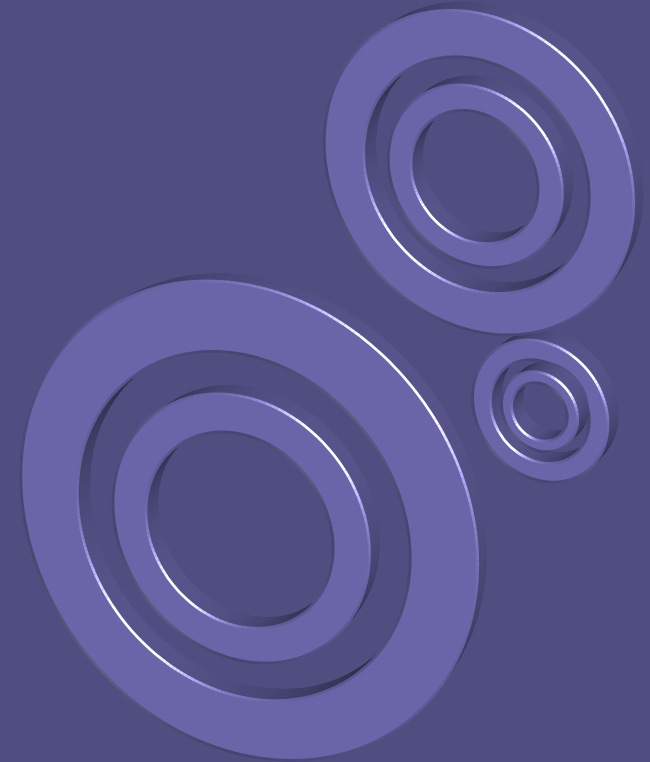


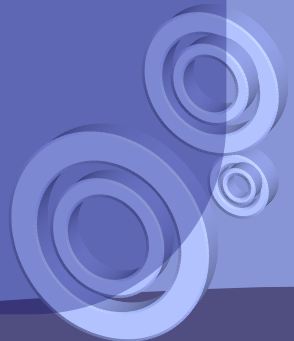
# Catheter-Related Blood Stream Infections in the Adult Population



Molly Blake, ICP

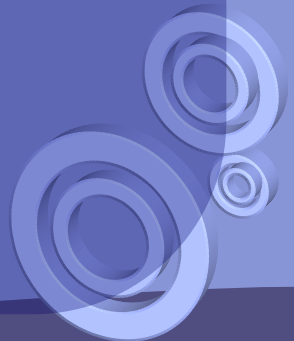
# National Benchmarks

- PHAC (2006) combined data, pooled mean rates
  - **2.3**/1000 catheter-days for short term CVCs
  - **0.4** for PICCs
  - **1.2** for long term tunnelled cuffed catheters
  - **0.2** for totally implanted devices



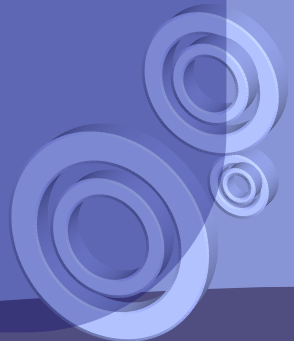
# National Benchmarks

- CNISP CR-BSI surveillance (2006-2009) shows overall decline in adult rates
  - 2.3/1000 CVC-days ('06) to **1.3** ('09)
- Pediatric rates increased from 2.88 to **3.98**
- Neonatal rates relatively stable: 5.39 ('06) and **5.37** ('09)



# Impact

- **Third** most common HAI in ICUs
- 68% of all reported infections =
  - Nosocomial pneumonia 31%
    - 83% ventilator associated
  - Urinary tract infection 23%
    - 97% catheter associated
  - Bloodstream infection 14%
    - 87% central line associated



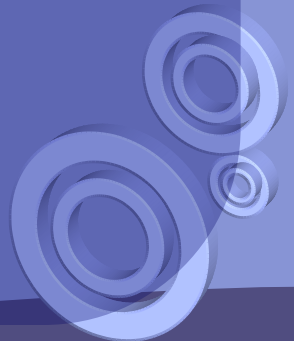
# Risk Factors

- BSI rates influenced by
  - **Patient-related factors:** e.g., severity of illness, type of illness (e.g., third-degree burns)
  - **Catheter-related factors:** e.g., the condition under which the catheter was placed, catheter type, clinical practice
  - **Institutional factors:** e.g., bed size, academic affiliation

