FACULTY OF MEDICINE AND HEALTH SCIENCES

Hospital-acquired bloodstream infections: bridging epidemiology and prevention

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Dissertation submitted to obtain the degree of 'Doctor in Medicine' in academic year 2019-2020

GHENT UNIVERSITY

Summary

Hospitalised patients are at risk of developing infections during their admission. Patients in intensive care units (ICU) are particularly vulnerable due to underlying illness severity, comorbidities and use of invasive devices such as central venous catheters (CVC), intubation or urinary catheterisation. These infections can lead to bloodstream infection which is diagnosed by blood cultures (HABSI: hospital-acquired bloodstream infection). These invasive infections are associated with increased length of stay, hospital costs, morbidity and mortality. Because of their widespread prevalence and preventable nature, identifying this burden of disease is necessary to introduce preventive measures and improve public health. This doctorate aims to describe infection epidemiology and prevention to bridge the gap between the two disciplines.

Part one describes HABSI epidemiology based on the Sciensano surveillance system (2000–2014). Although the total HABSI incidence rate was stable, the proportion of bacteria with higher risk of mortality increased over time. Although it is the most preventable HABSI, the rate of central venous line-associated bloodstream infections (CLABSI) did not decrease over the years. Seasonal changes were identified with summer increases for gram-negative HABSI, CLABSI and urinary tract HABSI. The incidence of gram-negative bacteria was positively associated with higher outside-hospital temperature, including differences between warm and cold summers. The

Part two describes the current evidence for interventions to prevent HABSI and CLABSI in the ICU. Daily patient bathing with 2% chlorhexidine-impregnated washcloths reduced HABSI primarily due to prevention of CLABSI. Quality improvement interventions, which promote adherence to aseptic CVC insertion and maintenance, were shown to prevent CLABSI. Trials applying a CVC care bundle or checklist demonstrated stronger CLABSI incidence rate decreases. However, this impact became non-significant after the third month, indicating the presence of an observer bias (Hawthorne effect). Personnel's adherence first increases as a response to being observed, but this novel behavioural effect lowers over time. This emphasises the need for a cyclical quality improvement strategy to prevent infections.

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Future steps include automating data collection and registration that allows comparisons across hospitals. Hospital benchmarking identifies areas for improvement, which can be addressed through evidence-based infection prevention initiatives within the context of a cyclical quality improvement strategy. Understanding which interventions will be beneficial, and their final impact on the infection rate, requires the implementation of a surveillance system. In this way a bridge is formed between the disciplines of infection epidemiology and prevention to improve the safety of hospitalised patients.

Curriculum vitae

After obtaining his medical degree in 2015, Koen Blot finished his specialisation in general internal medicine in 2020 at Ghent University Hospital. He is currently working at Sciensano coordinating the research and surveillance of COVID-19 infections among hospitalised patients across Belgium.

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Financing

No financing obtained.

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