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## Environmental cleaning in the Emergency Department

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Environmental Cleaning in the Emergency Department

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Author Note

This paper is a practice improvement project to investigate, suggest improvements, and teach other nursing personnel about a practice issue relevant at my capstone site, the emergency department in the northwest metropolitan area and information presented to site. It was prepared for Nursing 379, Synthesis of Professional Nursing, section 01A taught by Professor Hoover

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Abstract

Emergency Departments (ED) have protocols in place for cleaning rooms vacated by patients in order to reduce the spread of infection. What is the health care staff's responsibility to ensure these protocols are being updated and implemented as part of infection control? The principle objective of this project is to re-educate healthcare staff on the importance of the environmental cleaning policy in the ED to decrease transmission of multi-drug resistant organisms (MDRO). Secondary objectives include a review of the literature to provide evidence on the most effective disinfectant wipe to reduce MDROs, and best methods for evaluating cleanliness. Data will be collect from ED staff during the cleaning process and a survey conducted on cleaning practices and reported to the agency to improve practice.

*Keywords:* environmental cleaning, high-touch surfaces, disinfectant, ATP  
bioluminescence

### **Introduction**

There has been high radar within the health care institutions with increasing number of infection spreading throughout the facility. Dirty hospitals are at a higher risk of infection. Many studies has shown that hand hygiene reduces infection and pathogen transmission. In addition, environmental cleaning is effective to reducing pathogens transmitted within the hospital. However, cleaning is not an evidence-based science because there is no scientific standard to measure the outcome of individual cleaner or to assess the result of cleanliness (Dancer, 2009). Studies have shown that improving in cleaning and disinfection of environmental surfaces and medical equipment can reduce pathogen transmission. Pathogen can transmit through the contaminated environmental surfaces by healthcare workers contaminating their hands, gloves, or medical equipment that has direct patient contact. Patient with pathogen such as methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile* (C-diff), vancomycin-resistant enterococci (VRE), and *Acinetobacter* frequently contaminate environmental surfaces in their immediate vicinity. The organisms can remain viable in the environment for weeks, months, or years (Otter et al., 2011). Thus, it comes along the question; do health care worker follows their environmental cleaning protocol?

At my capstone site in a northwest metropolitan area emergency department (ED), I have communicated with the nurse manager to help me identify problems within the ED. The nurse manager has suggested for me to focus on infection protection and prevention and other identifies problem. However, I have chosen this environmental cleaning after shadowing the charge nurse and thoroughly thinking of the problem from my experience in the ED. The ED is a quick pace and a challenging area. In the ED, there are protocols in place for cleaning rooms vacated by patients in order to reduce the spread of infection. Housekeeper role is to clean the environment of the hospital. According to my capstone experience, their protocol is for each

occurrence or after each patient encounter; “all staff including patient care support services” (capstone site protocol) has the responsibility to clean the equipment and/or environment. However, some health care staff has only partially implemented protocols for environmental cleaning. The problem I wanted to focus on is to improve environmental cleaning to reduce the spread of infection in the ED to provide patient, family, and staff a safe environment and improve quality in environmental cleaning and service to the patient. The objectives of this quality improvement are to raise an awareness to inform nurses about the importance of environmental cleaning to decrease pathogen transmission. A second objective is to review the literature for improve and effective disinfectant wipes to use in health care facility and the best method to measure cleanliness.

### **Literature Review**

Throughout our appraisal of the literature, I have focused my literature review on high touch areas, disinfectant wipes, and measurement method of cleanliness. There are two articles related to high touch areas. High-touch is frequent touch surfaces or items in contact by hands from patients, staffs, and families. One of the articles is a quantitative approach to defining high touch area by observing health care workers such as physician, registered nurse, and nursing aid providing care to patients. There was a total of fifty interactions observed in the intensive care units (ICU) and seven general medical surgical units (MedSurg) in North Carolina. From both the observation, the five high-touch surfaces are the bed rails, the bed surfaces, the supply cart, the over-the-bed table, and the intravenous pump. Both units identify bed rails to be the highest frequently touch surfaces, accounting 7.76 contacts per interaction in the ICUs and 3.12 in MedSurg (Huslage et al., 2010). It is essential to understand high-touch surfaces of where it is most contaminated.

