

Using Care Bundles to Reduce Catheter Associated Blood Stream Infections in the NICU

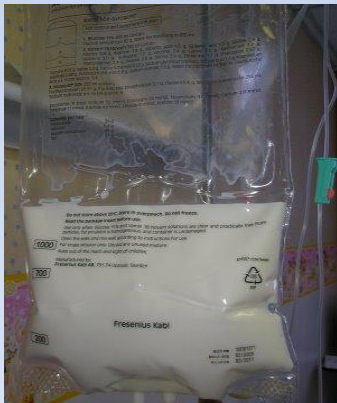
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Outline of Presentation

- Introduction
- Definition of CABSI
- Magnitude of the Problem
- The Care Bundle
- Aim statement
- PICO method
- PDSA cycle
- Results
- Conclusion

Introduction

- Intravascular devices are indispensable in modern day medical practice
- Central venous catheters are commonly inserted in critically ill neonates for :



Parenteral nutrition



Fluids

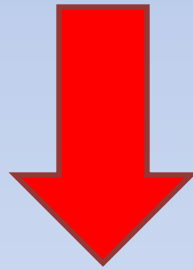


Medications



Monitoring
hemodynamic
status

- Although such catheters provide necessary vascular access, their use puts patients at risk for infection



Catheter associated blood stream infections
(CABSI)

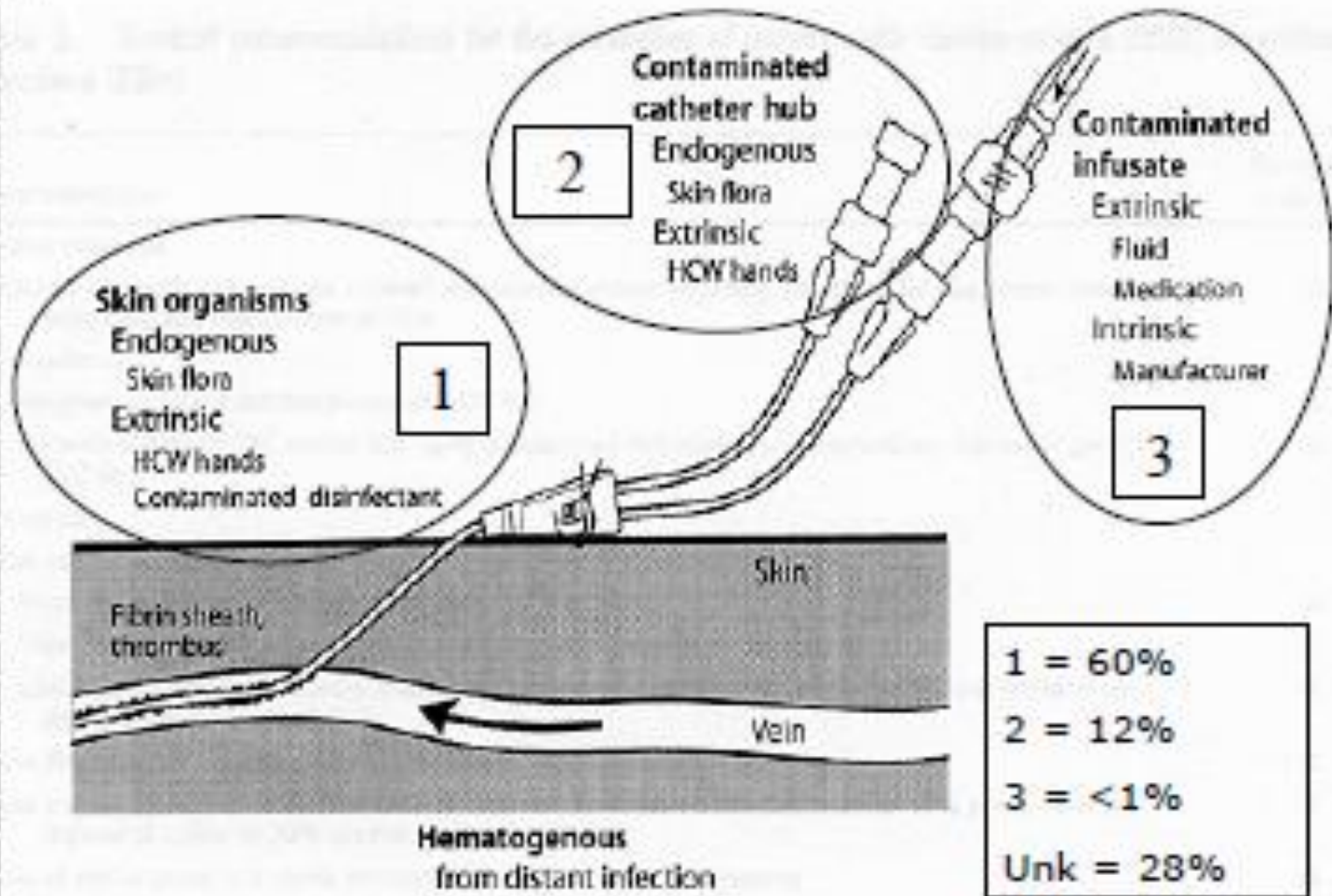
Definition of Catheter Related Blood Stream Infection (CDC)

