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Preventing infections

through the selection of hygienic floors + walls

AIA/CES + IIDA Program

CONTINUING EDUCATION AIA

Learning objectives

The dangers and costs associated with Healthcare Associated infections (HAIs).

The major superbugs and how infections are spread.

The role different types of surfaces play in infection and what makes some floors and walls more hygienic than others.

How the design team can help prevent infection by specifying floors and walls with hygienic attributes.

Healthcare associated infections (HAI’s)

Healthcare associated infections (HAI's)

- According to the CDC, Healthcare-associated infections (HAIs) are infections caused by a wide variety of common and unusual bacteria, fungi, and viruses during the course of receiving medical care.
- "What used to be referred to as 'hospital-acquired infections' is now called 'health-care-associated infections' to reflect the growing amount of care provided outside hospitals," Russell Olmsted, president of the Association for Professionals in Infection Control and Epidemiology and director of infection control and prevention for the St. Joseph Mercy Health System in Ann Arbor, Mich.*

*Rita Rubin: War on Hospital Infections Drags On. USA Today, page D4, September 20, 2011.

Healthcare associated infections (HAI's)

Statistics

- It's estimated that each year, two million people contract an infectious disease during in-patient treatment.
- Their mortality rate is 12%, more than 90,000 lives annually.*
- Between 5-10% of patients admitted in US hospitals acquire one or more infections there and the risks have steadily increased.*

*Burke, J.P., Infection Control: A Problem for Patient Safety. New England Journal of Medicine 2003; 348: 651-656

Healthcare associated infections (HAI's)

Statistics

HAI Estimates Occurring in US Acute Care Hospitals, 2011*

Major Site of Infection	Estimated No.
Pneumonia	157,500
Gastrointestinal Illness	123,100
Urinary Tract Infections	93,300
Primary Bloodstream Infections	71,900
Surgical site infections from any inpatient surgery	157,500
Other types of infections	118,500
Estimated total number of infections in hospitals	**721,800**

*Most recent data available.

Healthcare associated infections (HAI's)

The cost of HAI's

- A 2009 CDC report estimated that hospital costs for treating infections spread in healthcare settings was up to $45 billion per year.*
- One hospital study showed that each HAI resulted in a 19.7 day stay on average, generating more than $191,000 in extra treatment costs per patient.**
- Beginning in 2008, Medicare and private insurance no longer covered the costs of HAI, hospitals were now 100% responsible for these costs.

*Rita Rubin: War on Hospital Infections Drags On. USA Today, page D4, September 20, 2011.

**Hospital-acquired infections in Pennsylvania, 2007, the Pennsylvania Health Care Cost Containment Council.

The biggest threat:
Super bugs + spreading infections

Superbugs and spreading infections

Dr. Margaret Chan

Director General of WHO

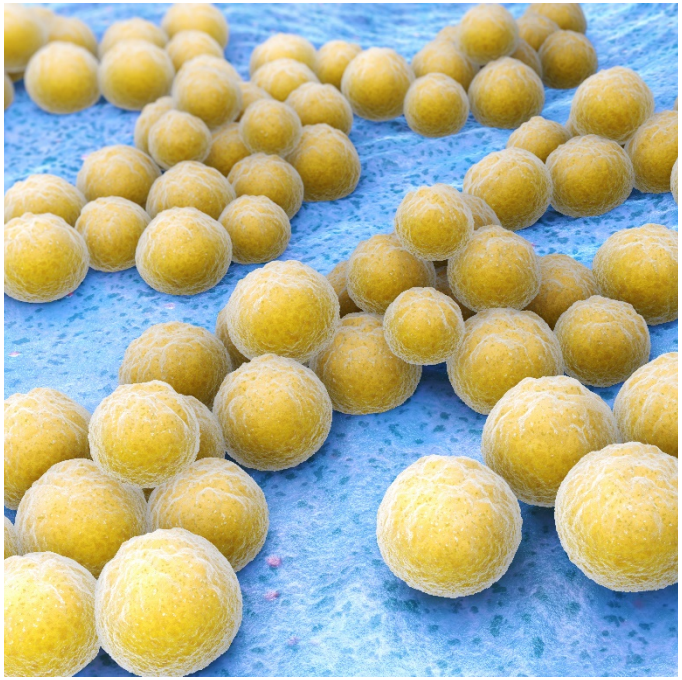
The world is entering an era where injuries as common as a child's scratched knee could kill, where patients entering hospital gamble with their lives and where routine operations such as a hip replacement become too dangerous to carry out, the head of the World Health Organization (WHO) has warned.

