

# Impact of a Closed Luer Access Split-Septum Device on Catheter-Related Bloodstream Infection (CR-BSI) Rates in a Community Hospital Adult Population

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## Abstract

### BACKGROUND

Jennie Edmundson Hospital is a 254 bed acute care facility in the mid-western United States. Mechanical access vascular devices (MAVD) have been associated with significant CR-BSI increases in a variety of clinical settings in at least two countries over the past five years. In August 2007, during the use of a positive pressure MAVD, the CR-BSI rate in the Adult Medical/Surgical ICU reached a peak of greater than 5 CR BSIs per 1000 catheter days. This peak was more than twice the pooled mean CR-BSI rate of 2.2 per 1,000 catheter days reported to the Centers for Disease Control and Prevention's National Healthcare Safety Network System in 2006. This peak occurred despite multiple CR-BSI prevention measures introduced as part of a bundled initiative in 2007. Infection Prevention responded to the peak by replacing the MAVD with a closed luer access/ split septum alternate device in November 2007. The CR-BSI rate promptly decreased to 0 CR-BSI in the ICU setting. The purpose of this study was to evaluate the impact of a closed luer access, split-septum device in reducing CR-BSIs in both the Adult Medical-Surgical Unit and the Adult Medical/Surgical ICU population.

### METHODS

Baseline CR-BSI rates were measured in November 2007. Investigators also reviewed 24 consecutive months worth of retrospective CR-BSI data and compared rates to 12 consecutive months of CR-BSI data collected after the introduction of the closed luer access, split-septum device. Monthly CR-BSI rates per 1000 catheter-days for each month of the pre-and post intervention period were calculated according to the NHSN methodology and pooled for either the pre or post intervention period. Analysis included more than 23,000 catheter-days. No other specific interventions targeting CR-BSI reduction were introduced or enhanced during the 12-month post split septum period.

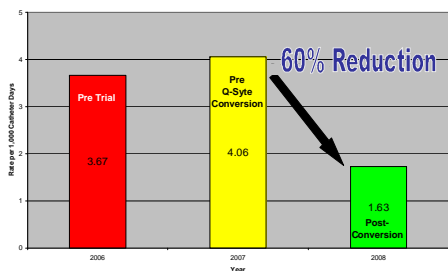
### RESULTS

The mean rate of catheter-related bloodstream infections per 1000 catheter-days decreased 60% from 4.06 infections per 1,000 catheter days at baseline to 1.63 infections per 1,000 catheter days 12 months after implementation of split septum device.

### CONCLUSION

Consistent with other recent domestic and international studies, removing the mechanical valve and replacing it with a closed luer access, split-septum device resulted in a dramatic and sustained reduction in CR-BSI infections in the Jennie Edmundson Hospital Adult Medical-Surgical Population and in the Adult Medical/Surgical ICU population.

Mean CR-BSI Rate (per 1,000 catheter days) in all Acute Care Units



## Impact

### The Possible Impact of Needleless Connectors

In a Joint Guidance published in October 2008 SHEA and IDSA recommended that members "Do not routinely use positive-pressure needleless connectors with mechanical valves before a thorough assessment of risks, benefits, and education regarding proper use."<sup>[1]</sup>

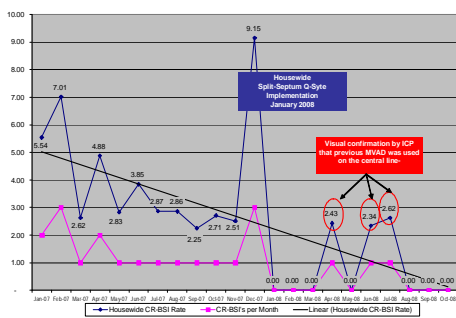
Concerns regarding needleless injection port technology were first mentioned as a potential contributor to increased rates of primary bloodstream infection (BSI) in the mid 1990s.<sup>[2]</sup> This technology was introduced to decrease the potential risk to healthcare workers from IV-access related needle stick injuries by eliminating unnecessary needle use.<sup>[3, 4]</sup> The designs of needleless connectors have evolved progressively from split septum (needleless luer-activated) connectors, neutral displacement needleless mechanical valves and positive displacement or positive pressure valves<sup>[4]</sup>.