- Surveillance definitions
 - Includes all BSIs that occur in patients with CVCs, when other sites of infection have been excluded
 - Overestimates the true incidence of CRBSI because not all BSIs originate from a catheter. Thus, surveillance definitions are really definitions for **catheter-associated** BSIs.
- Clinical definitions
 - Include only those BSIs for which other sources were excluded, and where a culture of the catheter tip demonstrated substantial colonies of an organism identical to those found in the bloodstream.
 - Such a clinical definition would focus on **catheter-related** BSIs.

Definition of CABSI Used for this Study

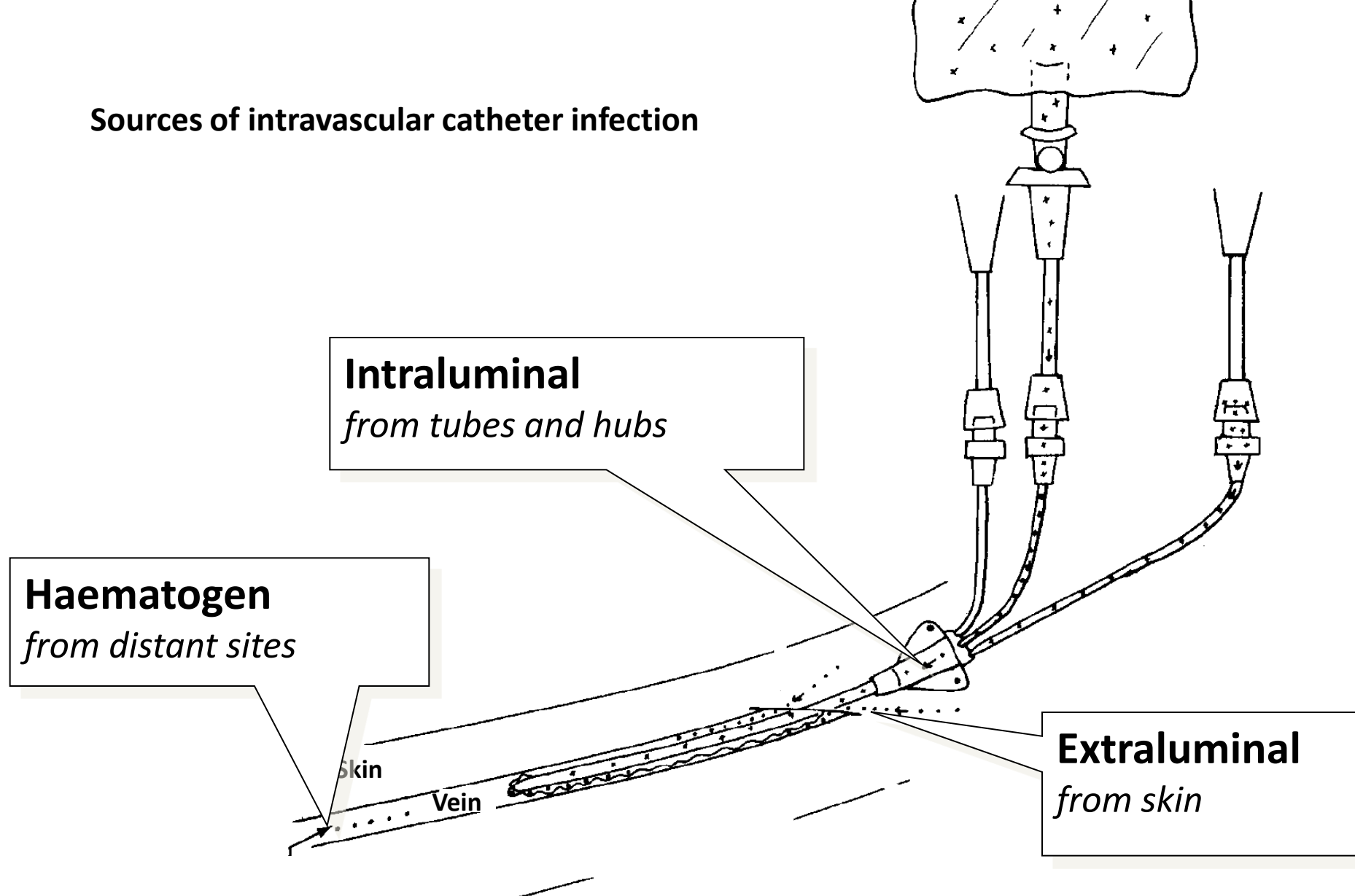
- Laboratory confirmed blood stream infection
- Vascular access device present
- 48-hour period after initial insertion
- Clinical evidence of infection and no other source apparent source for infection (except the catheter)