Superbugs and spreading infections

The superbugs

Methicillin-Resistant Staphylococcus Aureus(MRSA): This is a common bacterium which spreads through infection. MRSA is one of the most commonly spread infections during a person's hospital stay.

Vancomycin-Resistant Enterococci (VRE): This bacterium infects patient's urinal tract, intestine or blood streams. This type of infection often occurs when a person is hospitalized.

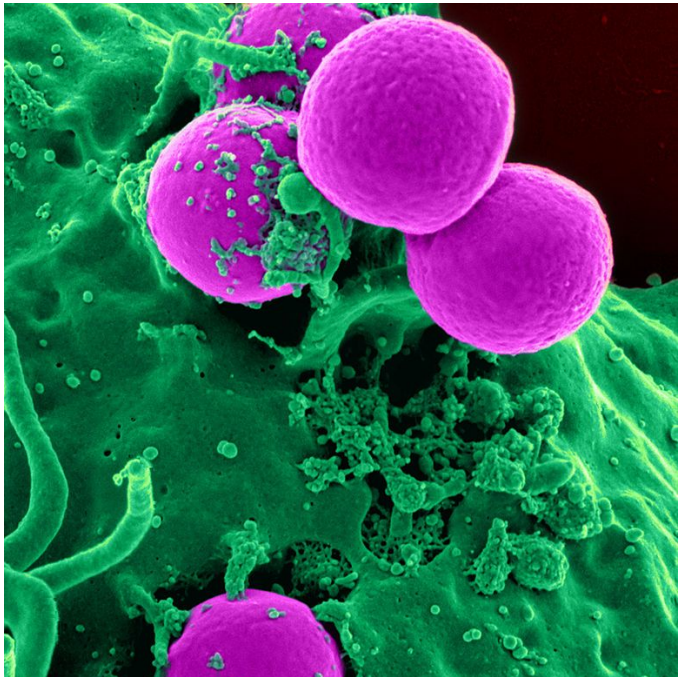


Super bugs and spreading infections

MRSA

Methicillin-Resistant Staphylococcus Aureus

Methicillin was invented in 1959 by Beecham to fight Gram-positive bacteria. It was quickly defeated by Staph and other Gram-positive bacteria.



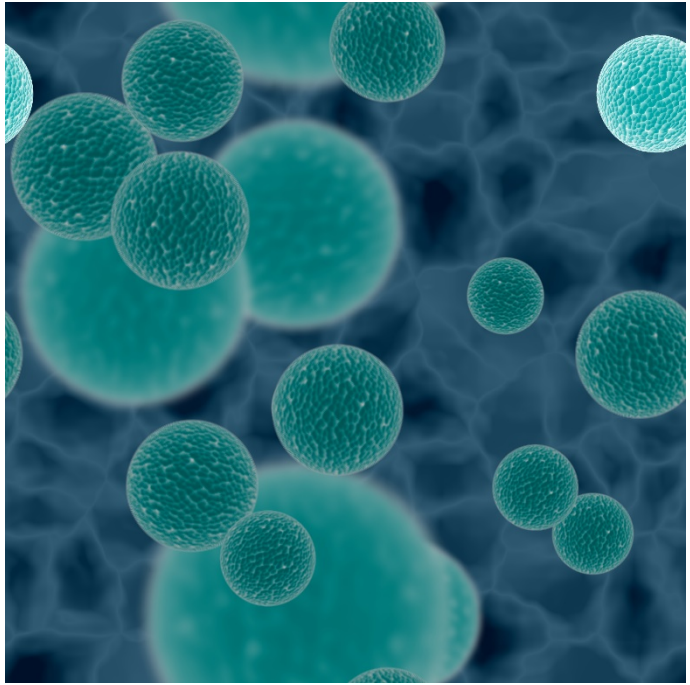
In the news – Daniel Fells stricken by MRSA

New York Giants tight end Daniel Fells developed MRSA infection following cortisone shot in ankle (10/14/2015)

- Shot was initially given to treat toe and ankle injury
- Week after treatment, appeared in emergency room with 104-degree fever
- Doctors determined MRSA infection developed in Fells' ankle and could potentially result in foot amputation

Superbugs and spreading infections

VRE



Vancomycin-Resistant Enterococci (VRE)

Vancomycin-Resistant Enterococci was isolated in 1953 by Eli Lilly from a soil sample found in Borneo by a missionary (two banded chlorine atom and is used intestinally).

