An Overview of Healthcare Associated Infections and Their Impact

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Healthcare associated infections (HAI) are defined as infections which are not initially present or incubating when healthcare is initiated but subsequently develop in relation to the healthcare "exposure". There is a broad spectrum of types of HAI and severity. For example, HAI include the occurrence of an upper respiratory tract infection in the days after having a routine visit at a doctor's office. Due to their impact on patient morbidity and mortality and their reflection on the safety of care received, HAI related to surgeries and hospital care receive most of the attention. These HAI include surgical site infections, infections related to medical devices (e.g., central line associated bloodstream infections, catheter related urinary tract infections, ventilator associated pneumonia) and *Clostridioides difficile* (*C. diff*) infections.

Surveillance for these infections by the US Centers for Disease Control and Prevention (CDC) has estimated that 3.2% of patients hospitalized in the US are impacted by HAI and while this has decreased from 4.0% a decade ago, CDC estimates that in 2015, 687,200 persons hospitalized in the US experienced 721,800 HAI. HAI are well known to lead to greater hospital lengths of stay for patients. This increased duration of hospitalization and risk for mortality are correlated with both the type of HAI and its severity. The cost of HAI impacting hospitalized patients is estimated to be over $35 billion US annually.

A multitude of factors impact an individual's risk to develop a HAI. While many HAI are caused by microbial pathogens which are part of an individual patient's microbiome, microbes contaminating the healthcare environment pose a significant risk. These potential pathogens can either directly cause a HAI or become, at least temporarily, part of the patient's microbiome and lead to an infection at a later date. As resistance to antibiotics and the failure of the market to develop new antibiotics worsens, the risk for more difficult to treat, and potentially more deadly, HAI grows.

While the proportion of HAI related to microbial contamination in the healthcare environment is unclear, it is well established that a significant proportion of HAI may result from this contamination. Effective environmental cleaning of the healthcare environment is challenging and costly. The effective implementation of ultraviolet and other germicidal light shows significant promise to support the elimination of HAI.