

Infection Control (Prevention) Risk Assessments: Across the Construction Continuum

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Introduction

Health care facilities continue to undergo transformation as service lines and patient populations change. Construction and renovation of facilities provide legal, regulatory, business and ethical responsibilities to design, construct, and maintain a safe environment for patients, their family, staff, and practitioners. The 2010 edition of the Facilities Guidelines Institute (FGI) "*Guidelines for the Design and Construction of Health care Facilities*" (Guidelines) was adopted by 42 states as well as The Joint Commission for construction guidance or standards. The Joint Commission is an accrediting organization that can provide deemed status for health care facilities receiving federal Medicare and Medicaid payments. This document provides guidelines for minimum standards for health care facility design and construction. Included in the updated Guidelines are recommendations for space requirements, accessibility, fire protection, medical gases, lighting, safe patient handling assessments and noise abatement as well as infection prevention practices, among others.

While an infection control risk assessment (ICRA) process has been considered standard practice in health care construction over the past decade in the 2001 and 2006 editions published by the American Institute of Architects, the 2010 Guidelines underscores the need for a multidisciplinary team including Infection Preventionists in the design phase as well as in the mitigation, construction and post construction phases.

Infection Prevention vs. Infection Control

Infection prevention is the discipline concerned with preventing nosocomial or health care-associated infection, a practical sub-discipline of epidemiology. It is an essential, though often under-recognized and under-supported, part of the infrastructure of health care. Infection prevention and hospital epidemiology are akin to public health, practiced within the confines of a particular health-care delivery system rather than directed at society as a whole.

Infection prevention addresses factors related to the spread of infections within the health-care setting (whether from patient-to-patient, from patients to staff, from staff to patients, or among staff), including prevention via hand hygiene/hand washing, cleaning/disinfection/sterilization, vaccination, and surveillance.

Infection control is the mitigation of a demonstrated or suspected spread of infection within a particular health-care setting through surveillance and outbreak investigation as well as management for the interruption of outbreaks. Within health care the common title being adopted is "Infection Prevention & Control."

The Centers for Disease Control and Prevention have linked numerous outbreaks of nosocomial infections in health care facilities to poor environmental design and breaks in infection prevention practices including environmental cleaning. The mission is to design and sustain the elements of good infection prevention practices over the service life of the newly constructed or renovated space.

Infection Control (Prevention) Risk Assessment (ICRA)

An ICRA is multidisciplinary, organizational, documented process that is developed after considering the facility's patient population and its program that focuses on reduction of risk from infection. It is intended to address issues and protocols throughout each of the phases of planning, design, construction, renovation, and facility maintenance. Participation is to include but not limited to: Infection Prevention, Administration, users of the area, Construction/Facilities Managers, Contractors, Architects and Finance.

The FGI Guidelines were developed by a consensus process similar to and the consensus standards approved by the American National Standards Institution (ANSI). It is intended to provide a set of minimum standards for the design and construction of new health care facilities. It is also for renovations which, in addition to the relevant NFPA 101 Code, identify the design principles that need to be incorporated. The Guidelines also include references to the need for conducting multiple infection control risk assessments throughout the process of planning, design, construction, and post construction phases of any new construction or renovation project. The need for multiple ICRA reviews stems from the different purposes for which an ICRA is to be used.

ICRA During Planning and Design

The planning phase requires a long-range view of the facilities potentially connected to the strategic plan for service line growth. This is a time to discuss uses for the new or renovated space in years to come. Planning for ventilation, hand hygiene, and durable finishes that will withstand hospital grade disinfectants for years to come play a key role in the design process. The Guidelines add new elements for finishes and surfaces which are a critical feature for infection prevention over the lifetime of the facility. Considerations for ventilation may include the number, location, and type of airborne infection isolation and protective environment rooms; the location of special ventilation and filtration such as in emergency department waiting and intake areas; air handling and ventilation needs in surgical services; laboratories; local exhaust systems for hazardous

agents; and other special areas. An ICRA is needed to plan and design water systems to limit *Legionella sp.* and other waterborne opportunistic pathogens as well as identify durable finishes and surfaces that are cleanable and do not support the growth or harboring of infectious agents. The location of hand-washing sinks, electronic sinks with emergency power, and integral back splashes and the location of hand sanitizers provide ready access to health care providers for the most important element of infection prevention: hand hygiene.