A second article is a prospective study of visiting five different site of university-affiliate hospital to sample their mobile rolling blood pressure (BP) units on all medical and surgical wards. All the hospital protocols were to disinfect between each patient use by nursing staff. In this study, five items on the rolling BP units: control buttons of the automatic BP unit, BP cuff, electronic thermometer, machine handle, and pulse oximeter. To identify the high touch and how thoroughly disinfect by staffs using a measuring tool known as adenosine triphosphate (ATP) bioluminescence that is express as relative light unit (RLU) values. The 101 samples of portable medical BP units indicate that the highest RLU is the pulse oximeter (Havill et al., 2011). Some more examples of high-touch items and surfaces in the health care environment are show in figure 1 (see Appendix A). By realizing high-touch surfaces, an awareness to inform individual cleaners to clean surfaces and items more frequently will prevent pathogen transmission and performance on cleaning to improve quality and safety for patient, family, and other health care workers.

Disinfectant wipes are used in health care facilities for environmental cleaning to decrease the acquire infection at the hospital. Center for Disease Control (CDC) has listed out all different ingredients use in disinfectant including disadvantage and advantage of product use (e.g., alcohol, chlorine and chlorine compounds, hydrogen peroxide, and quaternary ammonium compounds). Quaternaries are commonly use in ordinary environmental sanitation of noncritical surfaces, such as floors, furniture, and walls. EPA-registered quaternary ammonium compounds are appropriate to use for disinfecting medical equipment such as blood pressure cuffs (Rutala et al., 2008). Gold and Hitchins (2013) find six commercial disinfectants cleaning wipes for their effectiveness to remove a coagulated blood test soil or streptococcus pneumonia bacteria from the surface of a reusable medical device. The wipes were measure by three methods: residual protein debris by o-phthaldialdehyde analysis, ATP bioluminescence, and force required to

remove the dried debris by force measurement. All the disinfectant wipes are equally effective to disinfect contaminated surfaces. This literature does not necessary provide evidence that one disinfectant wipes work better than another disinfectant wipes. However, it varies by the hospital institution finding which disinfectant wipes best fits to their criteria.

In addition, I have search the product use at my capstone site, Sani-Cloth AF3. The product is effective against MRSA, VRE, Salmonella, E. Coli, Influenza A2, TB, Herpes Simplex Type 2, HIV-1, HBV, HCV and Staphylococcus aureus in 5 minutes or less (Julius et al., 2012). This produce is alcohol free with no requirements to use personal protective equipment (PPE) such as gloves, gowns, and eye protector. However, it would require cleaning staff to wear PPE as appropriate and as necessary for bodily fluids or soil contact such as blood and urine. All products use in any hospital has approved from Environmental Protection Agency (EPA) and Food and Drug Administration (FDA). From Ecolab, they have found a new disinfectant cleaner, OxyCide, that through their laboratory assessment of this produce was as effective as bleach for disinfection of C. diff spores, VRE, and MRSA, resulting in >5 log reductions in recovered counts of each organism (Ecolab, 2013). Although there is no literature and evidence base practice on product, it is approve from the EPA to use product. Disinfectant wipes equal improving the hospital-setting environment that equals reducing contaminated surfaces and increasing patient satisfaction that will also serve them a safe and quality services through the hospital.

Literature evaluation of the most effective measuring tool for cleanliness recommended the use of the five different methods identify through the six articles. One article emphasizes the effectiveness of using fluorescent gel. It is a prospective, multicenter, and pre- and post-interventional study in the ICU in 27 acute care hospitals. There are 3532 environmental surfaces assessed after a terminal cleaning of the 206 rooms. The mean average prior to the intervention

of cleaning object is 48.1 % (95% confidence interval) and after the intervention of objective feedback to environmental services staff, the cleanliness of cleaning has improve to 82% (95% confidence interval (Carling et al., 2010). The Fluorescent system is an invisible transparent gel that dries onto the surfaces. The focus is to remove the marks of the fluorescent gel on the surfaces or items. Cleaning staffs would physically have to remove the mark that shows the effectiveness of cleaning but not the not measure the actual cleanliness of the environment. Improving in through cleaning and environmental hygiene will enhance patient safety.

Carling P. (2013) uses a cleanliness measurement tool of ATP bioluminescence. It is a technology to detect the presence of microbial and non-microbial on surfaces. A specialize swab use to sample the surface area and then analyze using a portable handheld program luminometer. The Adenosine triphosphate is quantified and express as relative light units (RLU). The higher the RLU, the poorly cleaned the surfaces present with aerobic colony counts. Carlings P. identify the benchmark for ATP bioluminescence is poorly clean if it is less than 250 RLU. It provides a quantitative measure of cleanliness. Moore et al.,( 2010) conduct in two central London teaching hospitals within the MedSurg ICU. The staff cleaner are to clean twice-daily using ultra microfiber cloths for 40 weeks. Every week 10 surfaces will be randomly select to assess with the ATP bioluminescence to measure cleanliness and outcome is to meet the benchmark less than 250 RLU. In result of the study, the modified of cleaning reduce the level of surface contamination and overall environmental cleaning significantly reduce from 534 RLU before cleaning to 122 after following the modified cleaning. In this case, almost 95% of the surfaces cleaned have RLU value of less than 500 (Moore et al., 2010). This has propose as an improvement to manage the hospital cleaning environment that will produce safety to patient and the quality care service to patient, family, and staff.