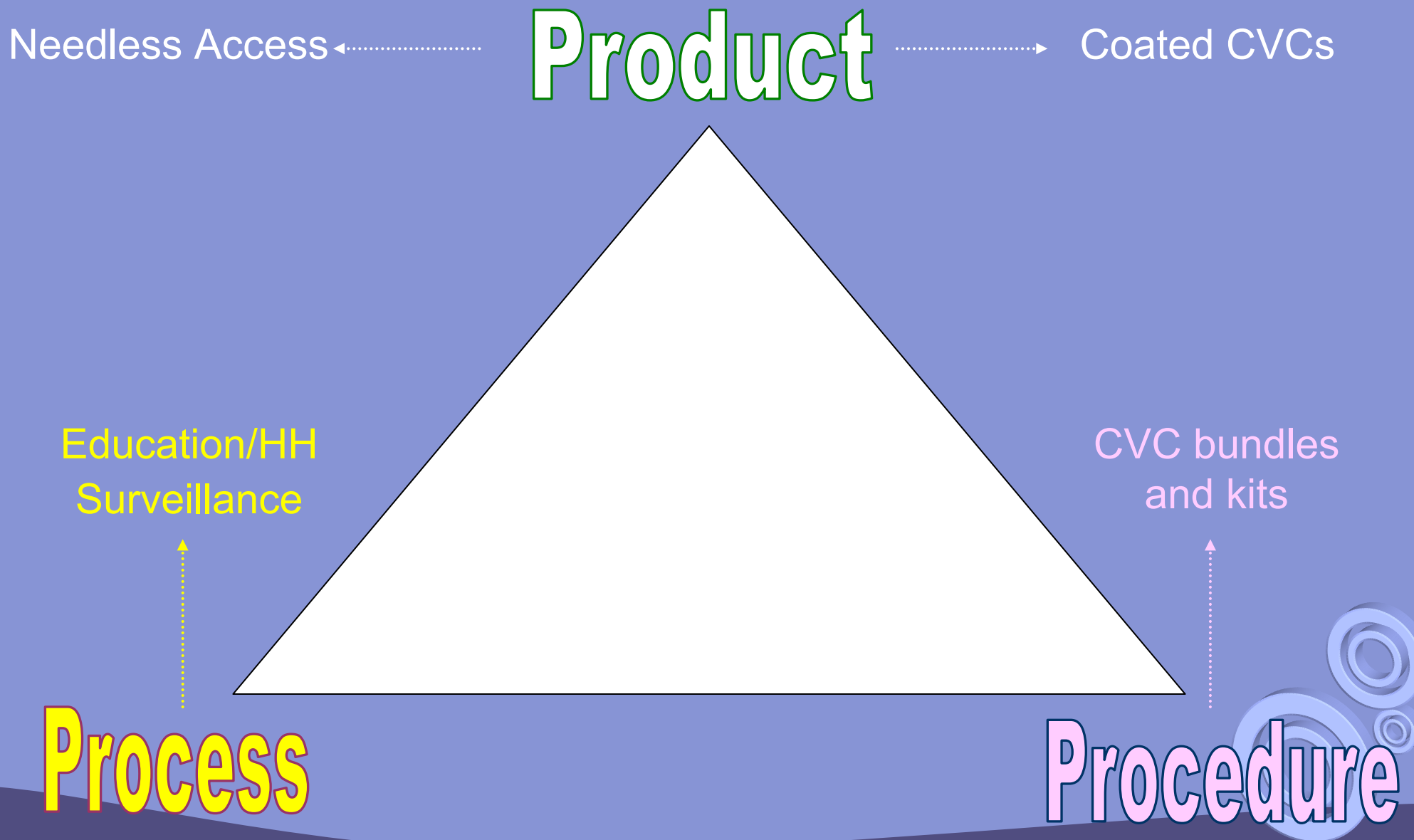


# Risk Factors

- Include
  - Catheter insertion practices
  - Catheter care practices
  - Products administered through the line
  - Frequency of manipulation
  - Age group
  - Underlying disease
  - Severity of illness of the patient



# Contributing Factors to CR-BSIs



# Contamination

- Skin organisms (60%)

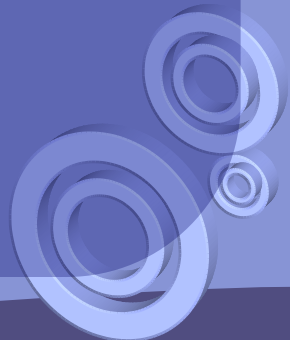
- Endogenous (skin flora)
- Extrinsic (HCW hands; contaminated disinfectant)

