Emerging Idea: Saving Costs through the Decontamination of the Packaging of Unused Medical Supplies Using Hydrogen Peroxide Vapor [1]

Rationale / Objectives

Contamination of environmental surfaces and medical equipment is an increasingly common source of in hospital transmission of multidrug-resistant organisms (MDROs). Patients who are treated in hospitals rely on the provision of sterile supplies for many aspects of their treatment. Supplies (such as catheters, needles, scalpels, tubing, filters, dressings, and culture swabs) are packaged and sterilized by the manufacturer. In intensive care units (ICUs), supplies are stored in supply carts close to patients, where they are exposed to frequent contact by healthcare personnel hands. As the packaging of unused supplies and carts can become contaminated with nosocomial pathogens; and though the pathogens do not breach the inside of the packaging they can contaminate the healthcare personnel hands or the product as it is removed from the packaging. To help ensure patient safety, unopened supplies that have had contact with patients infected or colonized with certain MDROs are discarded. Although there is no specific guidance on the management of these items in Centers for Disease Control and Prevention guidelines, this practice has been recommended in several circumstances (e.g., during some outbreaks). Disinfecting these items using the manual application of liquid disinfectants is impractical. An alternative approach that has been tried in a study at John Hopkins Hospital is the use of hydrogen peroxide vapor (HPV) decontamination, which is an Environmental Protection Agency–registered sporicidal sterilant that is effective against a range of nosocomial pathogens.

Project/Program Description & Major Achievements

The disposal of unused, packaged supplies has direct costs in their purchase value, indirect costs associated with their disposal, and a substantial environmental burden. Therefore, the ability to disinfect the medical supplies instead of discarding them is attractive and would generate financial and environmental benefits. HPV technology may provide a creative option to disinfect the packaging of contaminated supplies and avoid their disposal. We evaluated the frequency of contamination on the packaging of unused supplies in the rooms of patients under precautions for MDROs, assessed whether HPV is effective for the disinfection of these items, and calculated the cost of discarded supplies. In a pilot study, seven of 100 supplies not exposed to HPV from 4 rooms were contaminated with vancomycin-resistant enterococci (VRE), whereas none of the 100 paired supplies grew VRE after HPV exposure. The cost of supplies stocked in each room ranged from $96 on the transplant unit to $404 on the medical ICU. The annual value of discarded supplies on the 6 study units, and thus the potential direct savings associated with HPV decontamination of these supplies, was $387,055.
Lessons Learned

Previous reports have evaluated contamination of disposable patient-care items. Various strains of bacteria have been found in unused medical supplies. Contamination of supply packaging could result in the transfer of pathogens to the hands of healthcare personnel or to the sterile item as it is removed from the packaging. Additionally, the study found that half of the bacterial species identified on the supplies did not match the bacterial species known to be infecting or colonizing the patient in the room. Unidentified patient carriage or importation on the hands of healthcare workers seems most likely. In the study, only a small number of supply items were decontaminated in a wire rack during room decontamination. To realize the potential cost savings identified, the supplies from the rooms of all patients under precautions for MDROs would need to be decontaminated. Thus, supplies would need to be collected, transported to a dedicated decontamination room or facility, and then returned to the units. The personnel cost associated with this process and the cost of HPV disinfection would need to be accounted for to obtain a complete financial assessment.

People / Organizations Involved

- **John Hopkins Hospital** [2]
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Further Description

The Johns Hopkins Hospital (JHH) is a 994-bed tertiary referral centre. The hospital has a policy to dispose of all items in the supply cart of patients under contact precautions for MDROs at patient discharge. A pilot study of supplies from the rooms of 20 patients under contact precautions for vancomycin-resistant enterococci (VRE) was performed to assess the rate of contamination and the ability of HPV to inactivate VRE on supply packaging. VRE was chosen for the pilot study because it is commonly encountered in the facility. Rooms of patients on 2 ICUs (surgical and neurosurgical) and a high-risk surgical and solid-organ transplant unit were included, and patients with recent surveillance cultures that grew VRE were prioritized. Five pairs of unused, packaged supplies were selected from the supply cart in each study room when the patient was discharged from the hospital. To investigate contamination of supplies with other MDROs and disinfection using HPV, a follow-up study was performed. Paired supplies were collected at patient discharge from 20 rooms of patients on 5 ICUs (surgical, medical, cardiothoracic, oncology, and neurosurgical) and a high-risk transplant unit (Table 1). The 5 pairs were standardized with various bacteria strains. The 5 selected items were removed from the supply cart and laid out on a metal rack to maximize the surface of
packaging available for exposure to HPV. The metal rack was placed in patient rooms that were decontaminated using HPV, as described elsewhere.

**Major Achievements**

In the pilot study, seven of 100 supplies not exposed to HPV from 4 rooms (20%) were contaminated with VRE. None of the 100 paired supplies grew VRE after HPV exposure.

In the follow-up study, One or more MDROs was grown from 9 of the 100 supply items not exposed to HPV from 6 rooms sampled. In addition, 7 supply items had cultures that grew methicillin-susceptible Staphylococcus aureus (3 items), Aspergillus species (2 items), and Fusarium species (2 items); thus, MDROs or other potential pathogens were cultured. No supplies were contaminated with MDROs or MDROs and other potential pathogens combined after HPV.

The cost of supplies stocked in each room ranged from $96 on the transplant unit to $404 on the medical ICU. The annual value of discarded supplies on the 6 study units, and thus the potential direct savings associated with HPV decontamination of these supplies, was $387,055.

**Projected Cost Savings Associated with Hydrogen Peroxide Vapor Disinfection of Packaged Supplies:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Neurosurgical ICU</th>
<th>Surgical ICU</th>
<th>Transplant unit</th>
<th>Oncology ICU</th>
<th>Medical ICU</th>
<th>Cardiothoracic ICU</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of supply items per room</td>
<td>712</td>
<td>302</td>
<td>200</td>
<td>567</td>
<td>747</td>
<td>739</td>
<td>3,267</td>
</tr>
<tr>
<td>Room supplies costs per room</td>
<td>363.55</td>
<td>119.67</td>
<td>96.01</td>
<td>255.69</td>
<td>407.44</td>
<td>274.04</td>
<td>1,516.39</td>
</tr>
<tr>
<td>No. of patients under precautions discharged</td>
<td>165</td>
<td>189</td>
<td>556</td>
<td>259</td>
<td>379</td>
<td>150</td>
<td>1,698</td>
</tr>
<tr>
<td>Policy for discard of supply stock, %</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>Annual cost of discarded supplies, $</td>
<td>59,985.75</td>
<td>22,618.39</td>
<td>42,703.02</td>
<td>66,223.06</td>
<td>154,419.38</td>
<td>41,105.55</td>
<td>387,055.15</td>
</tr>
</tbody>
</table>

**Supporting Evidence:**

1. [Saving Costs through the Decontamination of the Packaging of Unused Medical Supplies Using Hydrogen Peroxide Vapor](#) [3]
External Links:


Review of Decontamination Practices within the Winnipeg Health Region [5]

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