Another type of measurement is using ultraviolet light rays for cleaning and cleanliness.

A study conducted to evaluate whether the introduction of the pulsed xenon ultraviolet (PX-UV) device had a positive impact on patient satisfaction in acute care setting. Patient satisfaction is measure by survey. According to the literature, 2011 before the introduction of the PX-UV system, patient satisfaction scores for cleanliness averaged 75.75%. An enhanced cleaning of the facility was introduce, it improve to 83%. Overall scores for the hospital rose from 76% (2011) to 87.6% (2012) (Fornwalt & Riddell, 2014). It indicates that an increasing of improvements to cleaning will increase patient satisfaction and safety. One other article related to UV light use to measure cleanliness and cleaning method was a convenience sample of ICU rooms. The UV has remove at baseline surfaces of 44% as to during the intervention 71% of pathogens removed. (Goodman et al., 2008). The use of an effective tool will decrease contamination on surfaces to improve quality of the hospital and safety.

Overall, of the five-literature review articles of measuring method for cleanliness, one article monitor and measure the effectiveness of the five different methods used to measure cleanliness of environmental cleaning. In figure 2 (see Appendix A), it evaluates the five different methods of direct observation, culture swab, agar culture system, fluorescent system, and ATP bioluminescence (Carling P. , 2013). From the literature, there is no one way to measure cleanliness. Again, cleaning is not an evidence base science. Therefore, it is most effective to use a combination of the five different methods.

### **Analyzing the Information**

I have conducted a survey at my capstone site to observe and evaluate health care worker such as registered nurse and ED tech cleaning dirty room after vacated room use by patient. After discharge, from my observation, staff often forgets to clean; or when they do clean, they forget to clean the doorknob as shown in figure 3 (see Appendix A). Other items missed are the telephones, call lights, blood pressure cuffs or cords, and the pulse oximeter or cords. The side

rails are clean more than the other items. I have also randomly asked different nurses and ED tech how they clean their dirty room. Two of the response from ED health care worker after telling them about my project improvement plan and educating them on high-touch surfaces and items:

“I never disinfect the telephone because everyone uses their cell phones” (anonymous).

“Oh yes. We tend to forget to wipe down the blood pressure cord or cuff and inside the oximetry probe area and the cord, too” (anonymous).

I have communicated with environmental services (ES) about what they have been doing for measuring cleanliness and what kind of disinfectant wipes they have find effective. As I talk to the ES, they are using ATP bioluminescence that is measuring the quantity of cleanliness. In addition, the ability to provide feedback to their housekeeper as needed after a randomize worker performance evaluation and effective cleaning by using ATP bioluminescence twice a week. The housekeepers are educated to use materials and educated how to clean thoroughly in each room. Speaking to the ES in related to high-touch surfaces, the ES has mention high-touch surfaces they found are toilets, sinks, over beds, side rails, TV controllers, BP cuffs, and keyboards. The most contaminated identify from ES is the BP cuffs and pulse oximeter. The information from ES are relevant to the high touch areas found through literature, the effectiveness of using disinfectant or cleaning supplies for environmental cleaning, and the use of method to measure cleanliness. ES agree upon the literature that UV is effective to cleaning surfaces and reducing pathogens. In all the literature review, it is not relevant to the ED. However, there are limitations among each of the articles find such as not in the ED and the sample or experiment conducted is in London.

### **Recommendation**

Again, it is essential to identify high-touch surfaces to reduce acquired infection in the hospitals. Through the literature review to my objectives in the introduction, my observation, and the expert opinion, the recommendation I have concluded that the use of disinfectant is a first line of defense to prevent pathogen transmission. Through the literature assessment there is no best or most effective disinfectant wipe to use specifically in the hospital to kill the pathogens. More research needed to evaluate effectiveness of using OxyCide as the new disinfectant cleaner from Ecolab to kill c-diff, MRSA, VRE, and other MDROs. However, it varies between hospitals to their choices of what disinfectant best fits for their institution. The UV ray light is an effective tool. However, to be quick and effectively clean the environment, ATP bioluminescence will provide the quick feedback to health care staff cleaner and use of products to clean. Furthermore, the use of the five methods such as visualization, fluorescent gel, and ATP bioluminescence will effectively evaluate own purposes and effect in cleaning to provide a safe environment in the hospital.