- Contaminated Cather Hub (12%)

- Endogenous (skin flora)
- Extrinsic (HCW hands)

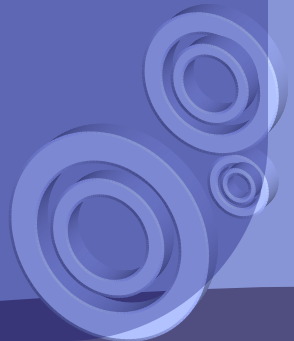
- Contaminated Infusate (<1%)

- Intrinsic (manufacturer)
- Extrinsic (fluid; medication)



# What To Target

- Changing Practice
  - Discuss why reducing CR-BSIs is NB.: *Why do*
  - Discuss most effective ways to reduce rates: *What to do*
  - Discuss strategies for managing process of improvement: *How to do*
- Changing Culture
  - Discuss need/process to work on above together

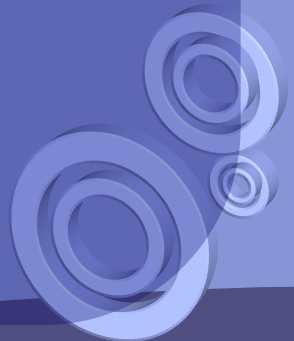


# What To Do - Staff

Hand Hygiene	Line Insertion	Line Care	Other
Products: e.g., alcohol, Chlorhexidine	Insertion & Maintenance Team	Insertion & Maintenance Team	Clean environment of care
Products readily accessible	Maximal barriers	Daily assessments: Line condition/need	Staff education
No artificial nails	Standardized deep line insertion packs	Proactive line removal	
Sleeves/jewellery issues	Skin antisepsis: CHG with alcohol	Closed medication system	

# What To Do - ICP

1. Perform ongoing CR-BSI surveillance
2. Implement ongoing best practice education for all clinicians accessing needleless IV systems
3. Monitor adherence to aseptic technique
4. Monitor impact of access device changes on CR-BSI rates
5. Monitor adherence to best practices



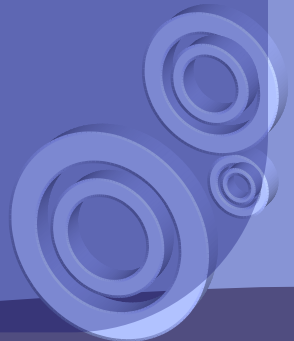
# What To Do - ICP

6. Ensure units have written practice documents such as P&P, etc. that identify requirements for CVAD insertion
7. Ensure units have written practice documents that identify requirements for CVAD maintenance
8. Develop process for daily evaluation of CVAD need



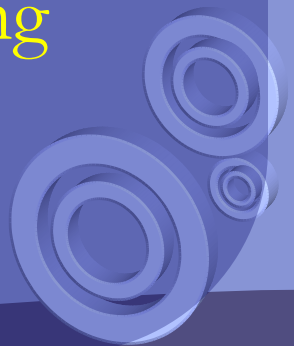
# What To Do - ICP

9. Establish process for education and routine evaluation of all staff inserting and caring for CVAD
10. Review CR-BSI rates, and if needed establish an interdisciplinary team including but not limited to staff nurse, advance practice nurse, ICP, and a physician



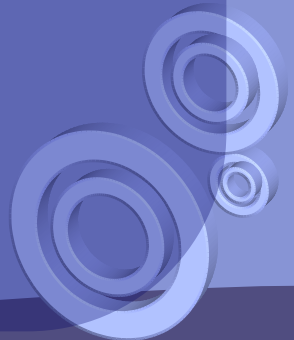
# Recommended Surveillance Practices

- Surveillance
  - Conduct in high-risk populations to determine HAI CR-BSI rates, monitor trends in rates, and assist in identifying lapses in IP&C practices
  - Report rates monthly (not quarterly)
  - Investigate clusters for common cause problem(s)
  - Monitor introduction of new CVADs, including needleless devices for increased occurrence of device associated infection



# Recommended Surveillance Practices

- Surveillance methodology
  - Collection of infection data for BSIs and their corresponding denominator data should be performed using active, patient-based, prospective surveillance and overseen by ICP
  - To minimize ICP data collection burden, other staff may be trained to collect denominator data



# Surveillance Definition – CNISP 2011

- **Criterion 1:** Recognized pathogen cultured from at least one blood culture, unrelated to infection at another site

