

Equipment Cleaning Education Flyer

New Equipment Cleaning Labels

Please be advised of the **new cleaning labels** on select medical equipment to assist with proper device cleaning practices:

Sticker **SHAPE** provides who is responsible for cleaning the device:

⬠ = Central Sterile Services (CSS)

☐ = Device User

◯ = Environmental Services (EVS)

Sticker **COLOR** provides what cleaner to use:

Orange = Bleach Wipes

Purple = Purple Top Wipes

All equipment used in Special Contact rooms should be cleaned with bleach, regardless of the sticker.

"**After pt use**" defined as: when the device is to be used on a **new** patient.
Please contact Infection Control (x6437) with any questions!

Equipment Cleaning Reference Chart

Equipment Cleaning - Reference Chart

All equipment used in Special Contact rooms should be cleaned with bleach, regardless of the sticker.

Equipment Cleaned by Central Sterile Services

Infusion Pump

PCA Pump

Feeding Pump

Equipment Cleaned by Environmental Services

SCD Pump

Wall-Mounted Vitals Sign Monitor

EarlySense Pad

EarlySense Monitor

Wall-Mounted Patient Monitor

Equipment Cleaned by User

Vitals Sign Monitor

EKG Machine

Defibrillator

Bladder Scanner

Telemetry Pack

Glucometer

Audits

- Continuous Audits
  - Ensure Sticker Status
    - Visual Inspection
  - Ensure Chemical Status
    - Visual Inspection
  - Verify Frequency of Cleaning
    - Chemical Indicator
  - Reinforce Stickers with Results
    - Management Review

Audit Equipment Tested

- Three surface cleaning detection indicators tested
  - Gel 1
    - Pro: Remained in place
    - Con: Required scrubbing to remove
  - Powder
    - Pro: Remained in place
    - Con: Required scrubbing to remove from some surfaces
  - Gel 2
    - Pro: Remained in place, but easy to remove with any chemical wipe from any surface
    - Con: None

Ongoing Process

- Methods used to upkeep system
  - Sticker type stored in CMMS
  - Ongoing education
    - Audit Results
    - Repairs
    - Annual Compliance
  - Review of existing devices without stickers
  - Review of new devices
  - Repair cost review

Go-Live Strategy

- Following were done in preparation for the go-live of the stickers
  - Replacement of all incorrect chemicals
  - Staff education
    - Clinical
    - CSS
    - EVS
    - Clinical Engineering
  - Stickering devices

Post Go-Live Results

- Initial Results:
  - Correct chemical was being used
  - Staff became more aware of responsibility
  - Device damage is continuously evaluated and detected early
  - Additional devices being considered for stickers

Post Go-Live Results

- Ongoing Results:
  - Continuous education being performed to break old habits
  - First audits showed an increase of cleaning on equipment.
  - Staff requested the glucometer sticker be placed in a new position for better results.

Challenges Overcome

- Barriers and Problems Experienced:
  - Staff concerns with amount of bleach needed
  - Bleach wipes leave undesired residue on screens
  - Certain scenarios will require bleach due to organisms
  - Maintenance of stickers over long periods of time
  - Breaking old habits of using previous methods for cleaning

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Questions