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One in three patients with bloodstream infections given inappropriate therapy

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Growing drug resistance, a high prevalence of *S. aureus* bacteria and ineffective antibiotics prescribed to one in three patients are among the challenges facing community hospitals in treating patients with serious bloodstream infections, according to researchers at Duke Medicine.

The findings, published March 18, 2014, in the journal *PLOS ONE*, provide the most comprehensive look at bloodstream infections in community hospitals to date. While the majority of people in need of medical care go to community hospitals, much of the existing research on bloodstream infections focuses on tertiary care centers, or hospitals offering highly specialized care.

"Our study provides a much-needed update on what we're seeing in community hospitals, and ultimately, we're finding similar types of infections in these hospitals as in tertiary care centers," said Deverick Anderson, M.D., MPH, associate professor of medicine at Duke and the study's lead author. "It's a challenge to identify bloodstream infections and treat them quickly and appropriately, but this study shows that there is room for improvement in both kinds of hospital settings."

Bloodstream infections are a leading cause of suffering and death in the United States. As many as 250,000 bloodstream infections occur each year and can cost up to $37,000 per patient. Some bacteria that cause these infections have adapted to the antibiotics designed to kill them, leaving the drugs less effective. These drug-resistant bacteria, or "superbugs," can be difficult to effectively treat.

To better understand the types of bloodstream infections found in community hospitals, and the risk factors that lead to infection, Anderson and his colleagues collected information on patients seen at community hospitals in Virginia and North Carolina from 2003 to 2006. They focused on 1,470 patients identified as having bloodstream infections.

The bloodstream infections were classified depending on where and when they were contracted. Infections resulting from prior hospitalization, surgery, invasive devices including catheters or living in long-term care facilities were designated as healthcare-associated infections. Community-acquired infections were contracted outside of medical settings or shortly after being admitted to a hospital, while hospital-onset infections occurred after being in a hospital for several days.

The researchers found that 56 percent of bloodstream infections were healthcare-associated but symptoms began prior to being admitted to the hospital. Community-acquired infections unrelated to medical care were seen in 29 percent of patients, while 15 percent had hospital-onset, healthcare-associated infections.

S. aureus was the most common pathogen, causing 28 percent of bloodstream infections, closely followed by *E. coli*, which was found in 24 percent of patients with infections.

Bloodstream infections due to multidrug-resistant pathogens occurred in 23 percent of patients – an increase over earlier studies – and methicillin-resistant *S. aureus* (MRSA) was the most common multidrug-resistant pathogen.

"Similar patterns of pathogens and drug resistance have been observed in tertiary care centers, suggesting that bloodstream infections in

community hospitals aren't that different from tertiary care centers," Anderson said. "There's a misconception that community hospitals don't have to deal with *S. aureus* and MRSA, but our findings dispel that myth, since community hospitals also see these serious infections."

The researchers also found that approximately 38 percent of patients with bloodstream infections received inappropriate empiric antimicrobial therapy, or were not initially prescribed an antibiotic that was effective against the infection while the cause of infection was still unknown. Certain groups of people were more likely to receive inappropriate therapy, including patients who were in the hospital or a nursing home within the past year, as well as those with impaired function and/or multidrug-resistant pathogens.

Anderson recommended that clinicians in community hospitals focus on these risk factors when choosing antibiotic therapy for patients with bloodstream infections. He noted that most risk factors for receiving inappropriate therapy are already recorded in electronic health records.

"Developing an intervention where electronic records automatically alert clinicians to these risk factors when they're choosing antibiotics could help reduce the problem," Anderson said. "This is just a place to start, but it's an example of an area where we could improve how we treat patients with bloodstream infections."

Provided by Duke University Medical Center