



Module 9: Healthcare- Associated Infections Across the Spectrum of Care

Part 1: Background and Definition of Healthcare-Associated Infections

Susan: Hi. My name is Susan Coffin, and I'm here today to talk to you about healthcare-associated infections occurring across the entire spectrum of healthcare delivery.

The Healthy People goal for 2020 is to actually prevent, reduce, and ultimately eliminate healthcare-associated infections. That's a tall order. For today, our objectives are to understand the burden and nature of healthcare-associated infections across the spectrum of care and to also talk about prevention strategies that are effective across this entire spectrum of care.

To do this, what we're going to try and tackle is review the epidemiology associated with the most common hospital-associated infections, look at the causes of healthcare-associated infections in long-term care facilities, and then, finally, talk about risks for healthcare-associated infections in ambulatory care settings.

To start off, let's talk about the burden and nature of healthcare-associated infections across the spectrum of care.

To start with, we should probably define what actually is a healthcare-associated infection. A definition that I and many people use is that a healthcare-associated infection is an infection that is neither present nor incubating at the time a patient is either hospitalized or seeks care in a facility.

Most commonly, the healthcare-associated infections that are focused on are associated with medical devices or invasive procedures. However, it's really underappreciated just what a large burden of morbidity as well as occasional mortality healthcare-associated infections can cause in people who are seeking care outside of acute care hospitals.

Using data back from 2002, we know a few things. First, back then, the rate of healthcare-associated infections exceeded 1.7 million events per year in the U.S. There was almost 100,000 attributable deaths due to healthcare-associated infections, and 1 out of 20 patients who were hospitalized in the U.S. would develop a healthcare-associated infection.

Healthcare-associated infections are a huge driver of healthcare costs. The attributable costs for each infection is estimated to be, using 2009 dollars, \$26,000. Additionally, the total annual direct costs associated with healthcare-associated infections ranges from \$35 billion to \$45 billion.

Worldwide, the burden of healthcare-associated infections is even greater. If you take a look across all parts of the developing and developed world, it's estimated that somewhere on the



order of one out of every five to ten hospitalized patients will develop a healthcare-associated infection.

To think about healthcare-associated infections and how to prevent them, we need to go back to first basic principles. How exactly are infections caused, and how do they develop in susceptible patients?

To begin with, we talk about what is the causative agent. Then, we need to consider what is the reservoir for that agent. How does it get out of its reservoir, get delivered to, and then actually enter a susceptible host?

If you think about a disease such as influenza, we can walk through this mechanism. Influenza might have as its reservoir a sick child who is going to visit their aging grandparent in a long-term care facility. That child might accidentally cough or sneeze, thus dispelling in their respiratory secretions the virus. That virus could then be transmitted through respiratory droplets and actually enter the susceptible host, their aging grandparent, through the respiratory mucosa lining the nose and mouth, thus setting the stage for that elderly adult to get an influenza infection while in a healthcare setting.

There's some fundamental factors which drive the epidemiology of healthcare-associated infections in just about any setting. First are patient-related factors. Patients who are most at risk for healthcare-associated infections are those at the extremes of age, the very young and the aged, patients who have immunocompromising conditions either because of an underlying disease such as cancer or because of medications they're taking such as steroids, and finally, a patient's other comorbid conditions, whether or not they have heart disease, whether or not they have lung disease, also influence their risk of developing a healthcare-associated infection.

The care setting matters a lot. It influences the nature of healthcare-associated infections that patients get, and it also influences the risk. Intensive care units, dialysis centers, outpatient oncology clinics, and emergency room settings all carry unique risks of healthcare-associated infections.

Medical devices, as we've mentioned, as well as invasive procedures also confer significant risks of healthcare-associated infections, and that's true whether we're talking about elective surgical procedures, patients who are getting prosthetic joints or other prosthetic materials placed, or perhaps a vascular catheter to deliver medication or fluids.

Finally, the specific processes of care, what actually is happening in the clinical care setting, makes a huge difference in a patient's risk of developing a healthcare-associated infection; whether or not hand hygiene is being done consistently and appropriately, how clean is the patient's environment and how free of contaminating organisms, and then also risks such as how adequately have medical devices which might be used in the process of care actually have been disinfected between use.



These really summarize large groups of major risks that patients in healthcare settings experience when they're receiving healthcare.

We've talked a little bit already about what are the risks of healthcare-associated infections, but I think most importantly for today, we need to consider what do we know about how to prevent them.

We now have numerous different evidence-based guidelines which can help drive clinical care and ensure that we minimize the risk of healthcare-associated infections in a large number of settings. In 2011, it was estimated that somewhere on the order of two-thirds to three-quarters of all healthcare-associated infections could be prevented just by consistent application of current knowledge.

Below, you can see a roadmap which HHS developed in 2011 targeting specific healthcare-associated infections that they wanted to see eliminated, with five-year targets of performance.

Some of these targets are very aggressive. However, if you now look over here on the right-hand side, you can see that we're doing some really impressive work. Already, one target has been retired, and that's adherence to central-line insertion practices. There are other targets where we feel like we're well on the way to meet our goals, such as reducing the frequency of bloodstream infections and urinary tract infections.

However, we don't feel that we're necessarily on the way to achieving our goals for other healthcare-associated infections, such as infections caused by *Clostridium difficile*, so much work remains to be done.

Strategies to prevent healthcare-associated infections often can be categorized into basic principles, and these are the principles that I like to think of when talking about how to prevent infection transmission in a healthcare setting.

First, I think we need to consider interventions which will prevent transmission from other patients and staff to the index patient. Next, we need to think about how we can minimize risk by reducing exposure, whether to medical devices or invasive procedures, and then also to prevent microbial contamination or invasion.

To prevent transmission from patients and staff, hand hygiene and appropriate adherence to respiratory etiquette are huge ways that we can reduce the risk of transmitting infections and potential pathogenic organisms to our patients.

Minimizing exposure to medical devices or procedures that break mucosal barriers or the skin also will reduce risk of invasive infection.



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Finally, 80% of all healthcare-associated infections arise from the patient's own flora, so minimizing the contamination of medical devices and the colonization of pathogenic organisms of a patient's mucosal surfaces and skin can benefit a patient.

There are a lot of challenges to preventing healthcare-associated infections. While it may sound simple, we've proven to ourselves time and time again it is actually much more difficult than it would appear.

Healthcare-associated infections are perceived by many people as being part of the cost of giving advanced healthcare. The healthcare we give is very complex, and it carries with it many risks.

Another huge challenge is that prevention is invisible, and our successes are invisible. In addition, we often talk about success in terms of rates and reduction in numbers rather than in improved outcomes for individual patients.

Behavioral change, whether we're talking about preventing healthcare-associated infections or other public health interventions, are hugely difficult, and even if we're able to achieve them, incredibly difficult to sustain improvements.

Finally, in healthcare settings, whether we're talking about acute care settings or long-term care facilities, to maximize our prevention efforts we often need to bring together groups of people that don't always work together. It's through this cooperation between doctors and nurses and environmental service workers and other groups that we can maximize our ability to prevent healthcare infections.