Vancomycin was overtaken by VR(E) in 1955 with a case in England.

The battle continues…

Superbugs and spreading infections

CREs

A sharp jump in the number of rare but potentially deadly types of a superbug resistant to nearly all last-resort antibiotics called CREs, has prompted government health officials to renew warnings for U.S. hospitals, nursing homes and other health care settings.

— February 27th, 2013 NBC Report

Superbugs and spreading infections

CRE

Drug-resistant superbug

At least four cases of a potentially deadly superbug have been identified at another Los Angeles hospital — the second outbreak reported in the city in recent weeks.

Cedars-Sinai Medical Center said Wednesday that the patients were infected with the drug-resistant bacteria *Carbapenem-resistant Entrobacteriaceae*, or CRE, after undergoing procedures with contaminated medical scopes.

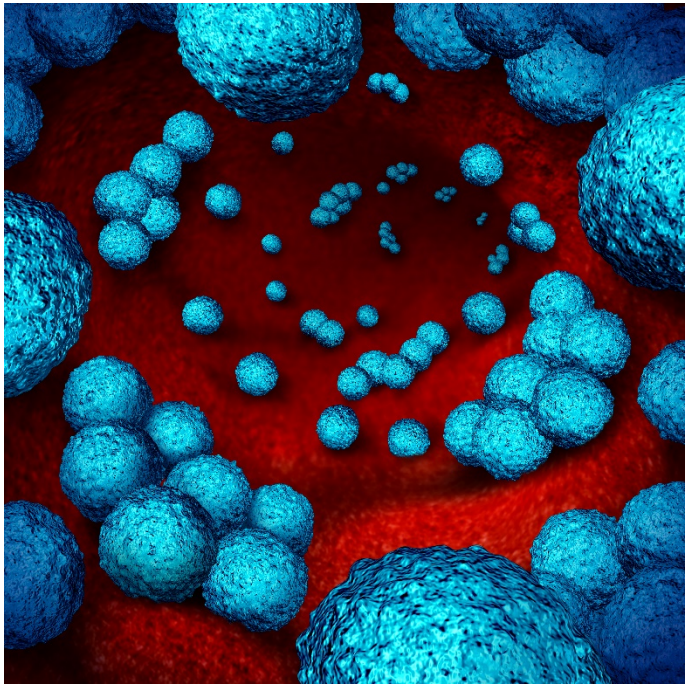
— March 4th, 2015 CBS News Report

Superbugs and spreading infections

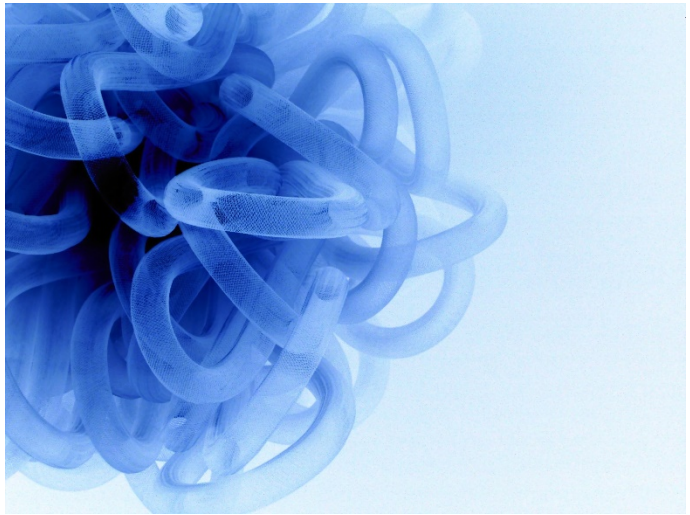
STAPH

Staphylococcus Aureus

S. Aureus (STAPH) has long been recognized as one of the most important bacteria that cause disease in humans. It is the leading cause of skin and soft tissue infections such as abscesses (boils), furuncles, and cellulitis. Although most staph infections are not serious, *S. aureus* can cause serious infections such as bloodstream infections, pneumonia, or bone and joint infections.