### **Implementation**

I presented, April 25, my poster to ED Nurse Manager, Infection Protection Services, and ES to raise awareness of environmental cleaning to reduce pathogen transmission. I am raising this awareness to the ED health care worker who help with cleaning dirty room. As I have notice from my observation, some health care are following the protocol to disinfect high touch surfaces while cleaning dirty room and others do not. After my presentation, the poster is post for one week, April 25 to May 2, in the ED lounge to allow other staff to read information on poster to inform and raise awareness of the importance for environmental cleaning to safeguard pathogen transmission. The method chosen is due to health care staff being busy and time limited if I am going to educate and present information to them. The ability to leave the poster in the ED lounge will allow them to read quick information and promote an awareness that even if they

pushes environmental cleaning to the back of their priority list, it is significant that they bring it to their priority to prevent disease acquire to other patients.

Learning outcome for this implementation is to raise awareness to at least 50% of the staff working in the ED. The ability to educate staff high-touch surfaces from the poster and the outcome measurement tool is for staff to be able to identify four to five high-touch surfaces through evaluation survey. Informing others of the different methods use for measuring cleanliness to how individual clean their room. Evaluating strategy of meeting outcome is through poster posted in the ED lounge with a survey to evaluate effectiveness of poster to raise awareness in environmental cleaning to reinforce an atmosphere of cleaning.

### **Evaluation**

During the presentation, there present two people, the ED nurse manager and assistant nurse manager out of the five people invited to the presentation. Both of them filled out the survey at the end of the presentation. When I left the poster in the ED lounge for one week, I had three anonymous health care workers who fill out the survey. It included quantitative and qualitative data about the effectiveness of the presenting information and other additional comments. The four quantitative data was measure on a Likert scale of 1 - 4. Therefore, five surveys total filled out. The outcome to inform 50% of the health care worker is unmet, only 0.03% of the staff probably read the poster, according to my surveys filled out the form. Although this may not be the most accurate of how informing or how many people actually seen the poster. For the relevancy of the topic, the evaluations all unanimously selected “*strongly agreed*.” The next question asked if the audience is able to identify the four to five high-touch surfaces, the results were all “strongly agreed,” and staff identify high-touch surfaces on comment note. Health care staff understands the different high-touch surfaces. The next question asks if the material effectively communicated and raise the awareness to improve environmental services. The results determined one “*strongly agreed*,” three “*agreed*,” and one

“*disagreed*”. One person did not agree because it believes that I did not confer or have hard data proving those who did or did not clean. The following questions ask if the information presented inform the different methods to measure cleanliness. The result is four “*strongly agreed*,” and one “*agreed*.” Everyone “*strongly agreed*” that presentation method of poster is effective. In addition, I collected some qualitative data by asking the watchers to describe how the presenters taught the information. Some did not answer this part of the evaluation, but for those that did, the feedback was positive, “well put together information but no overwhelming, useful, great poster.” The final part of the evaluation was a comments spot. Many opted out of filling out this part, but I did receive some constructive feedback such as “I would have liked to see hard data informing the contaminated area.” All outcomes were either unmet or partially met with progression. In conclusion, the feedback was positive and I reflected on presentation that the potential barriers is due to time, challenges to prioritize cleaning when patient comes first, and sometimes as human being we forgot about it.

### **Conclusion**

Environmental cleaning is an essential component to reduce pathogen transmission. The practices of good housekeeping and other health care individuals who help with cleaning are essential for reducing the risk of transmitting infectious diseases. This contributes to a culture of safety by providing a clean environment. All those using the health care premises have a right to assume that the environment is one where hazards are adequately controlled and where they receive any necessary information to enable them to safeguard themselves and others from disease. Maintaining a clean and safe health care environment is an important component of infection prevention and control.