Pathogenesis of CABSI

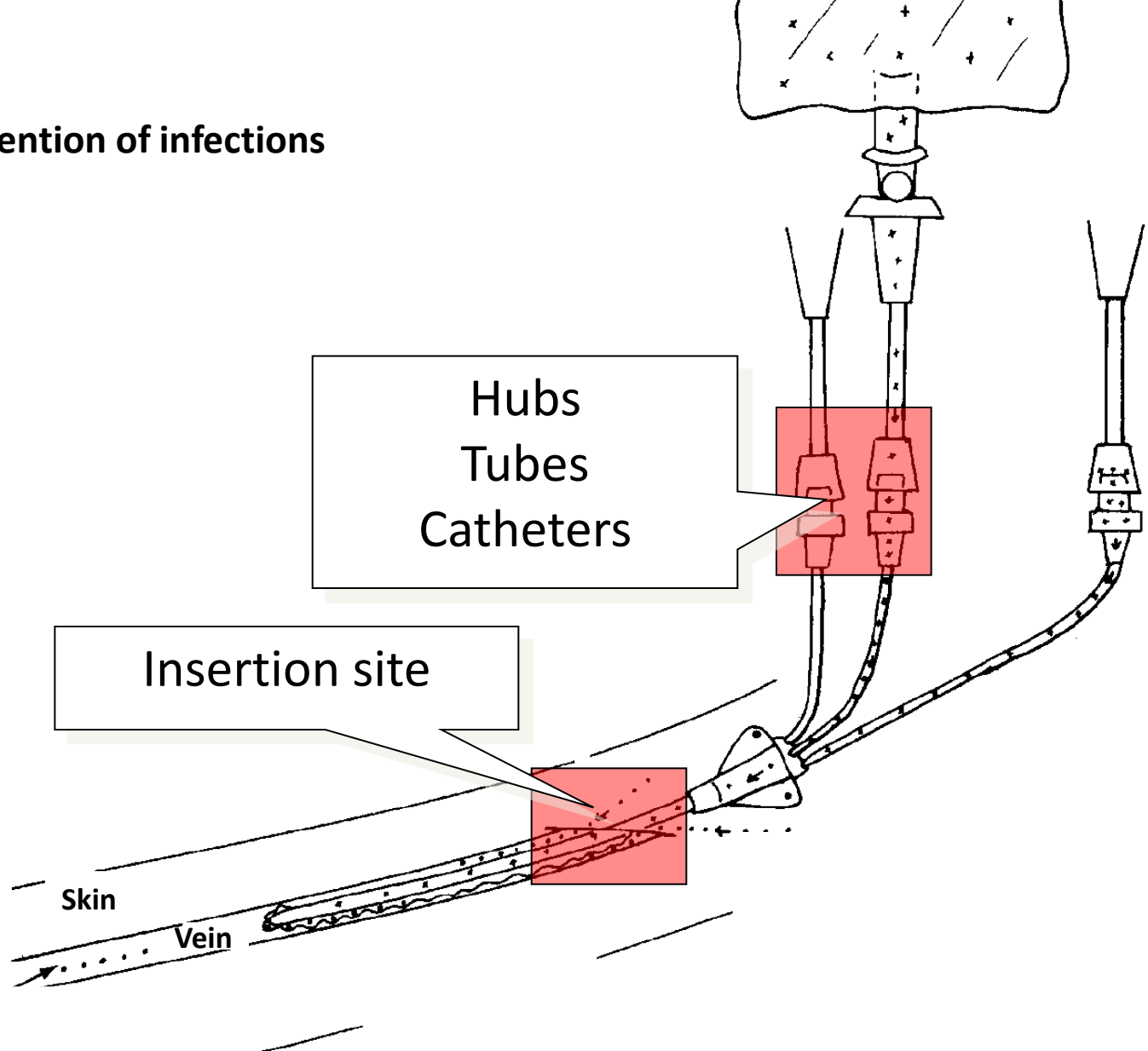


Safdar N, Maki DG. The pathogenesis of catheter-related bloodstream infection with noncuffed short-term central venous catheters. *Int Care Med* 2004;30:62-7.

Sources of intravascular catheter infection



Focus of prevention of infections



Magnitude of the Problem

- According to the National Nosocomial Infection Surveillance System established by the Centers for Disease Control and Prevention (CDC), the pooled mean in 2004 among 54 PICUs was 6.6 CA-BSIs per 1000 catheter days, higher than in many adult ICUs¹.
- More recent estimates that included 36 PICUs have shown a pooled mean rate of 5.3 CA-BSIs per 1000 catheter days².

