How Effectively Is Your Organization Leveraging Technology to Aid in Health Care Projects?
The Stakes are High When It Comes to Airflow

The risk of serious healthcare associated infections (HAIs) is increased in environments where airflow has not been optimized. Consider the statistics:

- The Centers for Disease Control and Prevention (CDC) has found that one in twenty patients will contract an HAI while receiving treatment in a healthcare facility.
- Experts estimate that 10% to 20% of HAIs are transmitted through airborne mechanisms.
- The impact of HAIs on patients can’t be understated. In 2002, CDC research found that 1.7 million patients acquired HAIs in U.S. hospitals and around 99,000 died from them.

The Benefits of Facility Airflow Modeling and Analysis

Including facility airflow modeling and analysis as an extension to design and engineering efforts can deliver important benefits to healthcare organizations.

- **Prevent the spread of airborne contaminants.** Air flow modeling and analysis identifies factors that affect transmission of airborne contaminants. Particular attention should be paid to designing airflow in ways that ensure sterile conditions at surgical sites. The goal is laminar, downward airflow to mitigate any recirculation around the patient.

Air flow modeling and analysis can also help organizations identify potential solutions, such as the number and location of HEPA filters, the layout of personnel and equipment within the room, and the location of low-wall returns. Low-wall returns, for example, can prevent “dead zones” and recirculation.

- **Optimize facility temperatures.** The temperature in healthcare facilities plays an important, but often overlooked role in patient recovery. Room temperature response is critical during the recovery process, especially for infants. Air flow modeling and analysis can highlight areas where the number or placement of low-wall returns could improve room temperature response. Environmental conditions, like temperature, also affect patient satisfaction.
When it comes to airflow in hospital and healthcare environments, settling for “good enough” can mean the difference between life and death for patients. Perhaps your organization simply assumes that your engineering firm is handling airflow modeling and analyses. It’s never safe to assume. Even if they are considering airflow modeling in their plans, it may not be enough to ensure patient safety. Standard airflow guidelines for operating rooms from organizations like the American Society for Healthcare Engineering and the American Society of Heating, Refrigerating, and Air Conditioning Engineers don’t always take airborne contaminant levels into consideration.

In addition to the patient impact, there are important business considerations related to facility airflow.

- **Healthcare associated infections pose reputational risks for organizations.** Today’s world is one dominated by social media and empowered consumers. If patients perceive that they have been subjected to unhygienic conditions, it could damage a hospital’s reputation for quality service.

- **High infection rates can affect accreditation.** The Joint Commission has implemented infection prevention and control standards that are evaluated during the accreditation process. Environment of Care standards focus on buildings, equipment, and people.

- **Infections can also directly affect the bottom line.** In 2008, Medicare ceased payment for treatments that resulted in certain hospital acquired infections. These include catheter-associated urinary tract infections, vascular catheter-associated infections, and surgical site infections following coronary artery bypass graft, bariatric surgery for obesity, certain orthopedic procedures, and implantation of cardiac electronic devices. In addition, patient distress about infections can influence HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) survey results, which directly tie to CMS (Centers for Medicare and Medicaid Services) reimbursements.

Facility air flow modeling, primarily with Computational Fluid Dynamics (CFD), is becoming a critical component of healthcare ventilation projects. As a result, there are organizations exclusively dedicated to providing this service as an extension of the engineering firm’s design team. The airflow insight produced from these analyses, along with the collaboration across all project stakeholders, ensures that the most effective decisions around equipment selection and design layout are made much earlier in the design process.

**Conclusion**

Air flow modeling and analysis is an essential part of the design process in healthcare ventilation projects. The proper airflow can mitigate secondary infections and improve patient outcomes. Healthcare organizations should never assume that their engineering firms will provide this level of analysis. Partnering with a qualified CFD consultant who will act as an extension of the overall project design team empowers healthcare facilities and their chosen engineering firm to ensure optimal airflow long before final construction documentation is created. This greatly enhances confidence in the chosen design strategy, mitigates the incidence of airborne HAIs, protects facilities’ reputations for quality patient service, and improves post-surgery recovery times.

**About Rand Simulation**

Rand Simulation is focused on helping organizations bring their product vision to reality through incorporating engineering simulation technology into the product development process. Rand Simulation caters to product development organizations looking to compress the design process, maximize innovation, strengthen competitive differentiation and grow bottom-line profitability. Rand Simulation serves as both a North American reseller of Ansys engineering simulation software and as a trusted design consultant offering insights gained on over 3,000 design projects using engineering analysis software to balance design performance with size, cost, DFM and aesthetics.