



# CROSS-CONTAMINATION RISKS OF PATIENT PILLOWS IN THE HOSPITAL SETTING

*Based on an original study of pillow contamination surviving disinfection.*

## THIS RESOURCE IS FOR YOU IF YOU WORK IN OR MANAGE:

- Infection Prevention
- Emergency Rooms
- Operating Rooms
- Environmental Services
- Healthcare Distribution

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## CLINICAL BACKGROUND

Nosocomial, or hospital acquired, infections (HAIs) are a major cause of patient morbidity and mortality. While the individual patient may often be the source of particular pathogens, **researchers have projected that approximately 20% to 40% of HAIs are associated with cross contamination by way of contact contamination from the hands of healthcare personnel who have touched contaminated patients or contaminated environmental surfaces.**<sup>(1)</sup> There have been a number of studies that have supported this contention, relating the transmission of methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant *Enterococcus* (VRE) to environmental contamination.<sup>(1)</sup>

Recent studies suggest that the spread of norovirus, *Clostridium difficile*, and *Acinetobacter* spp can be related to environmental contamination.<sup>(1)</sup> These particular pathogens are known to survive on environmental surfaces for long periods of time, and the hospital environment is well recognized as an extremely important source of HAIs (or healthcare-associated infections as they are now called); yet the environment in which the patient spends the most time, the bed including the mattress and pillows, is often overlooked when it comes to finding the source of the pathogens.

We, in the Infection Control Department of our institution, decided to address this oversight and conducted a microbiological survey of patient-ready, decontaminated, reusable, vinyl covered patient pillows at our institution. As a result of this survey we recovered pathogenic bacteria from the pillows, including:

- Methicillin-resistant *Staphylococcus aureus* (MRSA),
- Vancomycin-Resistant *Enterococcus* (VRE),
- *Enterococcus faecalis* (E faecalis),
- *Escherichia coli* (E coli),
- *Providencia stuartii* (P stuartii),
- Yeast,
- Coagulase negative *Staphylococci* (CNS),
- *Klebsiella pneumoniae* (K pneumoniae),
- *Bacillus* species,
- Gram-Positive Cocci and
- Diphtheroids.

As a result of this study, we now firmly believe that reusable patient pillows pose a cross contamination risk. The reason for this may be attributed to the variability in disinfection technique, the condition of the pillow, and the effectiveness of the disinfectant. All of which make it difficult to completely clean and disinfect the pillow. Therefore, cross contamination may occur from the patient to the pillow, from the pillow to the healthcare worker and then to the patient, and from the pillow directly to the patient.

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# INTRODUCTION

There is increasing evidence which suggests that the hospital environment, including hospital room surfaces, bedding, and various equipment, plays a significant role in the spreading of nosocomial pathogens in healthcare settings.<sup>(2-6)</sup> Many of the pathogens found are multidrug resistant, and are linked to increased morbidity and mortality as well as increased costs.<sup>(7-10)</sup>

Studies have also shown that nearly one-third of the high-touch, high-risk objects in hospital patient rooms remain contaminated for the next patient. In some cases the extent of patient to patient transmission has been found to be directly proportional to the level of environmental contamination.<sup>(1)</sup> Objects in the healthcare setting such as reusable patient care articles and medical supplies such as pillows, mattresses, blood pressure cuffs, thermometers, stethoscopes, remote controls, bed rails, privacy curtains, and IV pumps and poles have been shown to harbor nosocomial pathogens.<sup>(11-22)</sup>

Reusable vinyl covered hospital pillows fall in this category of frequently used patient articles and medical equipment which can potentially harbor nosocomial pathogens. Some data exists regarding the microbiologic contamination of reusable hospital pillows.<sup>(11-14,16,21)</sup>

Because of this, **we undertook a cross-sectional study to examine the microbial contamination of reusable vinyl pillows at our institution.**

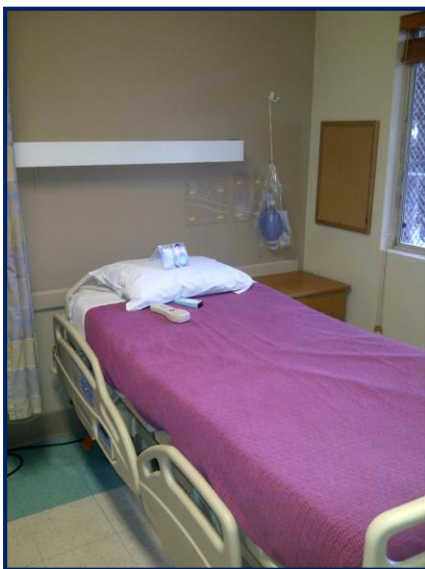
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## METHODS

