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Disposable Items Help Prevent Healthcare-Acquired Infections

By Larry M. Bush, MD

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The field of infectious diseases in the practice of medicine has greatly evolved since its recognition as a distinct subspecialty, commencing some time after the advancement of antimicrobial therapies following World War II. Involvement with diseases such as tuberculosis, malaria, epidemic influenza, and common bacterial and parasitic infections has been and will continue to be an integral part of this discipline. However, in the ensuing years, the knowledge base and pervue of the infectious disease practitioner has been required to undergo an extraordinary growth, coinciding with the expansive complexities surrounding the diagnoses, treatments and preventions of infections both in and outside of the hospital setting.

In most recent times, the recognition of emerging infectious diseases such as Acquired Immunodeficiency Syndrome (HIV/AIDS), lyme disease, hantavirus, West Nile virus, Severe Acute Respiratory Syndrome (SARS), avian influenza and Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (cMRSA) have both threatened the health and well- being of the population and challenged healthcare providers, perhaps to a greater extent than experienced in past eras. The detection, prevention and treatment of diseases caused by microbes used for bioterrorism purposes has also become an assumed role of those individuals working in the field of infectious diseases, before and since the anthrax attacks of October 2001.

Antimicrobial resistance among bacterial pathogens has become a serious health threat, as the incidence of infections with such organisms has risen at an alarming rate. MRSA, Vancomycin Resistant *Enterococci* (VRE), Drug-Resistant *Streptococcus pneumoniae* (DRSP) and gramnegative bacilli possessing the ability to produce Extended Spectrum Beta- Lactamases (ESBL) have become frequent pathogens causing infections in both hospital and community settings. This increase in resistance leads to greater morbidity, mortality and cost, and has challenged the medical field and pharmaceutical industry in the development of prevention and treatment strategies.

The infection control discipline was born in the 1950s, primarily as a response to the problem of staphyloccocal nosocomial infections. Greater than 5 percent of patients admitted to hospitals in our country develop a hospital-acquired infection. The estimated cost to the healthcare system exceeds $5 billion and results in approximately 88,000 deaths per year.

A great majority of these healthcare-acquired infections (HAIs) involve many of the pathogens displaying antimicrobial resistance as described above. The strategies employed to control the spread of HAIs primarily include emphasis on handwashing compliance in conjunction with the use of disposable gloves. Hand hygiene remains the single most important measure in decreasing the spread of nosocomial pathogens, as most HAIs are transmitted by contact via the hands of healthcare workers (HCWs). Other modalities that have been found to be effective include transmission-based precautions such as contact, airborne and droplet isolation. The appropriate choice, timing, and limitation of the use of antibiotics coupled with the knowledge of resistance patterns of microbial agents in a particular healthcare institution, strictly enforced, have been found to decrease the rate of infections caused by multi-resistant bacterial pathogens. Some facilities have taken to the screening of patients and the pre-identification of carriers and previously infected individuals, as a means to limiting their contact with the general hospital population. The success of these control measures is variable and under frequent scrutiny.

The approach to disinfection and sterilization of hospital equipment and patient-care items was developed more than three decades ago and remains in place to this day. This practice involves the categorization of items into those termed critical, semi-critical and non-critical. Critical items include those devices that pose a high risk of infection if they are contaminated prior to being placed in an otherwise sterile tissue or vascular space (i.e., surgical instruments, implants, cardiac catheters and other intravascular devices). Semi-critical objects are those coming into contact with non-intact skin or mucosal membranes (i.e., endoscopes and respiratory therapy equipment), whereas non-critical items include those coming into contact with intact skin (i.e., blood pressure cuffs, bed rails, linens, bed pans, patient furniture and floors).

While sterilization involves the destruction of all microbial life on an object or surface using thermal, chemical or pressure methods, the process of disinfection typically eliminates most microbes on inanimate objects with the exception of bacterial spores utilizing a variety of chemical agents. The degree of elimination of organisms by employing disinfection techniques is dependent upon the sensitivity of each population of microbes to the chemical agent and its time of exposure. As such, disinfection procedures have been classified as high-, intermediate- and low-level. High-level disinfection eliminates all microorganisms with the exception of large numbers of bacterial spores, whereas intermediate-level disinfection destroys mycobacteria, vegetative bacteria, most viruses along with most fungi, but does not guarantee the eradication of bacterial spores. Lastly, low-level disinfection employs agents which likely will kill the majority of vegetative bacteria, some viruses and fungi, but will not reliably kill mycobacteria nor spores. Alternatively, cleaning is the removal of organic and inorganic material from objects and surfaces, accomplished by manual or mechanical means with the use of water and detergents.

