Routine Disinfection of Mobile Communication Devices in the Postanesthesia Care Unit

Melissa Wagoner, RN, CPAN, Staci Snyder, BSN, RNC, Melanie McCarty, RN, Lynn Reed, RN, Shannon Flook, RN, Jane Holsinger, BSN, RN, CPAN (Ret), Cynthia A. Leaver, PhD, APRN, FNP-BC

Purpose: *Explore the effect of routine disinfection of mobile communication devices (MCDs) in postanesthesia care unit (PACU).*
Design: *Experimental, repeated measures design.*
Methods: *At a 247-bed, 20-bed PACU hospital, Mid-Atlantic region, United States, mean baseline bacterial adenosine triphosphate (ATP) counts of six MCDs were established with 3M Clean-Trace Luminometer. MCDs were routinely disinfected with CaviWipes for 10 days, every 12 hours. Mean bacterial ATP counts on six MCDs were repeated at day 11 and month 36.*
Findings: *For six MCDs, baseline ATP counts identified* Failure *for cleanliness. Postroutine disinfection bacterial ATP counts identified* Caution *and* Passing*; 36-month bacterial ATP counts identified sustained Passing for cleanliness.*
Conclusions: *Routine disinfection of MCDs in the PACU defined by time and method, obtains, and sustains Passing level of cleanliness. Staff nurses identified trigger, researched practice, changed practice, and implemented quality improvement follow-up.*

Keywords: *PACU, nursing, infection control, disinfection, mobile communication device.*

Melissa Wagoner, RN, CPAN, Meritus Medical Center, Hagerstown, MD; Staci Snyder, BSN, RNC, Meritus Medical Center, Hagerstown, MD; Melanie McCarty, RN, Meritus Medical Center, Hagerstown, MD; Lynn Reed, RN, Meritus Medical Center, Hagerstown, MD; Shannon Flook, RN, Meritus Medical Center, Hagerstown, MD; Jane Holsinger, RN, BSN, CPAN (Ret), Meritus Medical Center, Hagerstown, MD; and Cynthia A. Leaver, PhD, APRN, FNP-BC, Meritus Medical Center, Hagerstown, MD.

Funding: Funding for materials required to complete this project was provided by Mertitus Medical Center, Department of Nursing, Postanesthesia Care Unit.

Conflict of Interest: none to report.

Address correspondence to Melissa Wagoner, Meritus Medical Center, 1116 Medical Campus Road, Hagerstown, MD 21742; e-mail address: melissa.wagoner@meritushealth.com.

1089-9472/$36.00
https://doi.org/10.1016/j.jopan.2019.03.011

COMMUNICATION IN TODAY'S HEALTH CARE arena is inextricably inclusive of screens, keyboards, cables, and mobile communication devices (MCDs). Over the past decade MCDs have become essentially ubiquitous, where some consider MCDs to be an essential accessory in our social and professional lives.[1-4] Several studies confirm the use of MCDs in health care support research, education, clinical practice, and potentially provide unlimited access for communication across domains.[5-7] Therefore, it is worthwhile to consider the impact of increasing physical presence of MCDs in the health care arena and accept the challenges that these devices may present.[7,8] Explicitly, the management of the possible transfer of

microorganisms from MCDs in the health care setting warrants consideration.

Although MCDs are omnipresent, contribute to care, and improve communication of information, they are considered a fomite, posing a threat to infection control practices, exaggerate spread of bacteria, and responsible for health care–associated infections (HAIs).[1,2,4,9-11] A number of studies have identified pieces of equipment used in the perisurgical arena as carriers of the bacteria that health care is working to control.[12,13] Historically, the infection potential of telephones was first introduced in 1977.[14] Currently, MCDs are noted to be ideal breeding sites for bacteria as they are warm and typically kept clipped to clothing close to the body, in a pocket, or in a palm of the hand.[2,4,9,11] Several studies have investigated the role of MCDs in the transmission of infection in the health care setting. These studies identify bacterial growth on the MCDs of hospital staff ranging from 15.3% to 94% with the most common bacteria isolated to be coagulase-negative staphylococcus, *Micrococcus* species, *Pseudomonas* species, *Escherichia coli*, methicillin-resistant *Staphylococcus aureus*, and *Proteus* species.[1,7,11,15-17]