Superbugs and spreading infections



Infection of ESBL-producing bacteria

Spread through feces of an infected person ESBL-producing bacteria is also among the most common HAIs and are rapidly becoming resistant to commonly used antibiotics.

Pneumonia

Pneumonia, is one of the most common and dangerous HAIs. The combination of hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) constitutes the most common cause of death among all hospital-acquired infections, with mortality rates of up to 33% as of 2018.

Psuedomonas Aeruginosa

This is one of the most notorious pathogens which has developed resistance against most of the antibiotics used.

Superbugs and spreading infections

- Staphylococcus aureus, especially methicillin-resistant S. aureus (MRSA) infections, are a major cause of illness and death and impose serious economic costs on patients and hospitals.
- June 25, 2018 (HealthDay News) -- As many as 1.2 million U.S. hospital patients may be infected each year with a virulent staph infection (MRSA) that's resistant to antibiotics -- a rate almost 10 times greater than previous estimates.
- “According to the Centers for Disease Control and Prevention (CDC), MRSA infections are among the highest of all antibiotic-resistant threats. What’s more, treatment can last months and many times patients have to return after the initial discharge. For these reasons, MRSA care in the U.S. can cost up to $60,000 per patient and up to $9.7 billion annually.” – Infection Control Today

Superbugs and spreading infections

- On any given day, about one in 25 hospital patients has at least one healthcare-associated infection – CDC as of 2015
- In American hospitals, the Centers for Disease Control (CDC) estimates that HAIs account for an estimated 1.7 million infections and 99,000 associated deaths each year.

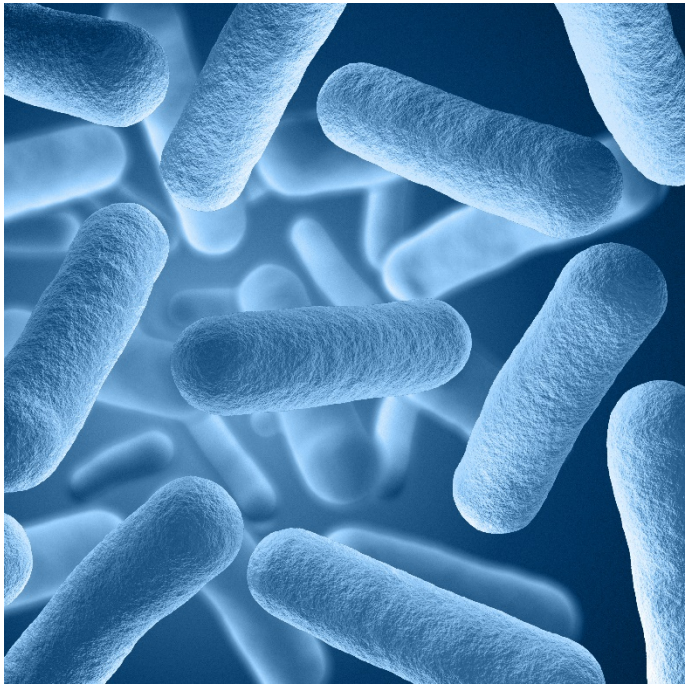
How interior surfaces impact infection control

Disease transmission and hygienic surfaces

Steps in disease transmission

To cause infection a pathogenic organism must:

1. Leave the original host
2. Survive transit to new host
3. Evade host's defenses
4. Multiply, invade tissue and cause damage



