



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

### Part 2: Epidemiology of Hospital-Associated Infections

Susan: Next what we'll do is review the epidemiology of some of the most common hospital-associated infections.

80% of all infections that happen in the acute care hospital seem to fall into one of four categories: bloodstream infections related to central lines, often called CLABSI; ventilator-associated pneumonias and catheter-associated urinary tract infections, all of which are obviously related to the use of medical devices; and the fourth most common type of healthcare-associated infections are surgical site infections, infections of the surgical wound after a surgical procedure has been performed.

Mechanisms by which these three device-associated infections occur actually are somewhat similar. Some of the themes that seem to span the occurrence of all three of these infections are:

Contamination of the medical device, either at the time it is inserted or during its use. This is captured on the slide here where you can see central line-associated bloodstream infections seem to arise due to defects in care during catheter insertion or when a dressing is being changed or when a catheter is being accessed.

Ventilator-associated pneumonias will often arise, again, when an endotracheal tube is being placed or if the ventilator circuit has been contaminated. Finally, aspiration of either oral or gastric secretions can inoculate the lower respiratory tract and lead to a ventilator-associated pneumonia.

And then finally, for catheter-associated urinary tract infections, bacteria can be introduced into the bladder during the process of catheter insertion, during the time that a catheter is in place if bacteria are allowed to basically migrate from the outside up through the catheter wall into the bladder, or if contaminated urine is accidentally allowed to reflux back from a reservoir bag into the bladder.

These mechanisms of infection can guide us to think about what are the most common organisms which cause these infections? For catheter-related urinary tract infections, enteric organisms are the most common. Ventilator-associated pneumonias are often caused by oral flora, whereas catheter-associated bloodstream infections are frequently caused by organisms that reside on the skin.



We've already talked about some of the common types of strategies we can use to prevent healthcare-associated infections, and on this slide, we can look at what are the specific actions which we can employ to prevent the three device-associated infections.

You can see first that to prevent transmission of infection from patients and staff, a huge intervention and a classic intervention that's important across all types of care, is hand hygiene.

Reducing exposure can be accomplished by minimizing the frequency with which we use central devices such as central lines or urinary catheters, or to consider daily systematic review of whether or not central lines, endotracheal tubes or urinary catheters are still needed.

Finally, different interventions can be used to minimize the contamination of the medical device during its dwell time, during the time the patient does require it. Patients can have less risk if we access central lines in a very aseptic fashion and minimize the frequency with which we actually do access them. Ventilator-associated pneumonias can be prevented by keeping the patient's mouth as clean as possible, performing frequent oral care and reducing the burden of oral bacteria. And then finally, catheter-associated urinary tract infections can also be prevented by close attention to basic hygiene at the site where the catheter is inserted.

So, what kind of impact can we have if we apply these different preventive actions? Well, actually, the impact is really quite significant. It's estimated that through the systematic and very consistent application of all of our current knowledge about how to prevent catheter-associated bloodstream infections and urinary tract infections, we can prevent somewhere on the order of 65% to 75% of them. A huge improvement.

The ability to prevent infections also results in approximately a 55% reduction in the risk of ventilator-associated pneumonia. Again, a huge reduction in the frequency of this event and also a large improvement in patient outcomes.

So as we think about all of these different interventions, how can we order them? Where should our priorities lie? Well, in device-associated infections, probably the most impactful intervention would be not to use them; find alternatives to their use. Second would be to remove them as soon as possible; don't leave a vascular catheter or a urinary catheter in any longer than is actually needed. All medical devices need to be inserted in an aseptic fashion, and then maintained in an aseptic fashion so we don't contaminate them.

Then finally, there are new technologies and devices which are becoming available which lessen the risk of infection, largely through the use of antibiotic or antiseptic compounds applied to a medical device. These new devices tend to be quite expensive, and really, most individuals only think these should be applied if the rate of infection remains quite high despite full adoption of all of the other interventions.