White Paper

Three strategies for minimizing healthcare-acquired infection risks

Hospital life safety

One of the most significant challenges faced by the healthcare industry today is keeping patients, staff, and visitors safe from the risk of developing healthcare-associated infections (HAIs). Nationally, the HAI statistics are staggering.

According to the U.S. Centers for Disease Control, **nearly 700,000** people will develop HAIs each year. That is one in every 31 patients who will suffer an HAI during their stay – and **around 75,000** will die from that HAI.[1]

Among the deaths, close to 5,000 will be caused by exposure to contaminants released into the air during construction and maintenance-related activities.[2]

And according to research conducted by the Association for Professionals in Infection Control and Epidemiology (APIC), even the most routine activities could pose a risk.[3]

As leaders in the facilities management industry, we want to help minimize this risk.

We believe we can create safer healthcare environments by implementing the following three strategies, and we encourage professionals in both the healthcare and building management industries to join us in helping to provide healthy places and spaces for their people.

Strategy 1: Establish and follow best practice guidelines during construction-related activities
Strategy 2: Develop advanced technologies that allow for less disruption of healthcare spaces
Strategy 3: Pave the way for the standardized use of new technologies by adopting new code changes

1. Healthcare Associated Infections, Centers for Disease Control and Prevention, https://www.cdc.gov/hai/data/portal/index.html, Accessed March 11, 2020.
2. J Bartley, Hospital construction: Stirring up trouble, Engineered Systems, https://www.esmagazine.com/articles/92931-hospital-construction-stirring-up-trouble, Accessed March 11, 2020.
3. IC in Case Series: Construction and Renovation Risk Management, Infection Control Today® https://www.infectioncontroltoday.com/transmission-prevention/ic-care-series-construction-and-renovation-risk-management, Accessed March 11, 2020.
4. Current views of health care design and construction: practical implications for safer, cleaner environments, Bartley JM1, Olmsted RN, Haas, https://www.ncbi.nlm.nih.gov/pubmed/20569851, Accessed March 11, 2020.

Strategy 1: Establish and follow best practice guidelines during construction-related activities

Facility administrators must establish processes to adequately address HAI risks, and then actively monitor those processes to mitigate the risk of infection.

In healthcare environments, most documented processes are designed using an Infection Control Risk Assessment (ICRA).

The ICRA was originally developed as part of the Guidelines for Design and Construction of Hospital and Healthcare Facilities, 2010, formerly known as the AIA Guidelines. These guidelines "... represent minimum U.S. healthcare standards and provide guidance on best practices."

"They recognize that the built environment has a profound effect on health and the natural environment, and require that healthcare facilities be designed to 'first, do no harm.'"[4]

Today, the ICRA matrix is widely accepted by engineers and architects as an effective method for completing an ICRA at the start of a construction project.

Infection Control Risk Assessment

Construction project type				
Patient risk group	Type A	Type B	Type C	Type D
Low	I	II	II	III/IV
Medium	I	II	III	IV
High	I	II	III/IV	IV
Highest	II	II/IV	III/IV	IV

NYU Winthrop Hospital – Engineering Department – "Construction Process Policy" (2017) PDF file.

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that Class III or Class IV control procedures are necessary.

Infection Control Risk Assessment

While not required by law, we encourage the healthcare industry to follow best practices by completing the Infection Control Risk Assessment in advance of building work being carried out.

By making the matrix available to contractors, third-party workers can be reasonably expected to adhere to these very important precautions.

Construction project type		
	During construction project	Upon project completion
Class I	1. Execute work using methods that minimize dust being raised from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection.	1. Clean work area upon task completion.
Class II	1. Provide active means to prevent airborne dust from dispersing into the atmosphere. 2. Water-mist work surfaces to control dust while cutting. 3. Seal unused doors with duct tape. 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area. 6. Remove or isolate HVAC system in areas where work is being performed.	1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA-filtered vacuum before leaving work area. 4. Restore HVAC system where work was performed.
Class III	1. Remove or isolate HVAC system where work is being done to prevent contamination of duct system. 2. Complete all critical barriers – i.e. sheetrock, plywood, plastic – to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA-equipped air filtration units. 4. Contain construction waste before transport in tightly covered containers. 5. Cover transport receptacles or carts. Use a tape covering unless there is a solid lid.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention and Control Department and thoroughly cleaned by the owner's Environmental Services Department. 2. Remove barrier materials carefully to minimize spread of dirt and debris associated with construction. 3. Vacuum work area with HEPA-filtered vacuums. 4. Wet mop area with cleaner/disinfectant. 5. Restore HVAC system where work was performed.
Class IV	1. Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers – i.e. sheetrock, plywood, plastic – to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA-equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site – or they can wear cloth or paper coveralls that are removed each time they leave work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.	1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention and Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spread of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Use a tape covering unless there is a solid lid. 5. Vacuum work area with HEPA-filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Restore HVAC system where work was performed.

