Quat Absorption

The “Quat Absorption Issue”

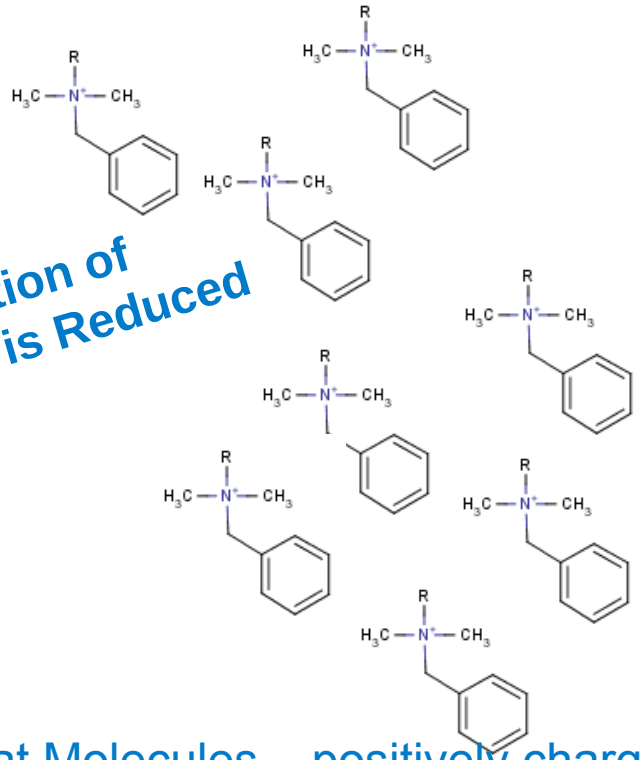
- The Concern
  - To achieve disinfection the appropriate level of disinfectant must be applied to surfaces.
  - Current programs often do not control critical inputs and combine improper products, tools and processes to deliver necessary disinfectant levels.

Understanding Quat Absorption

- Quaternary ammonium compounds are cationic surfactants and attracted to fabric surfaces which are anionic:

Cloth – negatively charged

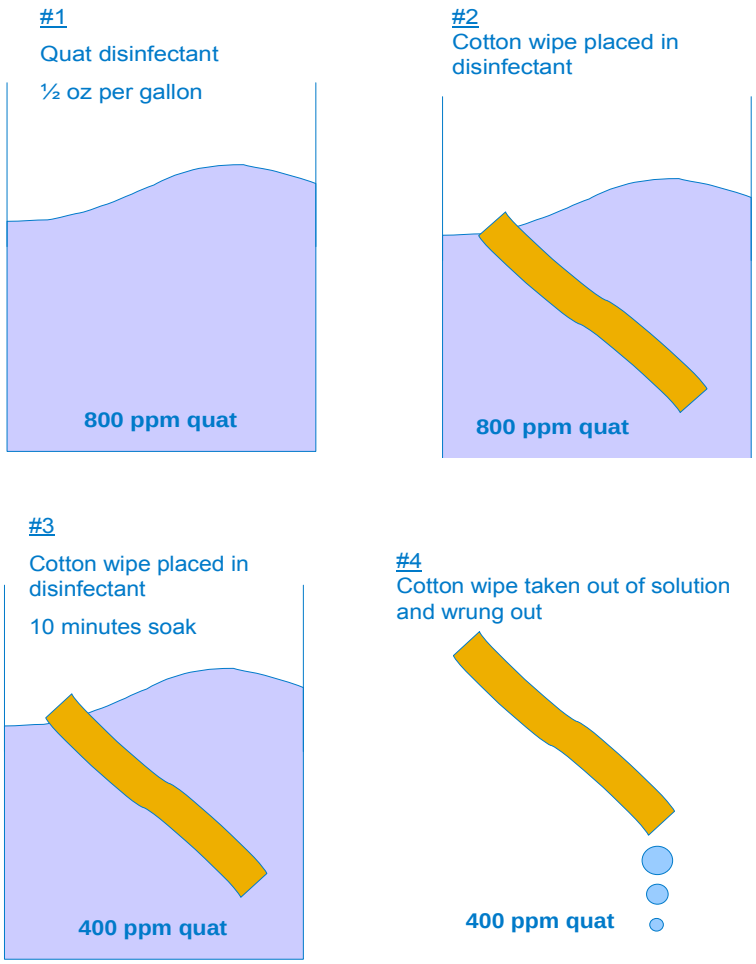
Concentration of Available Quat is Reduced