Baseline Data for SGH

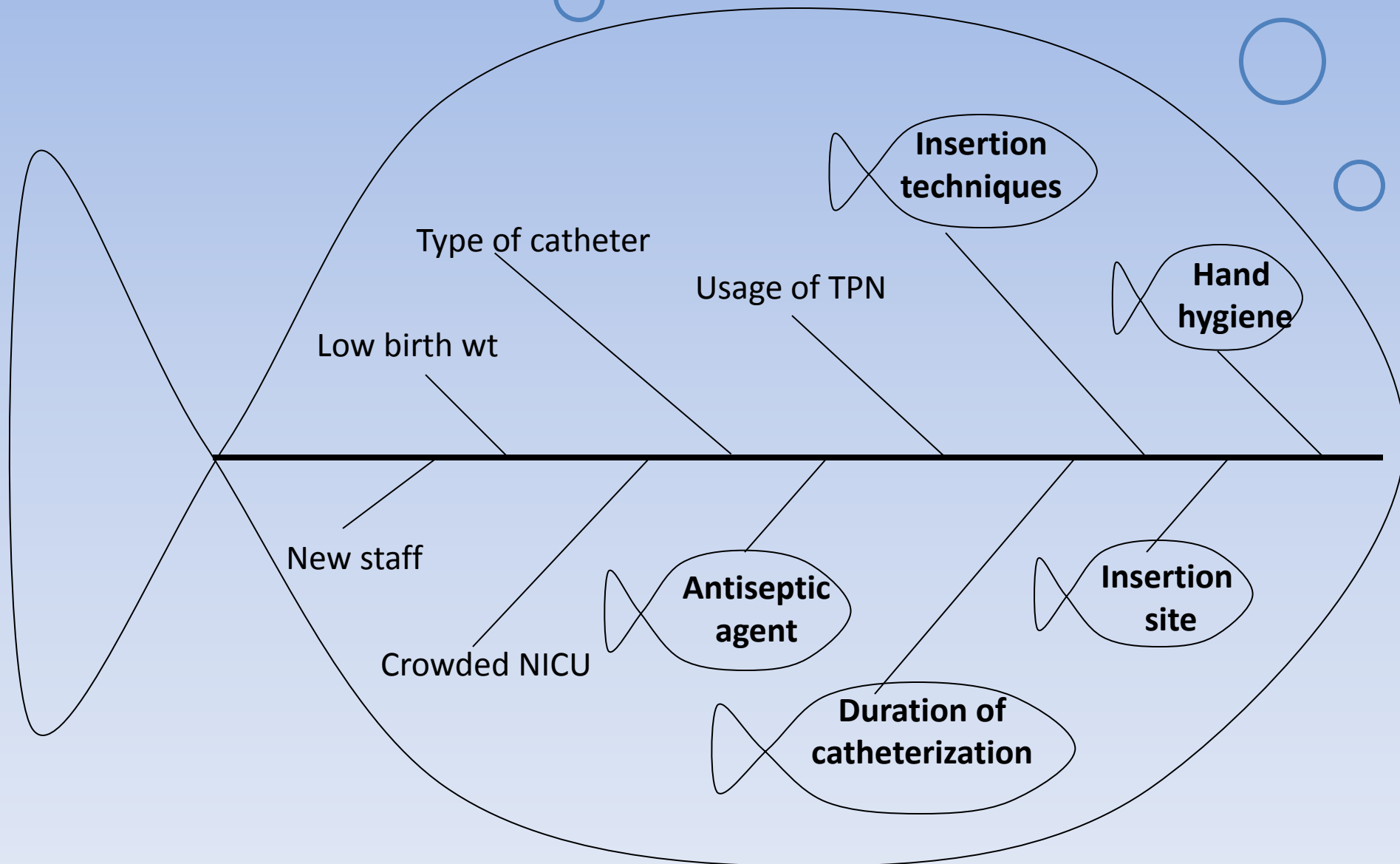
CABSI in 2010



Care Bundle

- Grouping of evidence-based best practices that individually improve care, but when applied together result in substantially greater improvement
- Bundle element compliance can be measured as 'yes/ no'
- 'All or none' approach
- Emphasis initially on process rather than outcome
- Eventual endpoint is outcome improvement

Factors Contributing to CABSI



Prevention Recommendations from IHI and CDC

Component	IHI	CDC
•Hand hygiene	✓	✓(IA)
•Maximal sterile barriers	✓	✓(IA)
•Chlorhexidine skin antisepsis	✓	✓(IA)
•Optimal catheter site selection	✓	✓(IA)
•Daily review of line necessity	✓	✓(IA)
•Weekly dressing changes unless damp, loosened, or visibly soiled	NA	✓(IB)
•Do not routinely replace CVCs solely for purposes of reducing the incidence of infection	NA	✓(IB)
•Use an antimicrobial or antiseptic-impregnated CVC	NA	✓ (IB)
•Use of mechanical IV valves	NA	NA
•Minimize contamination risk by wiping the access port with an appropriate antiseptic	NA	✓(IB)