Health care–associated infections (HAIs) remain a persistent concern for many domains of the health care arena, to include providers, researchers, educators, and administrators. The estimated 1.7 million HAIs cost an average of approximately $34,400 each.[18] Therefore, the total estimated cost of HAIs is estimated at $58.5 billion per year for the management of preventable infections. Surgical site infections are identified as the second highest form of HAI, second only to pneumonia.[19,20]

The literature identifies the need for further delineation of disinfection standards for MCDs.[1,21] The updated American Operating Room Nurses "Guideline on surgical attire," 2017, provides guidance on the management of personal items to include MCDs, recommending cleaning with a low-level disinfectant according to the manufacturers instructions for use before and after being brought into the perioperative setting.[21,22] However, in a postanesthesia care unit (PACU) where the MCD is considered a standard and necessary mode of communication, the MCD continues to be used throughout the perisurgical arena. The MCD is passed from one nurse to another, used by multiple disciplines, and even used by patients and family members throughout the day. Ulgar et al[4] identifies the need for delineation of processes for decontamination of MCDs. The exploration of defined routine disinfection in the PACU may reveal the opportunity for an improved infection control standard.

The purpose of this study was to explore the effect of a routine MCD disinfection process in the PACU. This study aims to answer the research question "Does establishing a routine process for disinfecting mobile phones in the PACU decrease the bacteria count on the mobile phones compared with the practice of random disinfecting of MCDs?"

Methods

The study implemented an experimental, repeated measures design. The independent variable was an established time scheduled and defined method for routine disinfecting of MCDs. The dependent variable was the measured bacterial adenosine triphosphate (ATP) count readings on the MCDs.

This study was reviewed by the Organizational Internal Review Board and deemed exempt from oversite.

Setting

The setting for this study was the 20-bed PACU in a semirural, 247-bed acute care hospital in the Mid-Atlantic region of the United States. In this PACU, six MCDs with push button key pads, no protective covering, and charged in docking stations located in the PACU, were used daily. Each MCD had a unique call number. Two of the six phones (the same two MCDs) were designated daily as resource phones and retained by the two resource nurses at the start of shift. All six MCDs were used by the staff nurses, shared throughout the shift, and then passed on to the nurses for the following shift. The MCDs were used for communication between the PACU, admissions offices, hospital units, and other perisurgical areas. The resource nurses carried the designated resource MCDs throughout their shift. The other four MCDs were shared between nurses, patients, and patients family

member if needed. PACU nurses carried phones to be readily accessible by keeping the MCDs clipped to either the inside or outside their scrub jacket pockets, scrub pants, or scrub top. At times the phones were placed on the bedside tables, on the counter at the unit central station, or placed back into the MCD charging docks. At the time of initial baseline bacterial ATP count, MCDs were previously disinfected on an as-needed basis with no documentation of disinfection episodes.

Materials

CaviWipes are small disposable cloths or towelettes that are impregnated with didecyldimethylammonium chloride 0.76%, ethanol 7.5%, isopropanol 15.0%, and inert ingredients 76.74%.[23] The wipes are widely adopted in the perioperative arena for cleansing and disinfecting of hard nonporous surfaces and fixtures. The manufacturer identifies the capacity of these towelettes to kill tuberculosis (TB) in 3 minutes, and kill methicillin-resistant *Staphylococcus aureus*, human immunodeficiency virus-1 (HIV-1), hepatitis B (HBV, hep B), and hepatitis C (HCV, hep C) in 3 minutes.[24] The CaviWipes manufacturer identifies wet time of 1 minute, no specific dry time or repeated cleaning time is defined.[23]