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Appendix A

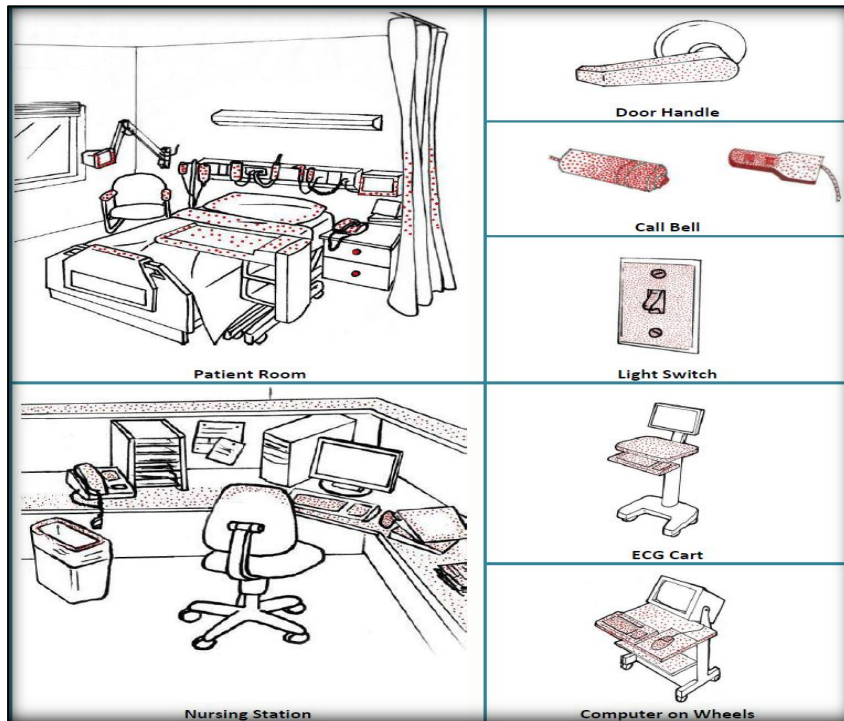


Figure 1. Examples of High-touch Items and Surfaces in the Health Care Environment Note: Red dots indicate area of highest contamination and touch (Ontario Agency for Health Protection and Promotion, P. I. (2012, May).

Evaluating Patient Zone Environmental Cleaning					
Method	Ease of Use	Identifies Pathogens	Accuracy	Useful for Teaching	Use in Programmatic Monitoring
Direct observation	Low	No	Variable	Yes	Difficult
Culture swab	High	Yes	High	No	No
Agar culture system	Moderate	Possible	Moderate	No	Possible*
Fluorescent system	High	No	High	Yes	Yes
ATP Bioluminescence	High	No	Variable	Yes	Possible*

\* Measures cleanliness at that moment but **NOT** the process of cleaning

Figure 2. Evaluating patient zone environmental cleaning. \*Measures cleanliness at that moment but NOT the process of cleaning. (Carling, 2013)



Appendix B

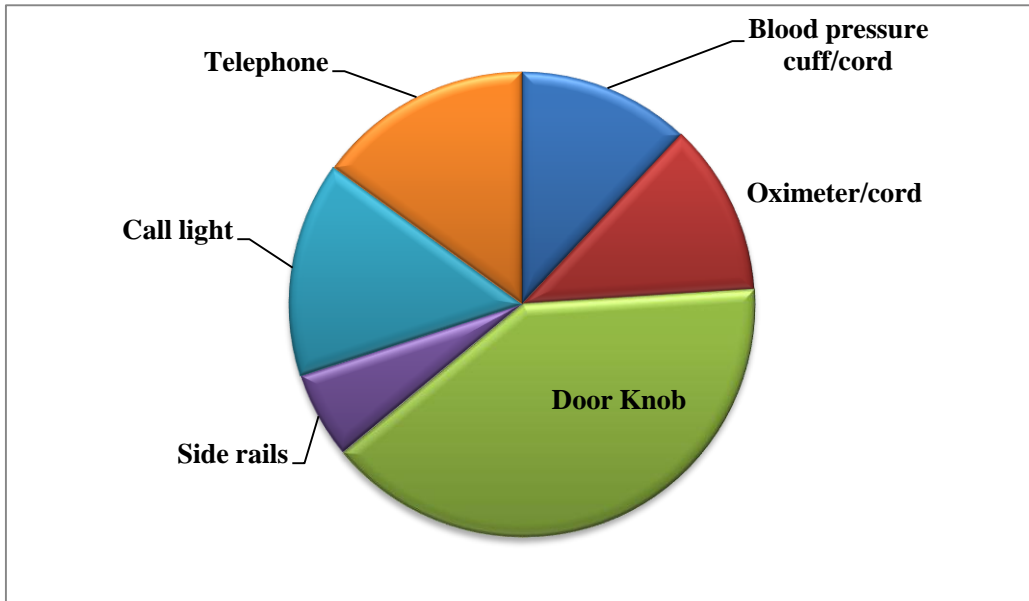


Figure 3. Approximate High-touch equipment misses in the Emergency Department