We decided to do a survey over a five week period by culturing one hundred (n=100) randomly selected vinyl covered patient pillows after they had been cleaned and disinfected, and ready for a new patient. Our institution is probably typical of most hospitals in that when a patient is discharged, the cloth pillow cases are removed and the vinyl surface of the pillow is disinfected by environmental services personnel following an established standard protocol. Occasionally, nursing assistant staff will perform the disinfection procedure. In either case, the vinyl covering of the pillow, as well as the mattress cover, is to be carefully wiped down with a quaternary ammonium solution (Vindicator+). The pillow then remains on the mattress until the room is being prepared for a new patient. At that time clean sheets and pillowcases from the hospital's contracted laundry service are applied.

Over a five week period one hundred (n=100) randomly selected vinyl pillows were cultured to determine the presence of pathogens remaining on the pillow post disinfection by environmental services. Swab samples from the vinyl pillows were collected from hospital units that house Long Term Acute Care (LTAC) patients.



*Figure 1, Cleaned and disinfected hospital bed awaiting new patient.*

The vinyl pillows were swabbed in patient rooms that were prepared to receive a new patient. The swabbing of the pillow occurred within 2 hours after the patient room and pillow had been fully cleaned and disinfected by environmental services. The following procedure was followed to collect the samples:

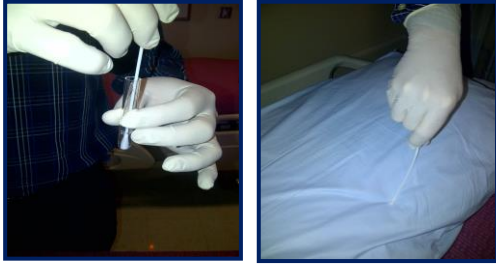
1.1. Upon patient discharge from the hospital, the hospital room is to be cleaned by environmental services according to the normal procedure followed at the study site. The vinyl covered pillow will be cleaned/disinfected following the standard disinfection protocol.

**1.2. Within 2 hours post disinfection the vinyl surface of the pillow is swabbed according to the following procedure:**

- 1.2.1. Apply sterile gloves
- 1.2.2. Open package of one sterile, polyester-tipped applicator swab
- 1.2.3. Immerse the sterile, polyester-tipped applicator swab into the Sodium Chloride solution in the test tube and then press against the wall of the tube to remove excess solution.
- 1.2.4. Use the swab to collect evidence from the pillow surface by rotating and rubbing in a zigzag pattern over the whole surface of the vinyl covered pillow (both sides) and repeat at an angle of 90 degrees to the first rub.
- 1.2.5. The swab will then be put into the test tube with Sodium Chloride solution and shaken to dislodge bacteria. The swab will be left in place in the tube 5 minutes and the tube will be vortexed.
- 1.2.6. After vortexing the tube discard the swab. The remaining solution will be in the tube.
- 1.2.7. Inoculate the SCDA or Blood Agar plates with 100 microliters of the solution.
- 1.2.8. Incubate the plates at 36 degrees Celsius for 72 hours

1.2.9. Follow incubation identify and enumerate pathogens on plate according to established industry practices.

1.2.10. Repeat this procedure for 100 samples and 1 Control.



*Figure 2 and 3. Swabbing the disinfected vinyl pillow.*



# RESULTS

The cultures of the swab samples taken from the cleaned patient ready pillows yielded a 38% recovery of infection causing pathogens. (95% CI, P < .016) Of the 38 positive samples, 3 pillows were found to harbor more than 3 pathogens on each pillow and 15 pillows had more than 2 pathogens on each pillow. Diphtheroids, MRSA, and E. Faecalis were the most prevalent pathogens remaining on the pillows.

**In our study hospital pillows, even those terminally cleaned by environment services in preparation for a new patient, harbored pathogens such as MRSA, VRE, E Coli, P stuartii, and Klebsiella pneumoniae.**

The average cfu range per pathogen per positive culture is shown in Figure 4. The percent of samples containing each pathogen is shown in Figure 5.

