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Improving Environmental Hygiene: Shining the Light on Air Systems to Cut Infections

By **Sabrina Rodak**

A source of pathogenic bacteria that may be overlooked in environmental cleaning in healthcare facilities is the heating, ventilation and air conditioning systems. HVAC systems have been shown to collect, amplify and spread microorganisms such as *Aspergillus*, *Pseudomonas*, *Enterobacter* and *Acinetobacter* that cause infections and increase patient morbidity and mortality. Implementing germicidal ultraviolet light in HVAC systems at the AC coil can eliminate these microorganisms and reduce healthcare-associated infections, leading to significant reduction of non-reimbursable hospital charges.

The evidence

A 2011 study in *Journal of Perinatology* found multiple infection-causing bacteria in the HVAC system of a neonatal intensive care unit at the Women and Children's Hospital of Buffalo (N.Y.). When the hospital installed an advanced ultraviolet germicidal irradiation system, the microbes were nearly

eliminated in the HVAC and the NICU environment. This improved HVAC and environmental hygiene directly led to a decreased rate of ventilator-associated pneumonia among high-risk NICU patients and decreased antibiotic usage.

The reduction in infections and antibiotic use resulted in approximately \$850,000 in savings on the initial \$50,000 UVC investment in the first year, according to Robert Scheir, PhD, president and CEO of Steril-Aire, which provided the UVC system in the study. "With this kind of important finding, it behooves the medical community to seriously explore and [eliminate] these sources of hospital-acquired infections," he says.

Other hospitals' experiences have shown the importance of HVAC environmental hygiene in preventing infections. For example, one



Dr. Robert Scheir

hospital reduced HAIs 40 percent, and another hospital decreased HAIs to zero when they installed UVC in the air systems, according to Dr. Scheir.

Lack of awareness, education

Many hospital administrators and clinicians do not realize the impact hospital HVAC systems have on infection rates. Buildup on the systems may look like dirt, belying their danger to patients and healthcare workers, according to Dr. Scheir. “Infection preventionists, medical directors and hospital administrators need to know and understand that a very significant amount of hospital-acquired infection rates may be sourced to the air conditioning systems,” he says.

However, even hospitals that are aware of microorganisms in the HVAC system may not be addressing the problem appropriately. Eliminating infection-causing bacteria and maintaining clean HVAC systems require more than a simple wash-down; a system, such as UVC, that continuously destroys bacteria with each air flow is necessary, according to Tim Leach, director of healthcare solutions at Steril-Aire. “Most hospitals have looked at maintaining acceptable environmental hygiene through historically good facility maintenance practices such as correct filtration, timely filter change-outs and more air change-outs per hour in critical care areas,” he says. “But even with these best practices, bacteria and fungi will proliferate in the HVAC system, making their way to critical care environments and eventually immunocompromised patients. UV light disrupts the DNA of the microorganism, taking away the ability for the organism to reproduce. If it can’t reproduce, it can’t build biofilm within the HVAC.”

Mr. Leach says hospital HVAC systems may be

the single largest reservoir of bacteria related to hospital-acquired infections. “In a study published in JAMA in 2009, the most problematic bacteria related to HAI are Pseudomonas and Staphylococcus. These microorganisms are the number one gram negative and gram positive bacteria, respectively, we identify from HVAC system cultures,” he says.



Tim Leach

While UV light systems are an effective long-term strategy for eliminating microorganism growth in HVACs, they do require maintenance, such as changing the light bulbs annually, according to Dr. Scheir.

Far-reaching benefits

UVC lights in hospitals’ air systems can greatly reduce hospital infection rates, improving patient safety and length of stay in addition to increasing reimbursement. “Attention needs to be drawn to the fact that the cost of hospital-acquired infection cases ranges into the millions, if not hundreds of millions of dollars per year, and they can be readily controlled by the proper application of UVC to the air handlers,” says Dr. Scheir.

In addition, ridding the AC coils of bacteria improves HVAC system efficiency, reducing energy costs and extending equipment life. Using the evidence-based design of high-output germicidal UVC at the coils, pathogenic and opportunistic bacteria can be eliminated, helping hospitals to deliver the highest quality patient care and satisfaction while meeting energy and sustainability initiatives. ■