Quat Molecules – positively charged

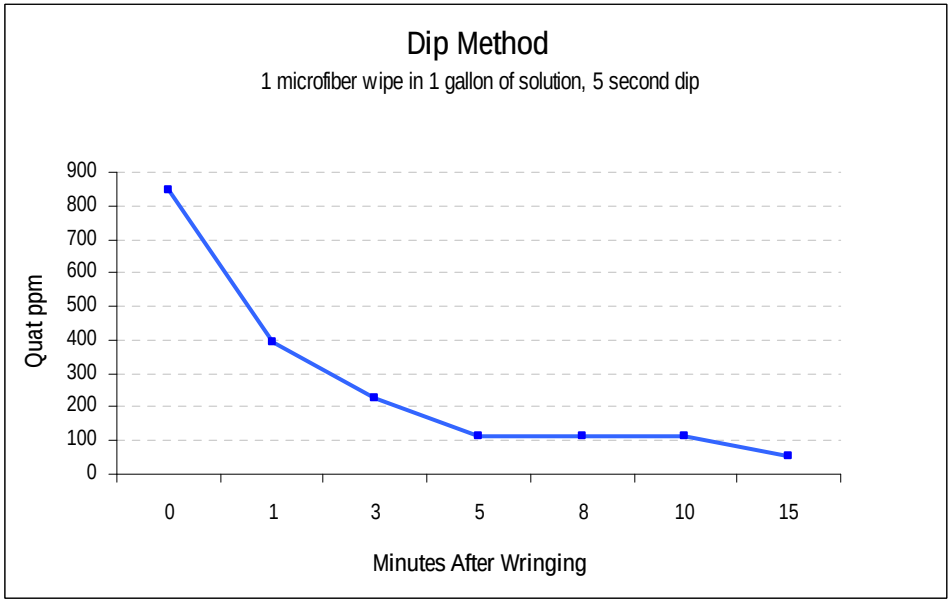
Understanding Quat Absorption

- Several factors affect quat absorption, including the following:
  - Concentration of disinfectant
  - Volume of disinfectant solution per wipe or mop
  - Fabric type
  - Time spent in disinfectant solution