The nosocomial pathogens commonly found contaminating the hospital environment vary in their ability to withstand commonly used disinfection techniques and various disinfectant products, therefore having a variable role in

the development of clinical disease. For instance, certain viruses such as influenza, hepatitis B, enteric viruses and the coronavirus associated with SARS, have been demonstrated to survive on inanimate surfaces and fomites, and can only be effectively eliminated by appropriate disinfection. Spores of *Clostridium difficile* often colonize commonly used patient articles such as blood pressure cuffs, furniture and bed pans among others, for long periods of time, therefore increasing the risk of nosocomial infection in predisposed individuals. Gram-negative bacilli tend not to spread to patients from the hospital environment as they tend not to be viable after drying. MRSA is frequently encountered on objects in patient rooms; however, proof of fomite to patient transmission has not been convincingly demonstrated. Nevertheless, these MRSAcolonized objects may serve as major reservoirs for the acquisition of these bacterial strains on the hands of HCWs and subsequent spread to their patients. The role of VRE in hospital fomite contamination depends upon the proximity of the environmental site to the patient carrying this organism; therefore these bacteria may be transmitted by both indirect (via HCWs' hands) and direct contact with colonized surfaces and fomites that have not been properly disinfected.

Much controversy exists regarding the spread of nosocomial infections in relation to the role of contamination of surfaces and equipment commonly encountered in the immediate patient's hospital environment. Although surveillance cultures have shown bacterial contamination of such inanimate items, its clinical significance remains unclear. Some factors that have been suggested to help possibly establish a causal relationship between hospital environment contamination-colonization and HAIs include:

- The degree/burden of contamination by specific pathogens
- The temporal relationship of environmental contamination to the patient's acquisition of these pathogens
- The degree of handwashing and thoroughness of fomite cleansing
- If more effective cleaning may diminish the risk of patient infection

In recent years, the concept and use of disposable items has been introduced into the hospital setting for the purposes of the prevention of HAIs, as well as for convenience and cost factors. Such items include: blood pressure cuffs, thermometers, stethoscopes, pulse oximetry devices, bed pans and personal-hygiene items, among others.

One object, perhaps not yet considered as a potential reservoir for nosocomial pathogens, is the television remote control device almost universally connected to the nurse call button attached to the hospital bed by a cord. Although not previously studied, one can presume that this object may also be colonized to various degrees with many of the microbial organisms implicated in nosocomial infections, not unlike other surfaces or fomites in the patient's room. Moreover, the television control systems presently used may not be amenable to be sufficiently disinfected due to limitations imposed by the intrinsic nature of the device. Television control pads are one of the most often manipulated objects in the patient's room; therefore, if the frequency and duration of contact with a colonized inanimate object has a direct correlation with the risk of transmission of a pathogenic organism, then this device may be an important potential source of hospital-acquired patient colonization and/or infection.

In line with this concept of single-use hospital items, a disposable, inexpensive remote control has been developed that operates all of the televisions in patients' rooms within any one particular hospital without the need for programming. These individually wrapped remote controls have been created to help in potentially reducing the risk of acquisition of nosocomial pathogens. Though studies regarding the role of colonized hospital environmental objects are limited and inconclusive, the idea of the use of disposable television remote controls is in keeping with the already implemented current practices. Any decrease in potential nosocomial infections may represent cost savings which far outweigh the expense incurred by the use of disposable items.

As the scope of hospital infection control evolves due to emerging infections, bloodborne pathogens, antimicrobial resistance and biologic agents used for the

purpose of terrorism, ongoing strategies to reduce the risk of HAIs need to be developed, studied, and implemented. Disposable devices in the hospital setting perhaps should be considered part of these infection control measures.

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