Increase in BSIs temporally associated with a change from split septum technology to mechanical valves have been suggested in a number of studies<sup>[2, 4, 5, 6]</sup>. The increases have not been associated with any one specific valve type or design but rather, have involved a variety of devices marketed by several different companies.

Multiple potential BSI risk factors related to needleless injection port design have been postulated and include:

- o difficulty disinfecting the access surface; <sup>[3, 7]</sup>
- o the presence of a "gap" around the device plunger and its associated potential to harbour bacteria; <sup>[7, 8]</sup>
- o opaque housing limiting visualisation and confirmation of complete flushing; <sup>[7,8]</sup>
- o internal device mechanisms which potentially obscure the fluid path. <sup>[7,8]</sup>

Housewide CR-BSI Rate for Study Period Jan 08-Oct 08



## Technology

### Overview Needleless Connector Technology Simple vs. Complex

#### Simple Split Septum

The cannula or the male luer is the fluid path, which is removed following administration.



#### Complex Mechanical Valve

Complex device technology - part of the device moves to open the fluid path.



#### More Complex Positive Fluid Displacement

More complex - there is an actual "reservoir" that fills and then fluid is expelled during disconnection.



Figure2: The evolution of design complexity of needleless connectors

ICU & Housewide CR-BSI Rates 2007 TO April 2009\*

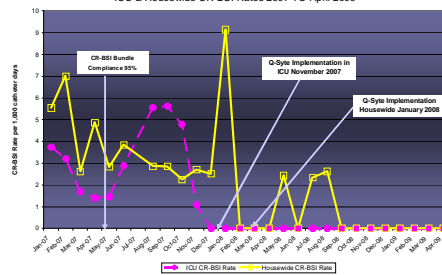


Figure 1: ICU & Housewide CR-BSI Data

\*Updated post-abstract submission

## References

1. Marschall, J., et al., *Strategies to prevent central line-associated bloodstream infections in acute care hospitals*. Infection Control Hospital Epidemiology, 2008. 29 Suppl 1: p. S22-30.
2. Rupp, M.E., et al., *Outbreak of bloodstream infection temporally associated with the use of an intravascular needleless valve*. Clinical Infectious Diseases, 2007. 44(11): p. 1408-14.
3. Casey, A.L. and T.S. Elliott, *Infection risks associated with needleless intravenous access devices*. Nursing Standards, 2007. 22(11): p. 38-44.
4. Salgado, C.D., et al., *Increased rate of catheter-related bloodstream infection associated with use of a needleless mechanical valve device at a long-term acute care hospital*. Infection Control Hospital Epidemiology, 2007. 28(6): p. 684-8.
5. Maragakis, L.L., et al., *Increased catheter-related bloodstream infection rates after the introduction of a new mechanical valve intravenous access port*. Infect Control Hosp Epidemiol, 2006. 27(1): p. 67-70.
6. Cosgrove, S.E., et al. *Increase in catheter-related bloodstream infections (CR-BSI) in pediatric intensive care units temporally associated with a change in needleless intravenous port*. In 15th Annual Scientific Meeting of the Society For Healthcare Epidemiology of America, 2005. Los Angeles, United States: Society For Healthcare Epidemiology of America.
7. Jarvis, W.R., et al. *Increased central venous catheter-associated bloodstream infection rates temporally associated with changing from a split septum to a Luer-access mechanical valve needleless device: A nationwide outbreak?* In Association for Professionals in Infection Control and Epidemiology, Inc. 2005, Baltimore, USA.
8. Jarvis, W.R. *Needleless devices and BSIs: Protecting patients or protecting healthcare workers*. In 15th Annual Scientific Meeting of the Society For Healthcare Epidemiology of America, 2005. Los Angeles, United States: Society For Healthcare Epidemiology of America.

### Disclosure

Ms. Love received an education grant from BD, Inc. to attend the 2009 APIC Annual Conference.

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Image 1. Split Septum BD Q-Syte™



Image 2. Split Septum BD Q-Syte™ on triple lumen catheter