**OR**

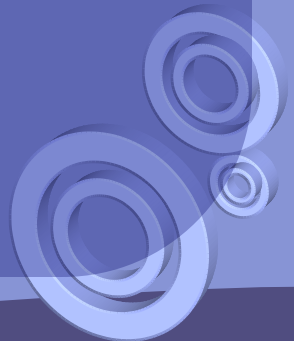
- **Criterion 2:** At least one of: fever ( $>38^{\circ}\text{C}$ ), chills, hypotension, or signs of infection of insertion site or catheter tunnel

**AND** common skin contaminant cultured from  $\geq 2$  blood cultures drawn on separate occasions




# Diagnosis of CR-BSI

- Accurate, early diagnosis essential; promptly collect cultures on suspicion of CR-BSI
- Catheter discard blood, arterial line blood, “left over” blood from blood gas or other analyses must not be used for blood cultures



# Blood Culture Collection

- If CR-BSI suspected
    1. Use strict aseptic technique, including HH
    2. Use sterile collection equipment
    3. Take first sample peripherally; cleanse skin and allow to dry prior to venipuncture
    4. Collect additional specimen(s) from each lumen of CVAD. If collecting directly from indwelling line, discard first few mL of blood
    5. Swab blood culture bottle diaphragm with sterile single use 70% alcohol swab prior to inoculating bottle
- 

# Culturing CVC Tips

- If pus present at insertion site, swab site prior to cleaning and send for culture
- If catheter-related sepsis is suspected
  1. Clean skin at skin-catheter junction; allow to dry prior to catheter removal
  2. Remove catheter aseptically
  3. Cut distal 5cm of catheter with sterile scissors into sterile screw-top specimen container



# Process and Outcomes Measures

- Process measures might include
  - Use of barrier precautions
  - Skin antisepsis
  - Selection of appropriate insertion sites
  - # of attempts to insert catheter
  - Adherence to dressing change protocols
  - Evaluation of catheter necessity on a daily basis



# Process and Outcomes Measures

- Outcomes measures should improve as process measures successfully implemented
  - # of CR-BSIs should decrease when devices placed and utilized appropriately
  - Data on other adverse patient outcomes such as thrombophlebitis
  - Reduction in duration of catheterization through daily review of catheter necessity



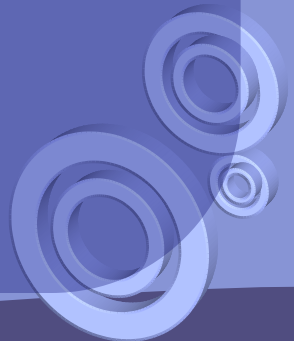
# Recommended Indicators

- Process Indicator


1. 100% of patients with a CVAD will be managed according to recommendations

- Outcome Indicator

1. \_\_\_\_\_% decrease in CR-BSI (as negotiated between IP&C and clinicians)



# Conclusions

- Comprehensive prevention program can dramatically reduce infection rates & improve patient safety
  - Prevention requires a multi-factorial approach
    - Implement Guideline Recommendations
    - Implement new prevention evidence
    - Implement insertion and maintenance bundles
    - Educate staff; ensure properly trained
    - Ensure policy = practice (clinician accountability)
    - Monitor insertion and maintenance processes, and CR-BSI rates (outcomes)
- 

# References

- SHEA/IDSA (2008). Strategies to prevent central line–associated bloodstream infections in acute care hospitals. *ICHE* 2008; 29: S22-30
- APIC (2009). Guide to the elimination of catheter-related bloodstream infections
- CDC (2009). Guidelines for the prevention of intravascular catheter-related infections (DRAFT)



# References

- CDC (2011). Guidelines for the prevention of intravascular catheter-related infections
- RNAO (2005). Care and maintenance to reduce vascular access complications
- Canadian Nosocomial Infection Surveillance Program (2011). Surveillance for Central Venous Catheter Associated Blood Stream Infections (CVC-BSI) in Intensive Care Units; 2011/2012 CVC-BSI Surveillance Protocol



# References

- Btaiche, I.M., Kovacevich, D.S., Khalidi, N., Papke, L.F. (2011). The effects of needleless connectors on catheter-related bloodstream infections. *AJIC: Article in press*
- Guembe, M., Rodriguez-Creixems, M., Sanchez-Carrillo, C., Perez-Parra, A., Martin-Rabadan, P., Bouza1, E. (2010). How many lumens should be cultured in the conservative diagnosis of catheter-related bloodstream infections? *CID; 50: 1575-79*