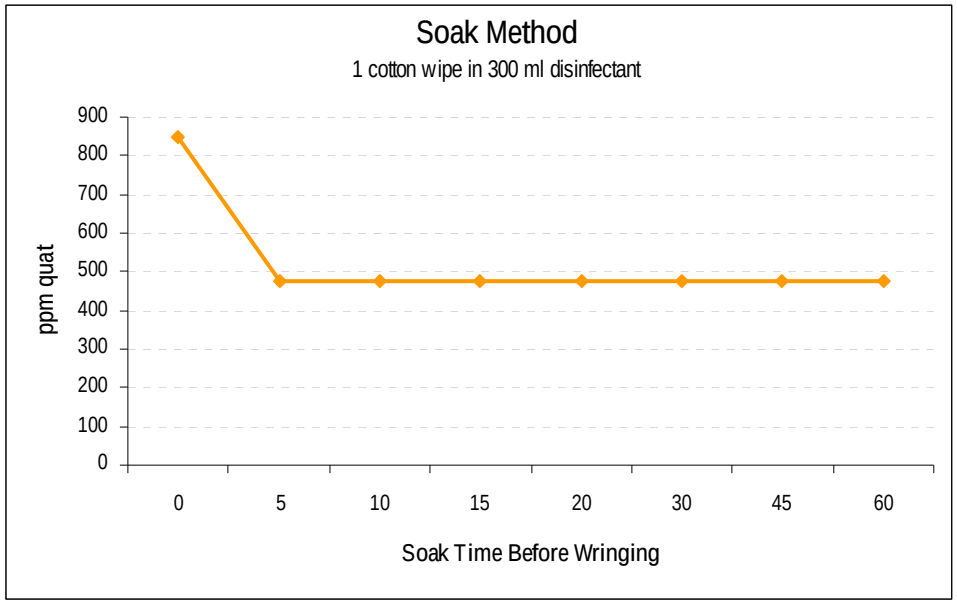


Time Spent in Disinfectant Solution

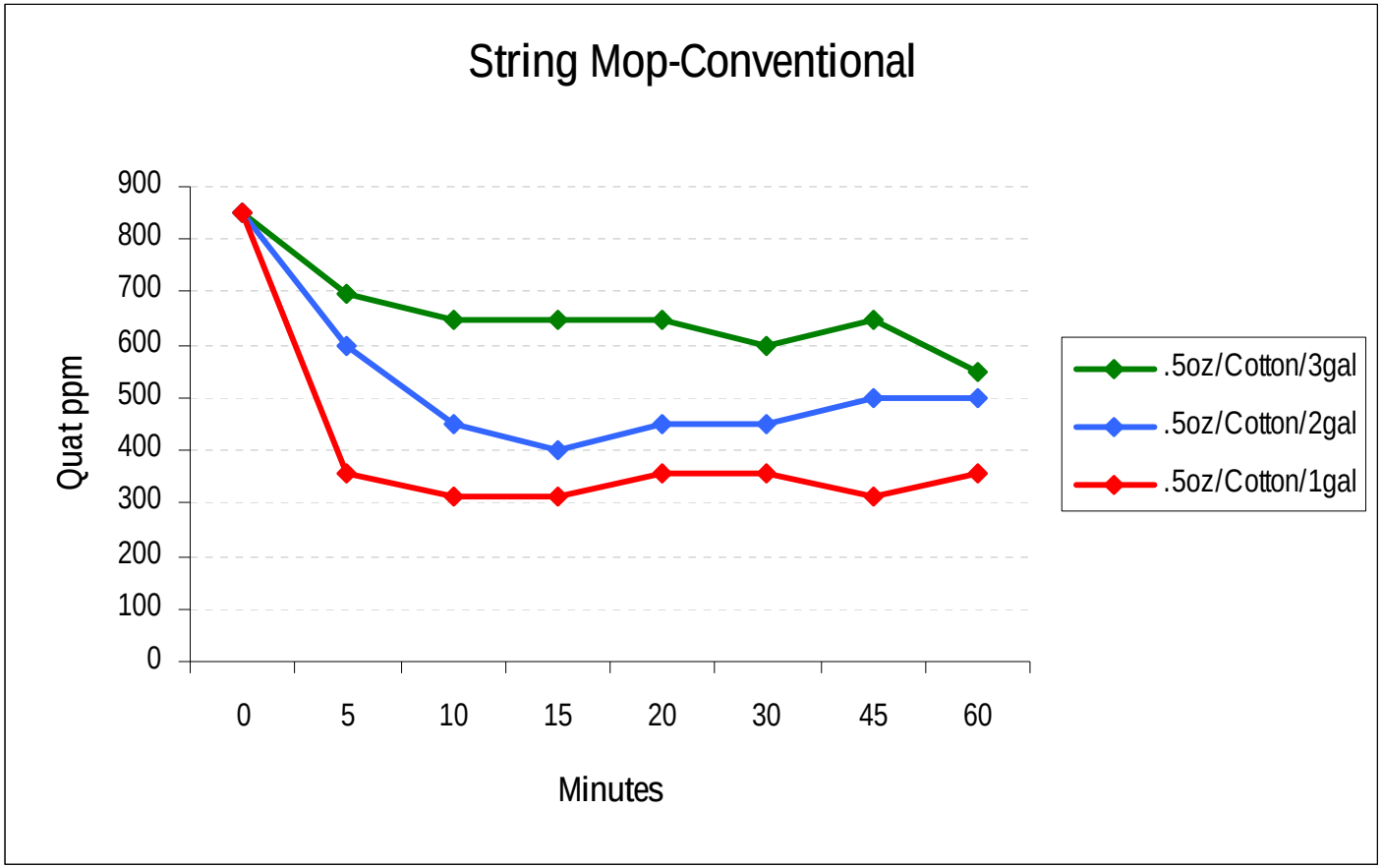
- Quat concentration continues to