Disease transmission and hygienic surfaces

Sources of microbes in the environment

People

Via active infections, droplet nuclei

Above: Tuberculosis

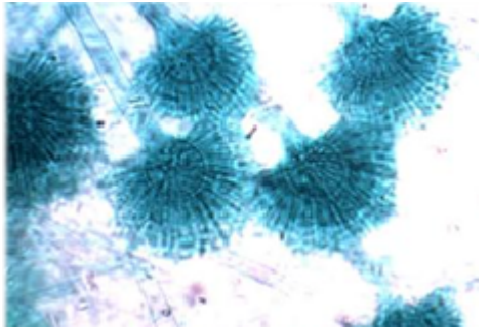
Airborne

Via ventilation/HVAC, humidifiers, showers/sprinklers

Above: Legionnaires

Surfaces

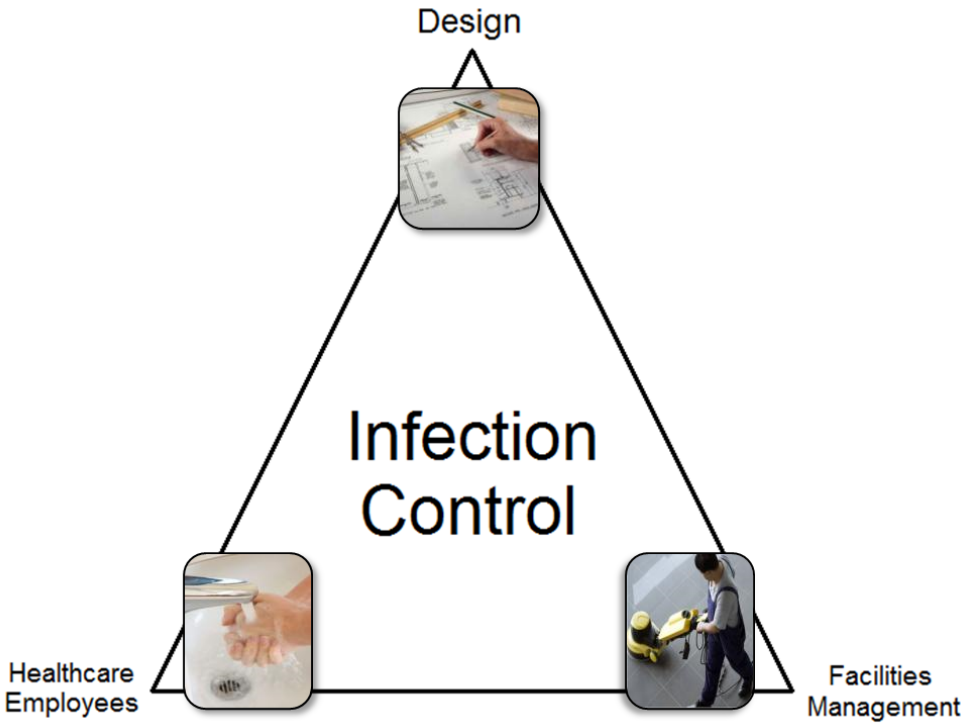
Via soil, dust, construction



Above: Mold

Disease transmission and hygienic surfaces

Infection control: A multi-facet approach



Disease transmission and hygienic surfaces

Sources of microbes in the environment

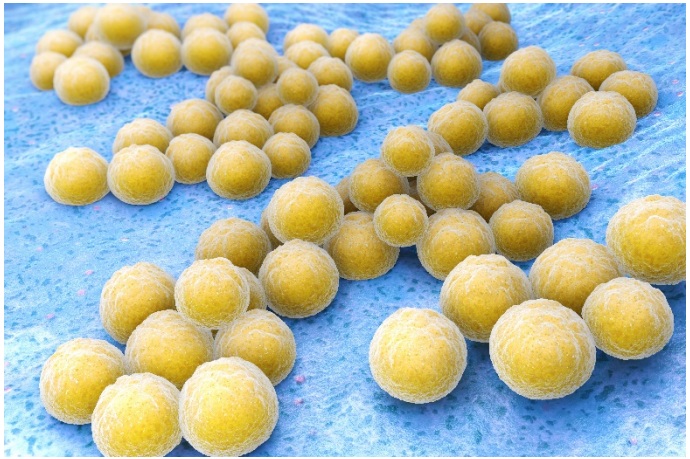
Surfaces are the one area where the Design Team can make a difference

- By selecting hygienic surfaces, the Design Team can help reduce survivability of pathogens and decrease the chances of patients coming into contact with bacteria.

Disease transmission and hygienic surfaces

Bacteria and microorganisms

- Learning how the Design Team can help infection control starts with understanding how bacteria & microorganisms survive and grow.
- By reducing the elements necessary for bacterial growth the more hygienic we make our environments.
- Survival rate of bacteria greatly depends on the environmental conditions.