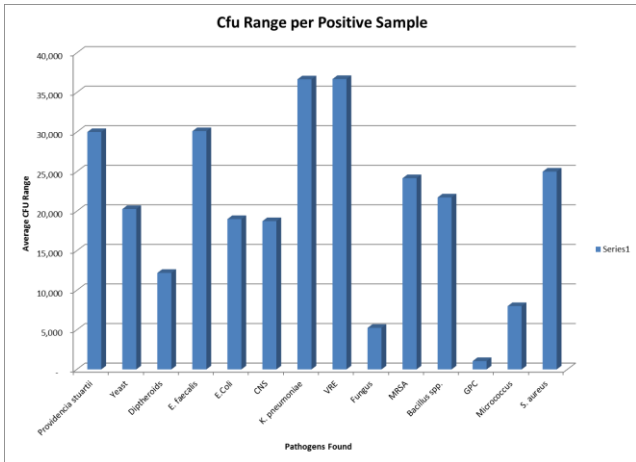


Figure 4. Average cfu range per positive sample

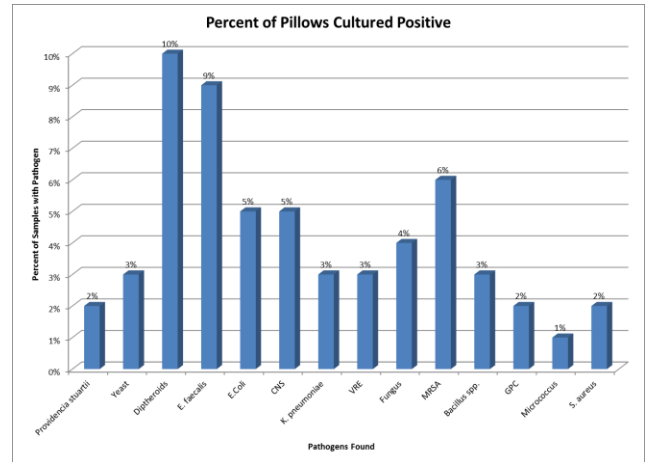


Figure 5. Percent of samples containing pathogen.

## DISCUSSION

While it has been reported that the incidence of healthcare-associated MRSA infections have decreased over the past few years, the emotional and financial costs of HAIs is still immense. The Centers for Disease Control (CDC), recently released a report on Antibiotic Resistant Threats in which they estimate that 23,000 patients die each year due to HAIs. **They also estimate that there are about 2 million incidents of HAI cases in the United States each year.**<sup>(29)</sup>

**In addition, a recent report in JAMA Internal Medicine estimates the financial burden of HAIs to be as much as \$9.8 Billion annually, with per case costs running from an average of \$11,285 for a C difficile infection to as much as \$45,814, on average, for a central line associated bloodstream infection.**<sup>(30)</sup>

The patient's environment and touch surfaces within the patients' room have more recently come under study as an important factor in nosocomial transmission of HAI associated pathogens. One study reported 42% of nurses performing routine care on patients without direct patient contact had MRSA cultured from their gloves. The non-patient surfaces they had come into contact with were: bed rails, bed linens including pillows and infusion pumps.<sup>(15)</sup> Hospital and patient care environments play a significant role in the epidemiology of multi-resistant bacteria.<sup>(1-6,22-25)</sup>

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Human secretions and excretions can heavily contaminate the patient's bedding and general care area. MRSA, for example, can survive for many days on various surfaces:

- 12 days on a laminated table,
- 11 days on a plastic patient cart,
- 9 days on a cloth curtain,
- 21 days on cotton fabrics,
- 14 days on terry cloth, and up to
- 40 days on polyester.<sup>(23-25)</sup>

It is also reported that even very strong cleaning may not be effective against MRSA and other contamination of fomites. Several studies have shown that when terminally cleaned by environmental services less than 50% of the hospital room surfaces are adequately cleaned.<sup>(26-28)</sup> A study performed at a facility in the United Kingdom reports in 46% of rooms formerly housing MRSA-infected patients, cultures of pillows, mattresses, chairs, bed frames, nurse call buttons and other environmental surfaces still grew MRSA despite "terminal" cleaning.<sup>(10)</sup>

In our study, we found that disinfected, patient-ready reusable vinyl pillows harbored microorganisms, including MRSA, E. faecalis, E.Coli, P.Stuartii, Yeast, CNS, K pneumoniae and Diphtheroids.