drop in the rag during dip method



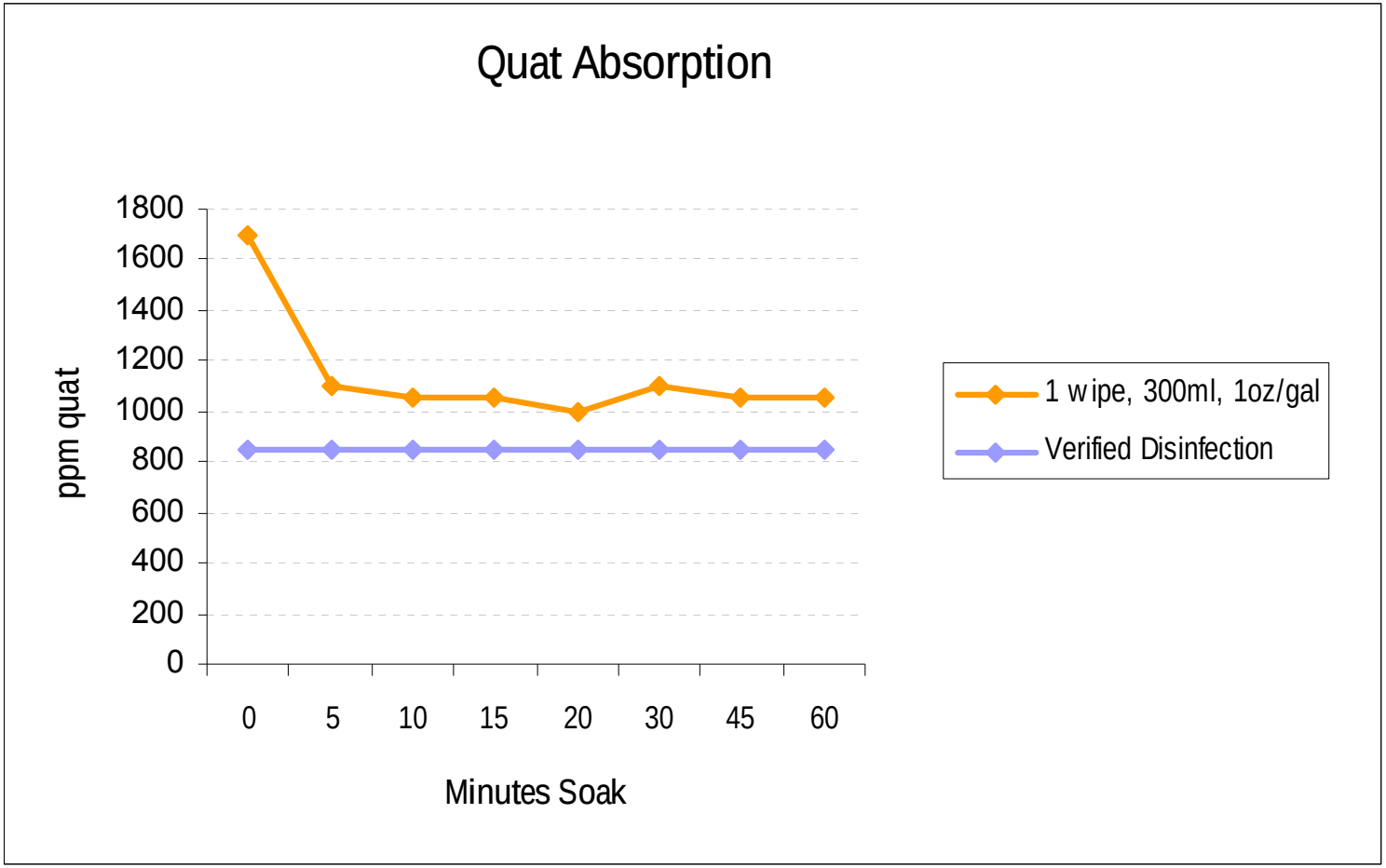
- Allowing rags to soak allows for consistent concentration after acclimation