Disease transmission and hygienic surfaces

Survival duration of bacteria on surfaces

Bacterium:	Duration:
Clostridium difficile (spores)	5 months
Escherichia coli	1.5 hours — 16 months
VRE and VSE	5 days — 4 months
Haemophilius influenza	12 days
Staphylococcus aureas, including MRSA	7 days — 7 months

Disease transmission and hygienic surfaces

Dying or thriving

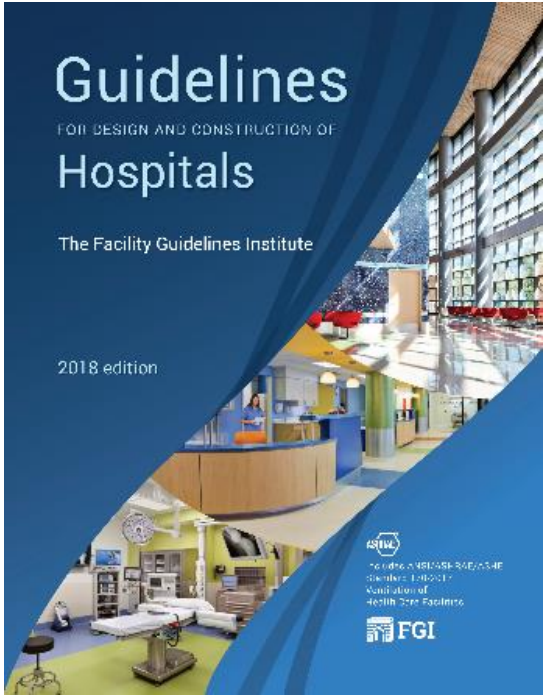
Facts about bacteria

- Bacteria are roughly 80-90% water.
- Bacteria require moisture to grow because they obtain most of their nutrients from their aqueous environment.
- Bacteria colonies do not remain a constant population, they are either dying or thriving.
- Eliminate moisture - eliminate bacteria breeding grounds.

Important considerations when specifying hygienic finishes

Selecting hygienic finishes

FGI guidelines



The 2018 AIA Healthcare Guidelines (FGI) states

- **Surfaces should be seamless**
- **Surfaces should be free from crack, gaps or fissures**
- **Surfaces must be non-absorbent, nonporous and smooth**
- **Surfaces must be cleanable**
- **Surfaces must be water resistant**
- **Areas subject to wet cleaning must have heat-welded seams and flash coved flooring**

Selecting hygienic finishes

Selecting non-porous surfaces

- The CDC recommends **avoiding the use of carpet** in high traffic zones, in patient-care areas, or where spills are likely (operating rooms, laboratories, intensive care rooms).*
- Floor and wall surfaces should be waterproof and non-porous.

*Guidelines for Environmental Infection Control in Health-Care Facilities – CDC, 2003. – (current version as of 2018)

Selecting hygienic finishes

Cleaning

- Surfaces must be able to withstand the cleaning regimes of the facility in which they are installed.
- For major spills of blood or bodily fluids bleach is often recommended, with a 1:10 dilution rate for the first application of germicide before cleaning. Materials installed should be highly resistant to these concentrations of bleach and/or other chemicals used by the hospital.
- Regardless of which floor or wall material is used, it is important that any disinfectant not be left to dry on the floor, this can damage the physical properties of the product

Selecting hygienic finishes

Hand washing stations

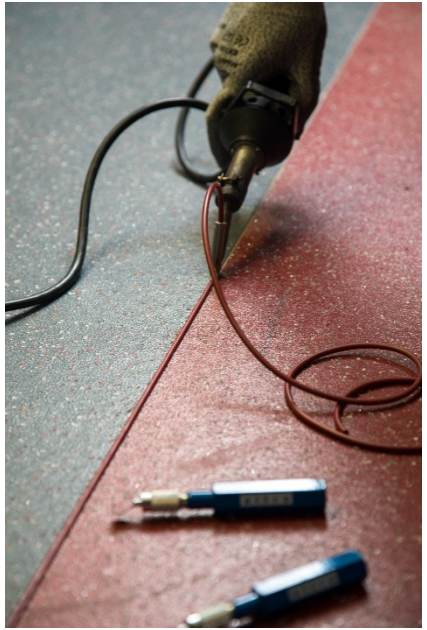
- Proper cleaning is paramount in healthcare. Simply attaching hand sanitizer dispensers to the walls outside patients' rooms and implementing a few low-cost preventive measures shortened hospital stays more than two days on average, reduced hospitalization costs by more than $12,000 per case and cut death rates by 2.3%*.
- For hygienic reasons, modern models do not have a drip tray. This means dripping now ends up on the flooring or carpet
- As the cleaning methods and chemicals are likely to change, surfaces should have good stain and chemical resistance, particularly in the vicinity of hand washing stations.