- Environmental contamination due to methicillin-resistant Staphylococcus aureus (MRSA). J. Hosp. Infect. 38:67-70
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## CONCLUSION AND KEY-TAKEAWAYS:

### **Conclusion**

Reusable hospital pillows may serve as reservoirs for nosocomial pathogens. Thirty eight percent (38%) of disinfected patient ready pillows were found to harbor pathogens. Clear and rigorous guidelines should be established for decontamination of patient beds and pillows. Outbreak investigations should include assessment of pillows and mattresses.

### **Key-Takeaways**

- HAIs place an undeniable physical and emotional burden on patients and their families.
- HAIs create an undesirable financial burden on healthcare institutions.
- Soft surfaces as well as hard surfaces in the patient's environment can act as fomites for the transmission of pathogenic agents.
- Even "terminally" cleaned and disinfected reusable items may likely harbor pathogenic agents.
- Greater attention may need to be given to proper education and training of lesser trained personnel who are responsible for cleaning and disinfecting items in the patient environment.
- A bi-directional barrier, such as the TIDIShield™ Pillow Barrier may be an appropriate shield against patient to pillow and pillow to patient transmission of infectious agents.

## WHAT CAN YOU DO ABOUT IT?

Use TIDIShield™ Disposable Pillow Barriers, which prevent pillow to patient cross-contamination of harmful HAI causing bacteria. It is the ONLY tested and proven barrier to being 100% effective against pass-through of bacteria where commonly used cloth pillow cases fall short.



*What's growing on your pillows?*

## **STOP** Cross-Contamination of Harmful Bacteria from Pillow to Patient

Study shows that after terminal cleaning 38% of reusable hospital pillows contain harmful bacteria such as Diptheroids, MRSA, and E. Faecalis.<sup>1</sup> The TIDIShield™ Disposable Pillow Barrier is an effective barrier against bacteria.<sup>2</sup> Uniquely designed, the premium layered poly-backed material helps keep patients protected. In addition, the durable material means your pillows are cleaner and last longer so you spend less on laundering costs.

### Improve Patient Safety & Comfort

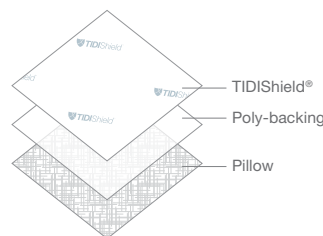
- Effective barrier against bacteria<sup>2</sup>
- Fluid-resistant material
- Soft, linen-like feel
- Single-use



*Use as a standalone pillow barrier or under a linen case. Fits standard reusable hospital pillows.*

### Reduce Risk. Save Time & Money

- Non-corrugated packaging
- Easy to grab, easy to apply
- Extends life of the pillow and saves on laundering costs



*Made with uniquely designed material, this layered poly-backed barrier guards against bacteria pass-through without the use of chemical coating or bacteria-cide that may itself contribute in the resistance building of "Super Bugs" to antibiotics.*

### TIDIShield™ Disposable Pillow Barriers

PRODUCT CODE: 6355

COLOR: White

SIZE: 21" x 30"

UNIT QUANTITY: 2 boxes of 50 / 100 per case

[CLICK HERE TO REQUEST A FREE SAMPLE](#)

## ABOUT US

TIDI Products manufactures single-use infection prevention products for the medical, dental and foodservice markets, and a variety of poly films for converters. The materials we use to produce disposable products enhance their performance and convenience.

We're focused on understanding the needs of professional care providers and the desires of the patients they care for. Our products provide specific solutions to meet precise needs, and we offer an array of clear choices, based on key factors that matter most to the people who use them.

We're also dedicated to helping distributors build their brands and market share, offering value-added support with private label packaging of selected products, as well as promotional materials. We're confident that our end-user focus assures the right product mix.

### **Building a sustainable future with a purpose**

Our commitment to LEAN Manufacturing increases efficiencies, eliminates waste, and improves the customer experience. One example is the Zero Waste Program, which will have a considerable impact on the environment by eliminating all material waste within the plant, repurpose materials, and reduce energy usage. Not only are we improving our efficiencies to continually improve our customer experience, but also reducing our impact on the environment.

### **Contact Us:**

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