Planning can assist health care providers in having easy access to frequently used patient care items such as alcoves for linen carts and patient handling equipment. The Guidelines also include a discussion about the selection of washable non-cloth draperies for Airborne Isolation rooms for ease of cleaning.

ICRA During Construction

The traditional use of the ICRA has been during the construction phases. It identifies the building and site areas anticipated to be affected by construction. The ICRA includes consideration of the following:

- Impact of disrupting essential services to patients and employees.
- Determination of the specific hazards and protection levels for each level of risk.
- Location of patients by susceptibility to infection and definition of risks to each.
- Impact of potential outages or emergencies and protection of patients during planned or unplanned outages, movement of debris, traffic flow, cleanup, and testing and certification.
- Assessment of external as well as internal construction activities.
- Location of known hazards.

The ICRA during the construction phase is also infection control risk mitigation. Risk mitigation identifies the practices and procedure recommendations from the ICRA panel and should address the following:

- Patient placement and relocation.
- Standards for barriers and other protective measures required to protect adjacent areas and susceptible patients from airborne contaminants.
- Temporary provisions or phasing for construction or modification of heating, ventilating, air conditioning and water supply systems.
- Occupied facility protection from demolition debris and dust.
- Measures taken to train hospital staff, visitors, and construction personnel.

Interim Life Safety measures are often discussed at the same time.

ICRA for Monitoring

Finally, the ICRA panel must inspect the installation of infection control measures

and provide continuous monitoring of their effectiveness throughout the project. The monitoring may be conducted by in-house infection prevention and safety staff or by independent consultants. Provisions must contain written procedures for emergency suspension of work, indicating responsibilities of each party—owner, designer, constructor, and monitors.

Monitoring may also include air particulate monitoring with a laser particle counter. Particle counts act as a surrogate value for mold spores by counting dust particles greater than 0.5 microns per cubic meter in real time. Mold spores can be grown on agar plates but the time elapsed is usually more than 48 hours.

There are no standards for acceptable particle counts for construction and renovation in health care facilities. One reference that may be considered as guidelines for air particle monitoring is the International Organization for Standardization (ISO) 14644-1: 1999 “Clean Rooms and Associated Controlled Environments.” This standard has been referenced by the US Pharmacopeia 797 Guidebook to Pharmaceutical Compounding—Sterile Preparations and used for the preparation of sterile pharmaceutical products.

Protocols for particle count monitoring may thus be developed by each facility. It would be important to establish preconstruction baselines of the affected areas. It is good practice to determine baseline counts for non-affected areas as well. Once the baseline counts of the preconstruction area is determined, ongoing particle counts at >0.5 microns per cubic foot may supply data for the effectiveness of the barriers, cleaning, and maintenance of the occupied side of the construction/renovation area. It is suggested that outside air particulate counts also be included in the air-monitoring protocols, as high outside air particle counts will impact the amount of particles entering the facility on any given day.

ICRA for Post Construction and Commissioning

An ICRA review is needed at the close out of the project. It is used to identify the processes and assign responsibility for terminal cleaning by contractor/facility, criteria for removing barriers, air particulate monitoring in terminally cleaned space prior to occupancy, the need to flush new or existing waterlines/pipes, and the need to clean the heating and ventilation systems .

ICRA for Small Projects

The need for an ICRA for small projects is often overlooked. Small projects conducted “in-house” rather than through a full bid and design process usually includes renovations of occupied space. Difficulties can arise when no ICRA is performed; the work is done “off-hours” even though risk to patients is 24/7; and the use of barriers, containment, and negative pressure may take longer to set up

and monitor than just “getting the project done.” The mindset of these projects may directly conflict with the ongoing mission of infection prevention. Involving the Infection Prevention staff in all discussions about facility projects, regardless of their size, may prevent outbreaks that lead to loss of patient satisfaction and life.

Conclusion

The ICRA serves as a tool for infection prevention in the planning, design, construction and maintenance of the built environment. Its multiple uses will help ensure that patients are protected during the construction/renovation of the environment as well as that the built environment will support the mission of patient safety. While hand hygiene is the cornerstone, safety, cleanability of surfaces over time, convenient access, heating, ventilation and air conditioning (HVAC), and water systems identified in the infection prevention planning process play a vital role in protecting our patients and staff.

Bibliography

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