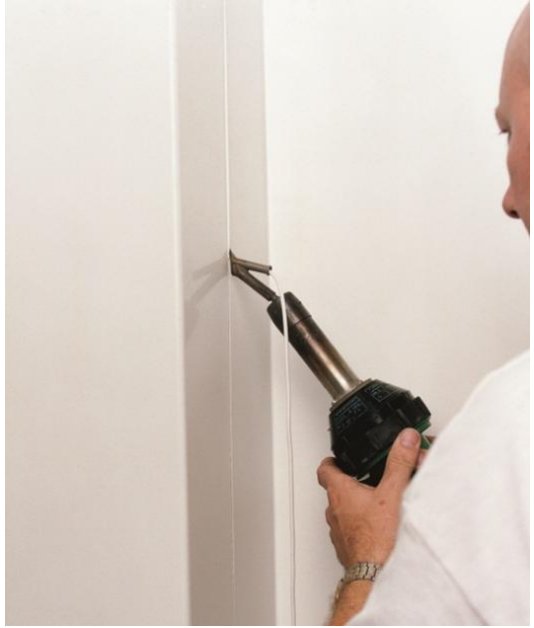
*Rita Rubin: War on Hospital Infections Drags On. USA Today, page D4, September 20, 2011.

Selecting hygienic finishes

Hygienic seams

- A very sanitary way to join materials is to join them together via a heat weld.
- The process of heat welding presses the molten weld rod (usually made out of plastic) into the grooves of the material fusing the material together.
- This creates a water tighter joint and prevents moisture ingress.





Selecting hygienic finishes

Seamless floor to wall transitions

- The transition between floor and wall must also be sanitary to create a hygienic envelope.
- The transition must be watertight and seamless.
- We recommend the overlap transition for most applications.
- Heat welding the transition between floor and wall is also acceptable.

Selecting hygienic finishes

Checklist

Floors

Non-porous
Water resistant
Commercial grade
High PSI
Heat-welded seams
Flexible
Able to flash cove
Stain and chemical resistant
Long warranties

Walls

Non-porous
Water resistant
Commercial grade
High impact resistance
Non-porous seams
Stain and chemical resistant
Long warranties

Examples of unhygienic finishes

Don’t let your project look like this!

- Bacteria harboring joints
- Unpleasant, stained appearance
- Open system (not encapsulated)
- Cannot be washed thoroughly
- No longer water-resistant

Examples of unhygienic finishes

Don’t let your project look like this!

- Split seams
- Open system (not encapsulated)
- Bacteria thriving environment
- Cannot be washed thoroughly
- No longer water-resistant
- Sharp, protruding edges

Examples of unhygienic finishes

Don’t let your project look like this!

- Not a seamless floor to wall transition
- Bacteria thriving environment
- Open system (not encapsulated)
- Unpleasant, stained appearance
- Mold penetration
- Cannot be washed thoroughly
- No longer water-resistant

By creating a seamless, water-tight environment from floor to ceiling, the Design Team can help minimize the areas that promote bacterial growth.

Summary

HAI's (Healthcare-Acquired Infections) are contracted during the course of receiving medical care and are the 6th leading cause of death nationally, with high mortality rates and risk of contraction steadily rising.

Choosing hygienic surfaces allows teams to reduce the chance of patients coming into contact with pathogens and bacteria.

Choose surfaces that are watertight and non-porous to eliminate bacteria breeding grounds, as well as those that are durable, stain and chemical resistant, and cared for with a proper cleaning regimen.

Design teams can help control and prevent infection by understanding how bacteria grow and thrive!

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Thank you!