Volume of Disinfectant



Concentration of Disinfectant



New Technologies and Processes

Chemicals and Biologics

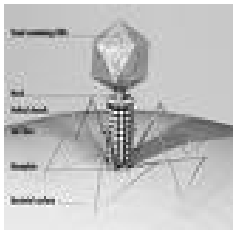
- Residual chemistries
  - Silver
  - Copper-EPA registered, 2008

- "Green" disinfectants?
  - No Green Seal approval
  - Look for products of degradation, sustainable packages

- UV
  - UV is electromagnetic radiation with wavelength shorter than visible light
  - Vegetative bacteria-15 minutes/Spores-50 minutes
  - Does not eliminate cleaning step

- Hydrogen Peroxide Vapor
  - Technologies use microcondensation or dry mist forms of HPV
  - Several studies published
  - Does not eliminate cleaning step

- Phage
  - Target bacteria of concern



www.sterilizationanddisinfection.org

Microfiber Tools

- Improved Cleaning Performance
  - Large surface area
  - Physical characteristics
- Reduction in chemical usage
  - Pre-saturation
  - Improved efficiency
- Prevention of cross-contamination
  - Color coding
  - No re-dipping in bucket

Process Controls

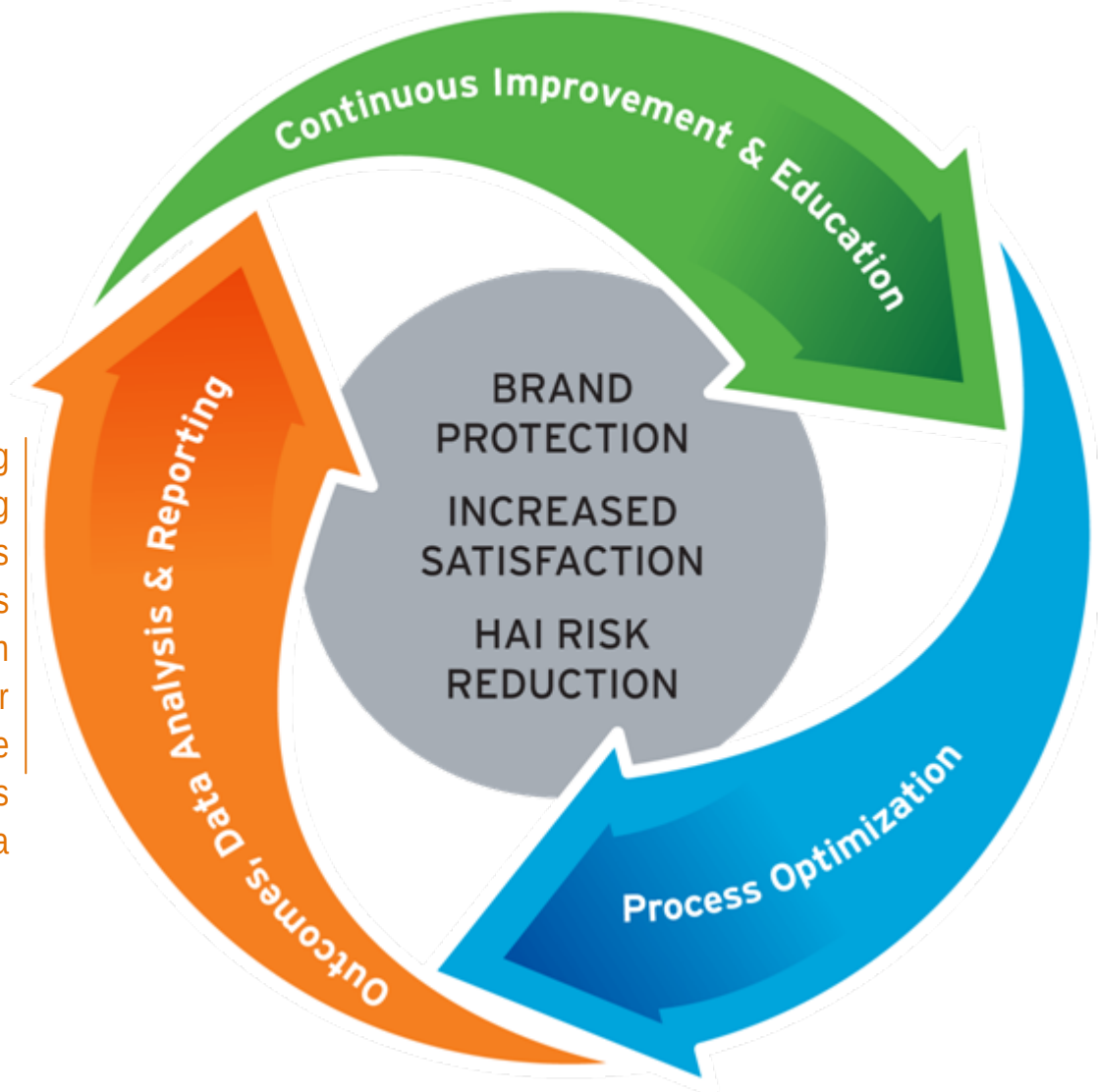
- Lean Six Sigma
  - Sustainability savings
  - Process efficiency
  - Process simplification and standardization
- HAACP
  - Controlling critical process inputs ensures consistent, desired outcomes
- Best Practices
  - AHE, CDC, APIC, JC
- Objective Outcome Monitoring

Standardizing Processes to Align With Best Practices

Process Controls Yield Superior Cleaning Outcomes

Best Practices – Pilot Studies

Room Hygiene Program Overview



Drive Continuous Improvement
Learning Management
Staff Certification
Process Controls
Standard Operating Procedures

Clinical Products & Tools
Verified Accuracy
HACCP
Best Practices
Statistical Process Controls
Lean Six Sigma
Sustainable Solutions

Auditing
Trending/Benchmarking
Objective Metrics
Cleanliness
Satisfaction
Behavior
Knowledge
Efficiencies
Qualitative Data

Pilot Study Overview

- Collect Baseline Data
- Provide an Intervention
  - Continuous improvement program using data to drive on-going enhancements
  - Clinically validated combination of Dispenser, Product and Tools
  - Hands-on multiple day program implementation
  - Staff certification program (Supervisors and Staff)
  - Data collected through regularly scheduled audits
    - Audits performed over multiple days/shifts
  - On-going staff education program driven by audit findings
    - Personally delivered by clinical educator
- Measure Results and Acceptability
  - Does the intervention make a difference?
  - Are best practices sustained?
  - Are there any other benefits?

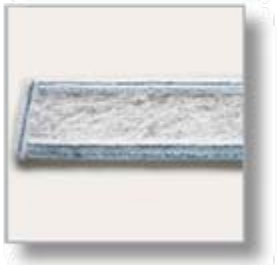
Process Optimization

Clinical Products & Tools
Verified Accuracy
HACCP
Best Practices
Statistical Process Controls
Lean Six Sigma
Sustainable Solutions

Clinical Products and Tools

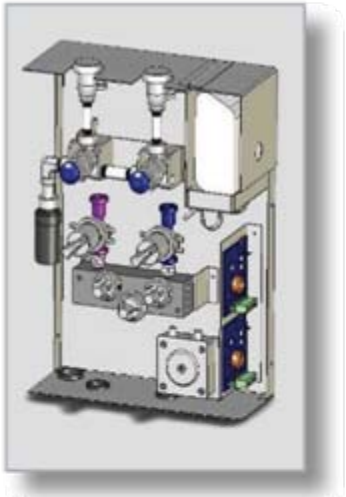
Designed for Clinical, Acute Care Setting

- Clinical Products
  - Products designed in combination with tools to deliver consistent, proven outcomes
- Clinical Tools
  - Microfiber
    - Color-coordinated cloths and mops
    - Ensure the appropriate amount of disinfectant is delivered
    - Eliminate cross-contamination
    - Improved efficiency
  - Carts
    - Separation of “Clean” and “Dirty”
    - Color coordination to reinforce best practices
    - Optimized efficiency
    - Improved ergonomics