The 3M Clean-Trace Luminometer is a device used with a reagent kit to measure levels of contamination on surfaces. The 3M Clean-Trace Luminometer is standard equipment used by environmental service departments in the health care setting for quality assurance of surface disinfection.[24] ATP is a standard measurement of biological residue and an effective marker for the assessment of hygienic status of an environmental surface.[24] The 3M Clean-Trace Luminometer cell counts are measured by levels of ATP.[24] The levels of cleanliness using the 3M Clean-Trace Luminometer are defined as follows: *Failure* as greater than 1,000 ATP; *Caution* as 500 to 1,000 ATP; and *Passing* as 500 or less ATP.[24]

The MCDs for this project were six Alcatel-Lucent mobile phones with push key pads for dialing, no additional casing or cover is applied to MCDs.[25]

Design

First, the MCD Routine Disinfection Accountability Log notebook (MCD-RDAL) was established. The MCD-RDAL comprised a reminder sheet delineating the routine disinfection method and data documentation log sheet. The documentation log sheet comprised a printed paper page with preprinted columns labeled name, date, time, MCD identification number (1 to 6), and confirmation of disinfection. An appropriate defined space was established to provide access to gloves, CaviWipes, and the documentation notebook. The MCD-RDAL was maintained by the PACU research team to confirm project fidelity. The Environmental Services Lead implemented the 3M Clean-Trace Luminometer to establish baseline bacterial ATP count readings of the six MCDs used in the PACU. The MCD baseline bacterial ATP count readings were documented by the designated research team member in the MCD-RDAL. Routine disinfection was defined as wiping each MCD with CaviWipes, allowing for the minute wet time. The routine disinfection was completed by the PACU nursing staff, every 12 hours, at 11 a.m. and 11 p.m., for 10 days. On day 11, the Environmental Services Lead repeated the 3M Clean-Trace Luminometer bacterial ATP count readings for the six MCDs. The MCD postcleaning bacterial ATP count readings were logged in the MCD-RDAL by the same designated research team member. Furthermore, at 36-month time postinitiation of project, the Environmental Services Lead repeated the 3M Clean-Trace Luminometer bacterial ATP count readings of six MCDs, and documented the bacterial ATP count readings in the MCD-RDAL.

Statistical Analysis

Statistical analysis was completed using Microsoft Excel, 2014. Descriptive statistics were completed. B1 identifies the first baseline bacterial count, B2 identifies the second baseline count, P1 identifies the first postroutine cleaning bacterial count, P2 identifies the second postroutine cleaning bacterial count. Means were calculated for the bacterial count ATP readings identified by the 3M Clean-Trace Luminometer at B1 and B2, and P1 and P2. The means of the bacterial count ATP readings were compared. Levels of cleanliness were defined by the standards of the 3M Clean-Trace Luminometer as follows: Failure as greater than 1,000 ATP; Caution as 500 to 1,000 ATP; and Passing as 500 or less ATP.[24]

Table 1. Bacterial Cell Count and Level of Cleanliness

Time	Mean Cell Count	Level of Cleanliness
Baseline 1	1,156.7	Failure
Baseline 2	1,176.5	Failure
Postroutine cleaning 1	546.2	Caution
Postroutine cleaning 2	456	Passing
Postroutine cleaning at month 36	< 200	Passing

ATP, adenosine triphosphate.
Failure greater than 1,000 ATP. Caution equal to 500 to 1,000 ATP. Passing less than 500 ATP.

Findings

From time of baseline count to 36-month follow-up, all six MCDs identified cleanliness level of Passing (Table 1). One MCD at P1 identified a postroutine cleaning bacterial count of greater than 1,000. Findings at 36-month follow-up identified Passing = 6 ($M < 200$), with all six MCDs remaining in the study. Specifically, both resource phones at the 36-month follow-up site identified cleanliness levels of Passing, (PACU Resource Phone 1 less than 50, and PACU Resource Phone 2 less than 100).