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Strategy 2: Develop advanced technologies that allow for less disruption of healthcare spaces

While developing processes to control contamination is a critical step toward minimizing risk and lessening exposure today, we believe a long-term, more preventive solution is of equal importance to the future.

"We are developing new technologies that allow us to be less disruptive in the healthcare space as we're installing new systems, conducting maintenance or replacing devices," said Fawn Staerkel, director of healthcare, Strategic Accounts, at Johnson Controls.

"That's where I think, as an industry, we can make a real difference in reducing the number of HAIs."

For example, much like the self-test functionality of addressable fire alarm systems that have been on the market for some time, advancements in technology now make it possible to virtually eliminate the need to regularly disrupt ceiling tiles to test smoke dampers to verify their proper operation.

Remote testing offers additional benefits that allow building professionals to:

- **Save testing time and effort.** To run a conventional damper test in an area where containment was necessary, an inspector would need to find the device, confirm its location by removing a ceiling tile, apply a zip-up containment from the ceiling to the ground with a ladder, test the device, replace the tile, and then remove the containment. The estimated time to test 25 devices is two to four hours. But remote testing dampers can be tested in just a fraction of that time.

- **Test more frequently.** The remote testing capability gives operators the option of testing more often than code requires, and exercising the devices regularly. "When these damper system louvers sit for long periods of time between mandated inspections, dirt, contamination, and oxidation can build up and cause them to malfunction," said Rodger Reiswig, Vice President, Industry Relations, at Johnson Controls. "With a traditional system, you're relying only on a periodic test – so you know it's working on those days, but what about all the days in between? You're hoping that the last test is indicative of what goes forward. But this provides an opportunity on a very regular basis to know it's working each and every day. And that should be a huge benefit for peace of mind."

- **Get real-time awareness of changes in damper status.** Damper failure can result in poor patient experiences (environments that are too hot or too cold) or poor air circulation that can lead to inefficiencies and increased costs. Remote testing technology is designed to alert facilities teams in the event of damper failure, so issues can be addressed before they become serious problems.

- **Create and maintain quality test documentation.** The self-testing capability virtually eliminates the risk of human error when recording and retrieving inspection results. Instead of an inspector physically 'checking a box' to show a unit is functioning properly, the test results are logged electronically in the control unit. From that control unit, facilities teams can easily run reports to comply with CMS (Centers for Medicare and Medicaid Services) and highly respected accreditation organizations such as The Joint Commission.

Strategy 3: Pave the way for standardized use of new technologies by adopting new code changes

In recognition of the benefits of this new damper technology, the National Fire Protection Association (NFPA) updated two standards in late 2019 to allow the use of remote testing smoke and combination smoke/fire dampers that virtually eliminate the need to regularly disrupt ceiling tiles.

- NFPA80 chapter 19.5.2 (19.5.2.3.3 Remote Inspection method)
- NFPA105 chapter 7.6.3 (7.6.3.3 Remote Inspection method)

While NFPA recognition of these new technologies is an important next step in our efforts to minimize HAI risks, it is now up to state and local governments to adopt the updated NFPA standards.

Until new local standards are established, Authorities Having Jurisdiction (AHJ) may make exceptions to existing codes and allow for the installation of self-testing dampers if it can be shown they are an alternative product that delivers equivalent performance.

But for now those decisions are being made on a case-by-case basis. By formally adopting the new NFPA standards, state and local officials can provide a clearer and wider path for the use of these technologies that have the potential to help save lives.

"We are always looking to better the codes to improve life safety and be more judicially responsible," said Rodger Reiswig of Johnson Controls, who is also a member of the NFPA Standards Council. "We want to fight things for the right reason. And this is one of those things. We're not just trying to sell a product and get it out there, we want to make sure that it's doing what needs to happen and helping the building owner with a problem they currently have."

According to Reiswig, not only will state and local adoption of the code changes pave the way for wider use of these new self-test technologies, the process itself will result in better-quality products and practices.

"With any new technology, it can be difficult for end users to be confident about what they're getting," he said. "A change in the code will lead to the development of guidance, benchmarks, and testing criteria for manufacturers, and give users confidence that the product functions according to the specification and meets the intended purpose.

"Plus, once the alternative product is in the code as an equivalent way of accomplishing the task, best practices can be established for its functionality. For example, does the electronic module need to be supervised? Does it need to backed up by batteries? When it doesn't detect a problem or doesn't detect it opened or closed properly, does it send a trouble signal to the central station to let the dispatcher know to call and send a technician now?

Does it need to send the information to some type of a log where I can run a report? What needs to be in that report? With guidance, benchmarks, and best practices, we can be confident that, as more of these technologies come on the market, they will perform as intended."

The next step: strategy implementation
While self-testing damper technology is in its infancy, we urge the healthcare and facilities management industries to consider its benefits, and join us in working toward the production of quality products that minimize HAI risk, as well as partnering to develop best practices guiding their use.

With our combined commitment to the following three strategies, we will be well on our way to reducing or eliminating the 5,000 HAIs each year that are linked to construction and maintenance activities.

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Join us in taking the next steps. We all have a role to play in minimizing HAI risk.

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