Improvements in Reliability & Accuracy

- Current programs not designed and monitored for healthcare needs (reliability and accuracy)
- Improvements
  - Highly reliable and accurate dispensing system
    - Verified through quarterly service visits
  - Microfiber – validated accuracy with Ecolab Quat
    - “Evaluation of Quat Absorption” – Poster for APIC 2009
  - Process optimization tools
    - Help ensure amount of disinfectant and cloths/mops



Control Quat Absorption

- Factors impact quat absorption:
  - Concentration of disinfectant
  - Volume of disinfectant per cleaning cloth
  - Fabric type
  - Time spent in disinfectant solution

- Best Practices ensure:
  - Accurate disinfectant concentration
  - Correct volume of disinfectant dispensed
  - Mixed with appropriate number of microfiber cloths
  - Assurance that quat level has acclimated to deliver full disinfectant activity to surfaces




Best Practice Processes

Drive Consistency & Efficiency

- Designed on technical/clinical foundation
- Following HACCP Principles
- Validated to achieve consistent outcomes
- Designed to improve staff safety and efficiency

Current System

Microfiber System

Outcomes, Data Analysis and Reporting

- Auditing
- Trending/Benchmarking
- Objective Metrics
- Cleanliness
- Satisfaction
- Behavior
- Knowledge
- Efficiencies
- Qualitative Data

Audit Overview

2-3 Day Quarterly Onsite Room Hygiene Assessment

- Room cleanliness monitoring
  (fluorescent marking solution and culture)
- Documented behavioral and other observations
  (pictures & interviews)
- ES and Nursing satisfaction surveys
- ES knowledge assessment
  (training records)
- Workflow analysis
  (including efficiency and ergonomics)
- Documentation and review of staff training records
- Dispenser analysis
  (dilution accuracy report)
- Products and tools analysis

Audit Overview

Findings Critical to Program Success

- Audit findings critical for successful program implementation
- Provide benchmark for future improvements
- Drive continuous improvement of key metrics
  - Audit findings direct quarterly education

High Touch Object Cleaning Verification

Key Data Collected

- Fluorescing Gel
  - Clear marker applied to HTOs after patient discharged, before cleaning
  - Marker reviewed by auditor with black light after cleaning
- Total Aerobic Bacteria Count
  - Pre-cleaning culture taken of HTOs
  - Post-cleaning cultures taken to ensure appropriate cleaning and reduction of organisms

Behavioral Observations

Monitoring Critical to Effectively Manage & Correct

- Gathering examples helps reinforce key program messages
- Can provide immediate corrective action and use later as training example for others
- Pictures and interviews help reinforce training

Outcome Data

Benefits of Consistent Data Collection

Benchmarking

- Versus pre-program implementation
- Across Health System or GPO

Trending

- Continuous data collection allows trending
- Early detection of potential issues
- Measurement of direct impact of program

Objective data

- True performance assessment

Drive continuous improvement

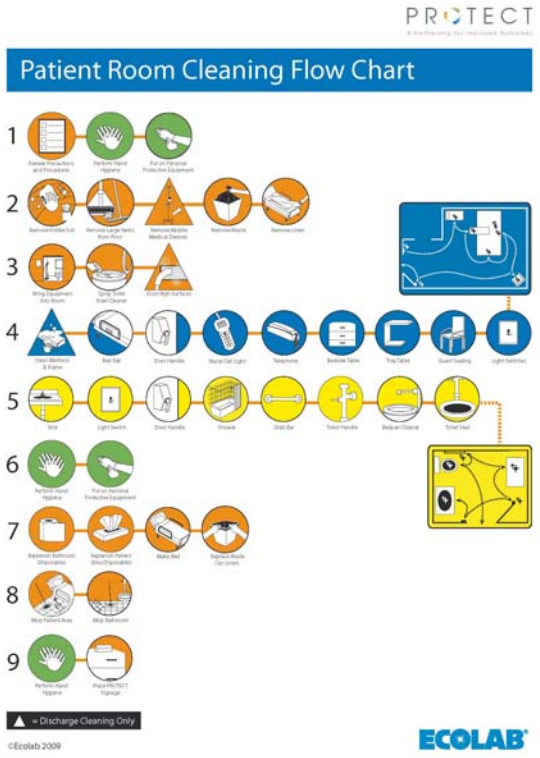
- Regular assessments provide opportunity to immediately address issues

Continuous Improvement and Education

Drive Continuous Improvement
Learning Management
Staff Certification
Process Controls
Standard Operating Procedures

Adult Learning and Behavioral Change

- Blended delivery approach
- Icon based tools
- Uses technology-enhanced learning tools
- Reinforced with ongoing coaching methods that ensure results are sustained



LEARN: Content personally delivered

PRACTICE: Learner works on new content with guidance & direction

DO: Learner applies new content and demonstrates proficiency

PATIENT ROOM

HIGH TOUCH OBJECTS

Room Inner Door Knob

Room Light Switch

Bed Rail/Controls

Call Button

Telephone

Bedside Table Handle

Tray Table

Chair

Room Sink

IV Pole

ECOLAB®

Everywhere It Matters.