Conclusions

This project developed evidence that supports a defined routine disinfection method, and defined routine disinfection schedule of MCDs in the PACU improves cleanliness to an acceptable level. If disinfection of MCDs is incorporated into infection control standards, these findings confirm assertions that effective adaptation of infection control standards may significantly reduce the incidence of nosocomial infections presently reported in medical facilities.[12] Follow-up surveillance using the 3M Clean-Trace Luminometer confirmed disinfection of MCDs in the PACU is attainable and sustainable.

Particular attention to the two MCDs carried by the resource nurses is appropriate. These MCDs receive the most calls throughout a single shift. Although they are carried by the resource nurse, these MCDs are used by multiple disciplines and patients throughout a shift. The resource MCDs at the start of the project were the exact same devices identified as resource MCDs at the conclusion of the project. With routine cleaning, these MCDs attained and sustained a Passing level of cleanliness, and no impairment to the functioning of the MCDs was inflicted.

The study findings have limited generalizability across hospital units where there is variation in hard surfaces such as scopes, implants, and medication containers (eg vials, intravenous [IV] bags) that come in contact with patients directly and indirectly. The design of the study applied baseline bacterial ATP count readings as the control group for comparisons. It may be worthwhile to consider maintaining a control group throughout the study for comparison. This comparison may be of particular importance to explore specific bacteria.

Implications for Practice

This project had significant impacts on nursing practice. First, the findings from this project generated evidence that was applied to develop new guidelines and impact practice. Concurrently, this project modeled the impact of the process implementation of staff-driven research. The findings from this project were presented at the organizations Nursing Professional Practice Council. The research findings were translated into practice by both nursing and infection control. The new nursing policy and procedure was adopted by the organizations infection control policy. The new policy and procedure delineated routine disinfection of MCDs in all patient care areas of the organization. Today, at the beginning of every shift and any point of an MCD handoff, MCDs are wiped clean with CaviWipes. The Quality Improvement Council maintains the scheduling of QI projects, where the Environmental Services Lead will implement the 3M Clean-Trace Luminometer again to establish baseline bacterial counts on MCDs every 24 months, determining level of acceptable disinfection. The findings from this project may contribute to American Operating Room Nurses or American Society of PeriAnesthesia Nurses guidelines for infection control.[22]

MCDs have become an essential communication accessory. These findings provide evidence to strongly consider the broader implications of the cleanliness of the MCDs brought into patient care settings. It is acceptable practice in most practice care settings for nurses to use smart phones, and for many appropriate professional purposes. For example, a smart phone may be used to check references, use search engines, calculate drug doses, check for adverse effects of drugs, or use a clinically appropriate app such as a flashlight or noise meter. Cell phones and any other hard surface may be a fomite for infectious microorganisms. Consideration of MCDs as fomites in patient care areas may be extended beyond health care providers to include vendors, visitors, and volunteers. Opportunities for further research include the exploration of bacteria ATP counts on MCDs and possibly smart phones, brought into patient care settings by providers, patients, and patient family members. Further high-quality studies are needed to generate evidence delineating the role played by hard surfaces in the transmission of infective agents, and appropriate interventions to reduce associated infection rates.

