

## Introduction

Central venous access is critical to the delivery of parenteral nutrition (PN). Unfortunately, these devices carry significant complications, most notably infection, with attributable mortality estimated at 18-25%. Recently, hospitals have achieved striking reductions in central line-associated bloodstream infections (CLABSI) using a bundle of evidence-based actions for care of central lines. The CDC reports an average drop in ICU CLABSI rates from 5/1000 catheter-days (1992-2004) to 1.7 in 2009. The increased length of stay associated with each CLABSI episode increases hospital costs by \$29,156. Because CMS classifies CLABSI as preventable, it ended treatment reimbursement in 2008. PN is widely recognized as an independent risk factor for CLABSI. Two recent reports cite rates of 18.8 and 16.02 per/1000 catheter days; another shows a 4-fold increase in odds ratio for CLABSI in patients receiving PN. Furthermore, exposure to PN also increases the risk for fungemia, which has a mortality > 30%. In the fiscal year prior to the study, using an enhanced bundle approach, (Table 1) our 900-bed academic medical center reduced ICU CLABSI rates from 5.3 to 2.6/1000 catheter days. Our nutrition support service plays a key role in reducing CLABSI by striving to avoid inappropriate PN. Prescribers must document PN indication, and all inappropriate use is subject to team review.

## Objective

To evaluate the trends in incidence of PN-associated CLABSI and fungemia in ICU and non-ICU patients.

## Methods

- Adult ICU and non-ICU cases of CLABSI in 2007 and 2009, as determined by our Infection Control Department, were retrospectively reviewed for PN administration via CVC during the septic episode.
- These were further analyzed for diagnosis of fungal vs. bacterial CLABSI.
- PN use for each year was determined by averaging the daily PN census.

## Results

Review of 92,505 device days for 2007 and 2009 revealed:

- 80.2% decline in CLABSI rates (3.42→0.68/1000 catheter days) in non-ICU and a 54.4% drop in ICU patients (2.63 →1.2) (Figure 1)
- Total CLABSI episodes fell from 139 to 39, with cases of CLABSI in PN recipients dropping from 46 to 8 (82.6% decline) (Figure 2)
- Fungemia dropped from 36 of 139 CLABSIs (26%) to 8 of 39 (21%)
- PN-associated fungemia declined 84.6% from 26 to 4 (Figure 3)
- Still, 50% of all fungemias occurred in the PN group
- Non-PN fungemias decreased 60% from 10 to 4
- Average PN use fell from 19.5 to 15 patients/day, a 23% reduction.

A CLABSI rate of zero was realized during the 3rd quarter of 2010.

Figure 2: PN-Associated CLABSI

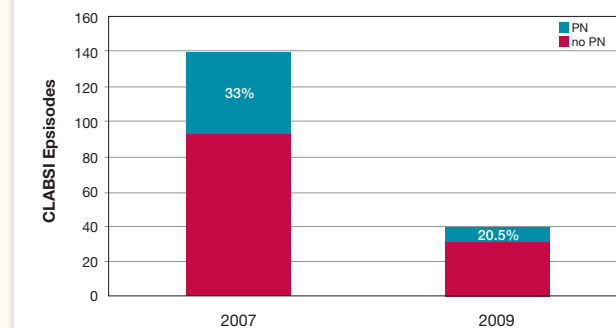


Table 1: Beyond Bundles...

### Additional measures implemented for optimal outcomes:

Updated insertion kit with large drape
Bedside checklist; RN empowered to stop procedure
Sutureless stabilizing device
Chlorhexidine patch/antimicrobial catheter
Aseptic management of the catheter hub — "Scrub the hub"
Minimize manipulation/avoid blood sampling from CVC
Avoid catheter-tubing disconnections during routine patient care
Dedicated TPN lumen; TPN-specific needleless cap

Figure 1: Central Vascular Catheter-associated Bloodstream Infections for Special Care Units

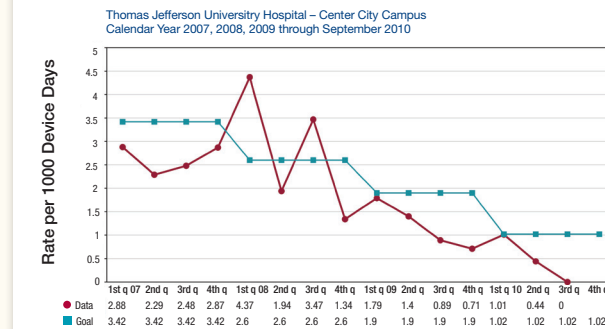
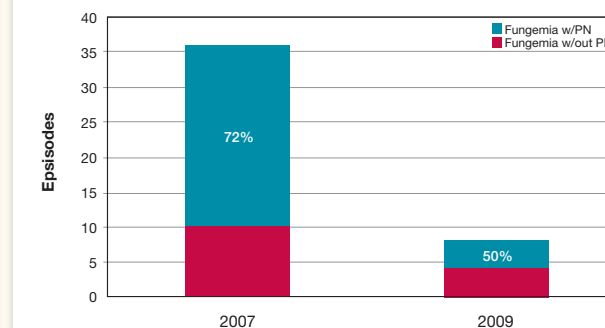


Figure 3: PN-Associated Fungemia



## Discussion

- Costly interventions do not always translate into improved outcome.
- We experienced 2 quarters with no improvement following implementation of antimicrobial catheters.
- Rates declined with intensive education, feedback of unit results to all stakeholders and full administrative support.
- Sound nursing practice focused on "scrub the hub" and minimizing manipulation yielded desired outcomes.
- Strategies to limit inappropriate PN use appear to have a positive impact on CLABSI in our institution.

## Conclusions

- Our data reveal a sustained decline in CLABSI using the CVC bundle, reaffirming the effectiveness of a multi-faceted approach.
- For 2009, our results translate to a potential for saving 18-25 lives and \$2,915,600 over 2007.
- Although PN is associated with a sizable proportion of CLABSI, preventive strategies can reduce the risk.
- While total episodes of fungemia fell sharply, PN remains linked with half of the cases.
- The findings also highlight the positive impact on CLABSI that can be achieved by using a team approach to reduce PN utilization.
- Even in the era of falling CLABSI, PN stands out as a risk factor for bloodstream infections, particularly fungemia.
- Study into areas such as lipid-induced immune dysfunction, hyperglycemia and biofilms may shed light on the etiology of PN-associated CLABSI.

## References

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