Pilot Results

APIC 2010 Poster

Program results from 2 Pilot Hospitals

Evaluation of a Programmatic Approach to Improving Patient Room Cleaning Outcomes

Emily McCracken, MPH, Director Infection Prevention and QI, Hamot Health System, Erie, PA
Karen Martin, RN, BS, HPN, CIC Director of Infection Control/Epidemiology and Environmental Services, Advocate Christ Medical Center, Oak Lawn, IL
Linda Homan, RN, CIC, Manager Clinical and Professional Services, Ecolab Inc, Saint Paul, MN

ISSUES:

Many patient rooms are not well cleaned, and there is increasing evidence that a programmatic approach to environmental hygiene can improve outcomes.[1] Cleaning of high touch objects is critical to prevent transmission of pathogens from the environment to the patients.[2] Methods used to monitor and evaluate the effectiveness of environmental hygiene are often subjective.[3]

PROJECT:

A pilot study was conducted at two sites, a 650-bed urban hospital and a 350 bed non-urban hospital, to evaluate the impact of a new programmatic approach on environmental hygiene (EH) practices, efficiency, sustainability and staff satisfaction. The program included the use of products, tools, processes, enhanced staff training and engagement, staff surveys and objective EH monitoring tools such as fluorescent marking gel and environmental cultures to monitor effectiveness of environmental cleaning. A pre- and post-intervention assessment of EH practices, efficiency, product usage and staff competency was conducted.

METHODS:

- EH practice effectiveness was evaluated by measuring the percentage of high touch objects (HTO's) cleaned as evidenced by the removal of a fluorescent gel mark that was applied to HTO's before discharge cleaning. If, after Environmental Services (ES) staff performed discharge cleaning, the fluorescent gel mark was disturbed, it was documented as a "pass". If the gel mark was not disturbed, it was documented as a "fail".
- At Site A, in addition to gel marking, an environmental culture obtained from the same HTO's was used to measure total aerobic colony counts before and after cleaning. Any value for culture colony forming units (cfu) that was above a 0 was considered a failure. Therefore, the culture data was coded as either pass or fail.
- For all gel and culture data collected, an attribute agreement analysis was performed in Minitab. This analysis identified what percent of the results agreed-both gel and culture "pass" or both "fail" (where gel removal=pass and culture result 0 cfu=pass).
- A best practices audit tool was employed to evaluate practices during direct observation.
- Room turnover, defined as the time the ES staff entered the patient room to the time that room cleaning was completed, was used as a measure of efficiency.
- Dispenser accuracy was evaluated by measuring disinfectant concentration parts per million (PPM) in dispensed use solution.
- Pre- and post-intervention chemical and water consumption was used to measure sustainability.
- The effectiveness of classroom and hands-on training on EH best practices was measured using a 10 question staff competency exam.

RESULTS:

- EH practice effectiveness, as measured by the percent passing in disturbance of a fluorescent marking gel on high touch objects at Site A and Site B, was 85.3% and 83.1%, respectively. Pre-intervention EH practice effectiveness was 55.7% and 78.4% at Site A and Site B, respectively. (See Table 1)

Table 1. Environmental hygiene practices, as measured by percent pass in disturbance of a fluorescent marking gel on high touch surfaces pre- and post-intervention

Site	# HTO's marked Pre- Intervention	% Pass Pre-intervention	# HTO's marked Post- Intervention	% Pass Post-intervention
Site A	564	55.7%	360	85.3%
Site B	464	78.4%	1063	83.1%

- There was a higher correlation between gel disturbance "pass" and 0 cfu "pass" after implementing a multi-modal environmental hygiene program at Site A. (See Table 2)

Table 2. Percent agreement between gel disturbance and 0 cfu culture, Site A.

Period	# of HTOs	% Agreement between "pass" gel & 0 cfu "pass" culture
Pre-intervention	168	60.1%
Post-intervention	295	78.6%

- The best practices audit tool for direct observation identified several areas for improvement, including:
  - A. Training to prevent food/drink on carts
  - B. Techniques to organize carts and minimize cross-contamination
  - C. Support of best practice cleaning and efficiency
  - D. Reinforcement of the proper use of PPE

(See Photos Left)

- Pre-intervention evaluation identified inaccuracies in hospital dispensing systems. Post intervention, samples taken identified 75% accuracy at Site A and 100% accuracy at Site B.
- The discharge cleaning time improved by 23.8% at Site A and 6% at Site B.
- Water and chemical usage on floors and surfaces decreased at both sites. (See Table 3)

Table 3. Decreases in water and chemical usage on floors and surfaces

Site	Water Usage Decrease	Chemical usage decrease on floors	Chemical Usage decrease on surfaces
Site A	94%	85%	74%
Site B	84%	95%	43%

- Staff competency scores measured pre-and post-intervention increased from 60% to 88% at Site A and from 78% to 90% at Site B.