References

1. Bhoonderowa A, Gookool S, Biranjia-hurdoyal S. The importance of mobile phones in the possible transmission of bacterial infections in the community. *J Community Health*. 2014;39:965-967.
2. Gallegos C, McDuffee V, Hong-Engelhard C, Boeck C. Hold the phone: mobilizing against cell phone pathogens. *Nursing*. 2018;48:68-70.
3. Manning ML, Davis J, Sparnon E, Ballard RM. iPads, droids, and bugs: Infection prevention for mobile handheld devices at the point of care. *Am J Infect Control*. 2013;41:1073-1076.
4. Ulger F, Dilek A, Esen S, Sunbul M, Leblebicioglu H. Are healthcare workers' mobile phones a potential source of nosocomial infections? Review of the literature. *J Infect Dev Ctries*. 2015;9:1046-1053.
5. Blaya JA, Fraser HS, Holt B. E-health technologies show promise in developing countries. *Health Aff*. 2010;29:244-251.
6. Dexheimer JW, Borycki EM. Use of mobile devices in the emergency department: a scoping review. *Health Inform J*. 2015;21:306-315.
7. Visvanathan A, Gibb AP, Brady RR. Increasing clinical presence of mobile communication technology: avoiding the pitfalls. *Telemed J E Health*. 2011;17:656-661.
8. Albrecht UV, von Jan U, Sedlacek L, Groos S, Suerbaus S, Vonberg RP. Standardized, App-based disinfection of iPads in a clinical and nonclinical setting: comparative analysis. *J Med Internet Res*. 2013;15:e176.
9. Akinyemi KO, Atapu AD, Adetona OO, Coker AO. The potential role of mobile phones in the spread of bacterial infections. *J Infect Dev Ctries*. 2009;3:628-632.
10. Badr RI, ibrahimBadr H, Ali NM. Mobile phones and nosocomial infections. *Int J Infect Control*. 2012;8.
11. Otter JA, Yezli S, French GL, et al. The role played by contaminated surfaces in the transmission of nosocomial pathogens. *Infect Control Hosp Epidemiol*. 2011;32:687-699.
12. Otter JA, Yezli S, Salkeld JAG, French GL. Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings. *Am J Infect Control*. 2013;41(5 suppl):S6-S11.
13. AORN Safe Surgery Together. AORN Guidelines for Perioperative Practice. Available at: https://www.aorn.org/guidelines/about-aorn-guidelines. Accessed March, 2019.
14. Aronson SH. The Lancet on the telephone 1876–1975. *Med Hist*. 1977;21:69-87.
15. Singh S, Acharya S, Bhat M, Rao SK, Pentapati KC. Mobile phone hygiene: Potential risks posed by use in the clinics of an Indian dental school. *J Dent Educ*. 2010;74:1153-1158.
16. Ashgar SS, El-Said HM. Pathogenic bacteria associated with different public environmental sites in Mecca city. *Open J Med Microbiol*. 2012;2:133.
17. Samy SA, Hamdy ME. Pathogenic bacteria associated with different public environmental sites. *J Med Microbiol*. 2012;2:133-137.
18. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care–associated infections. *N Engl J Med*. 2014;370:1198-1208.
19. Carnes TA. *Better Health*. Long Beach: California State University; 2018 [Dissertation].
20. Shepard J, Ward W, Milstone A, et al. Financial impact of surgical site infections on hospitals: The hospital management perspective. *JAMA Surg*. 2013;148:907-914.
21. Cowperthwaite L, Holm RL. Guideline implementation: Surgical attire. *AORN J*. 2015;101:188-197.
22. AORN Safe Surgery Together. AORN Guideline for Surgical Attire. Available at: https://www.aorn.org/about-aorn/aorn-newsroom/health-policy-news/2017-health-policy-news/aorn-guideline-for-surgical-attire. Accessed January20, 2019.
23. CaviWipe™. Surface Disinfectants. Available at: https://www.metrex.com/en-us/products/surface-disinfectants/caviwipes. Accessed January19, 2019.
24. 3M™ ™ Science Applied to Life™. 3M™ ™ Clean-Trace™ NG Luminometer NG3. Available at: https://www.3M™.com/3M™/en_US/company-us/all-3M™-products/~/3M™-Clean-Trace-NG-Luminometer-NG3-1-ea/?N=5002385+3294778420&rt=rud. Accessed January19, 2019.
25. Alcatel-Lucent Enterprise. Devices. Available at: https://www.al-enterprise.com/en/products/devices. Accessed January, 2019.