Central Line-Associated Bloodstream Infections and Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infections: Results from a Quality-Improvement Project in a Hematology-Oncology Unit

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**FGR Standardized Infection Ratio (SIR) for non-MBI and BMI-CLABSI 2015 to 2017**

Introduction

Bloodstream infection, including central line-associated bloodstream infection (CLABSI) and mucosal barrier injury laboratory-confirmed bloodstream infection (MBI-LCBI), is a severe, potentially life-threatening infectious complication in immunocompromised patients.

Rates of CLABSI and MBI-LCBI in a hematology-oncology unit (FGR) at an academic medical center started climbing in April 2016.

A comprehensive multidisciplinary approach was implemented to mitigate the risk. These resulted in the decline of the rates of both CLABSI and MBI-LCBI.

Methods

CLABSI and MBI-LCBI cases were defined based on the NHSN’s definitions. A Deep Dive, root cause analysis, and self-assessment survey were conducted to identify potential practice deficiencies. Intervention strategies included:

- Increasing audit counts for hand hygiene and CVC maintenance (>30 audits/month with a compliance rate >95%).
- Stabilizing compliance rates of saline oral care (>95%).
- Daily bathing with 4% chlorhexidine gluconate (CHG).
- Change to Mayo stand for dressing change to avoid using patient’s own bed table.
- Central line dressing change training and blood culture collection training.
- Standardizing environmental cleaning/disinfection practice.
- Infection control rounds and GAP analysis with nursing leadership.

Results

From January 2015 to March 2016 (historic data “baseline”), the rate was 1.57 per 1000 line-days. From April to December 2016 (cluster/intervention period), the rate was 4.12 per 1000 line-days. This constitutes a 162% increase in CLABSI rate (p=0.0009) (Cluster period vs. baseline). From January to December 2017 (post-intervention period), the overall rate was 1.53. The risk ratio in the post-intervention period vs. the cluster/intervention period was 0.37 (RR=0.37, 95% CI 0.15-0.65, p-value=0.001). This represents a 63% CLABSI reduction (p=0.001). Among 53% of CLABSI reduction, 70.3% of improvement is from MBI-LCBI.

Discussion

Mucositis (grade II-IV based on the WHO’s oral toxicity scale) and graft-versus-host disease (grade III-IV) were independent risk factors for MBI-LCBI. Among those MBI-LCBI patients, thirty-two (47%) required ICU admission due to hemodynamic instability or sepsis.

In addition to CVC insertion and maintenance bundles, we used a horizontal approach (CHG daily bathing, hand hygiene, environmental cleaning and disinfection). Our oral hygiene practice expanded to include daily documented exams by MDS and RNs and new standardized blood culture ordering and collection processes.

We performed compliance audits for CHG bathing, oral care, hand hygiene, and CVC maintenance. Malnutrition is associated with impaired intestinal mucosal permeability and mucosal integrity as a dietitian was engaged for nutrition review. Antibiotic usage was reviewed by pharmacists and physicians from BMT, Hematology-Oncology, and Infectious Diseases.

Each LCR event was analyzed to identify improvement opportunities. It was important to put focus on the data; share the CLABSI data, findings and actions with the nurses and physicians. To increase awareness HAI data is posted on the unit visibility board.

Conclusion

Although not all CLABSI or MBI-LCBI incidences are avoidable in highly immunocompromised patients, a gap evaluation, comprehensive multidisciplinary approach, and improved compliance can mitigate infection risk.