LESSONS LEARNED:

Use of a programmatic approach incorporating products, tools and processes, enhanced staff training and engagement, staff surveys and objective environmental hygiene monitoring tools can improve environmental hygiene practices, efficiency, sustainability and staff satisfaction. Fluorescent marking gel is a surrogate marker for bacterial contamination in patient rooms when used as part of a comprehensive environmental hygiene program.

REFERENCES:

1. Carling PC, Parry MM, Rupp ME, Po JL, Dick B, Von Beheren S.; Healthcare Environmental Hygiene Study Group. Improving cleaning of the environment surrounding patients in 36 acute care hospitals. Infect Control Hosp Epidemiol. 2008 Nov;29(11):1035-41.
2. Hayden MK, Bonten MJ, Blom DW, Lyle EA, van de Vijver DA, Weinstein RA. Reduction in acquisition of vancomycin-resistant enterococcus after enforcement of routine environmental cleaning measures. Clin Infect Dis. 2006 Jun 1;42(11):1552-60.
3. Carling PC, Bartley JM. Evaluating hygienic cleaning in healthcare settings: What you do not know can harm your patients. Am J Infect Control. 2010;38(5):Supplement 1.

Author/Financial Disclosures: Linda Homan is an employee of Ecolab, Inc.

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Pilot Summary - Outcomes

Metric	Site 1	Site 2	Site 3	Site 4	Site 5	Average
Cleaning Outcomes - DAZO						
Baseline	58%	69%	72%	59%	66%	65%
Ecolab Program	86%	83%	85%	85%	88%	85%
% Improvement	48%	20%	18%	44%	33%	**32%**
Cleaning Outcomes - Cultures						
Baseline		42%	71%	54%	62%	57%
Ecolab Program		69%	80%	87%	95%	83%
% Improvement		64%	13%	61%	53%	**45%**
Room Turnover Efficiency						
Baseline (minutes)	24	24	51	45		36
Ecolab Program (minutes)	24	18	45	34		30
% Improvement	-2%	26%	11%	24%		**15%**

Data Driven Continuous Improvement

Heat Map: Progress and Trend Report

N= 1015

Current Period n = 561

80-100%

70 - 79%

<70%

Percent of High Touch Objects Cleaned

	High Touch Object	Baseline	Q1 2011	Q2 2011	Net	Trend
Patient Room	Bed Rail/Controls	20%	64%	76%	55.8%	▲
	Bedside Table Handle	60%	59%	52%	-8.5%	▼
	Call Button	30%	68%	70%	39.7%	▲
	Chair	60%	55%	97%	37.0%	▲
	IV Pole (Grab Area)	0%	100%	79%	78.8%	▼
	Room Inner Door Knob	10%	73%	58%	47.6%	▼
	Room Light Switch	0%	54%	64%	63.6%	▲
	Room Sink	0%	69%	94%	93.9%	▲
	Telephone	50%	95%	70%	19.7%	▼
	Tray Table	60%	82%	55%	-5.5%	▼
	Bathroom Handrail by Toilet	40%	73%	79%	38.8%	▲
Patient Bathroom	Bathroom Inner Door Knob	13%	89%	94%	81.4%	▲
	Bathroom Light Switch	13%	80%	94%	81.4%	▲
	Bathroom Sink	20%	59%	73%	52.7%	▲
	Toilet Bedpan Cleaner	50%	79%	52%	1.5%	▼
	Toilet Flush Handle	50%	86%	82%	31.8%	▼
	Toilet Seat	80%	95%	94%	13.9%	▼
	Total Patient Room	41%	69%	71%	30.0%	▲
	Total Patient Bathroom	39%	81%	81%	41.6%	▲
	Grand Total	40%	74%	75%	34.9%	▲

Use data to identify cleaning deficiencies

Data shows areas where not achieving targeted improvement

Emphasize and reward improvement

Pilot Summary

What Did We Learn?

- Current environmental cleaning processes and tools are often inadequate
- Changing behavior takes right tools, time and reinforcement
  - Observation assists in determining where additional training is necessary
- Improvement opportunities exist in:
  - Cleaning outcomes
  - Staff knowledge and engagement
  - Data driven continuous improvement (collecting and using data to drive decisions)
  - Improved cleaning tools and processes designed for healthcare

Summary

- Latest Research
  - Role of the Environment
  - Latest Research
  - Monitoring the Environment
  - Quat Absorption
  - New Technologies and Programs
- Best Practices
  - Process Optimization
  - Objective Outcome Monitoring, Data Analysis and Reporting
  - Continuous Improvement, Reporting and Documentation

Questions?

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