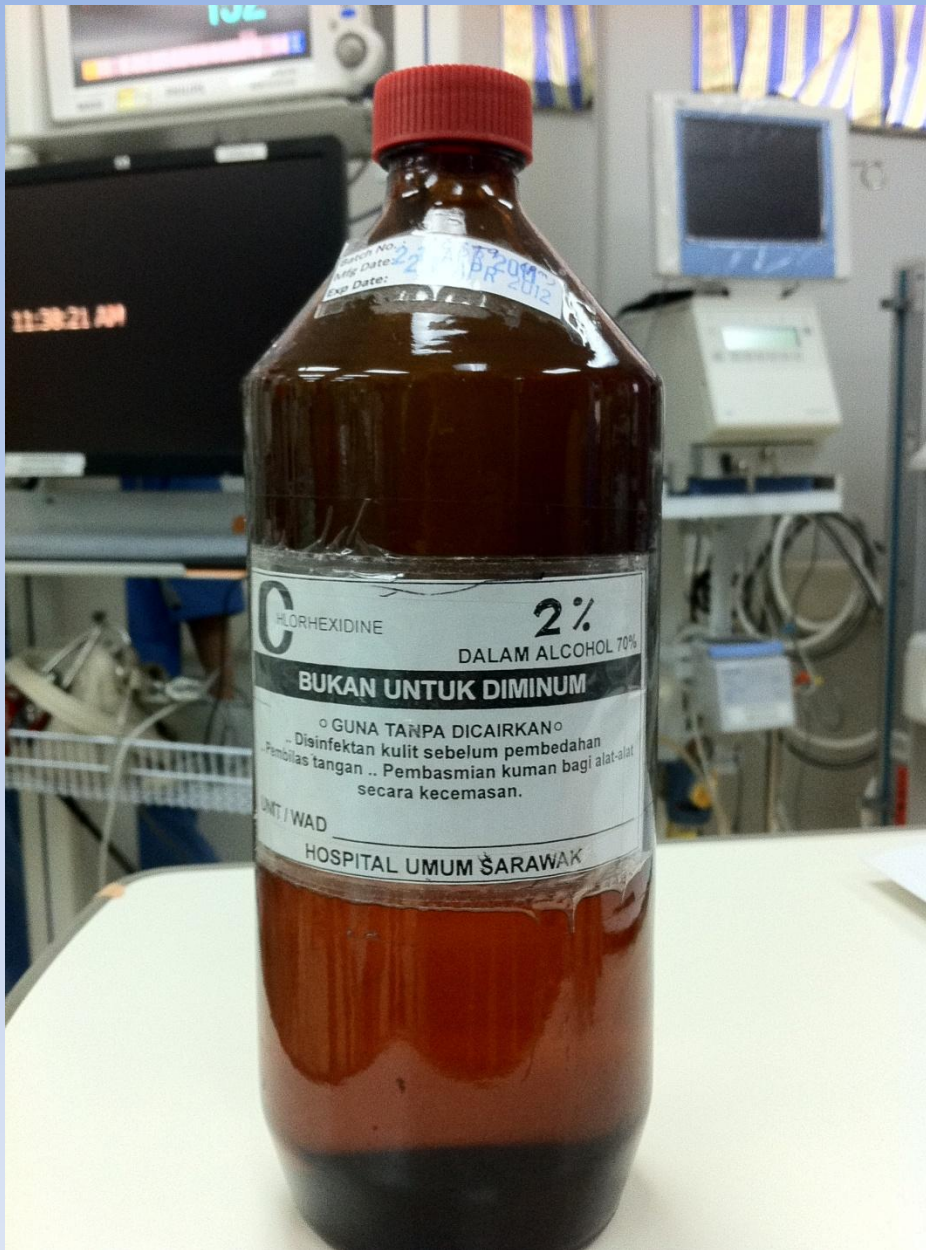
IHI 100K Lives Campaign. Getting Started Kit: Prevent Central Line Infections How-to Guide; CDC Guideline for Prevention of Intravascular Catheter Related Infections, 2002.

UI = unresolved issue; NA = not addressed

Bundle implementation for reducing CABSI

- a) Hand hygiene
- b) Maximal barrier precautions with line insertion
- c) Chlorhexidine skin antisepsis
- d) Optimal catheter site selection*
- e) Daily review of line necessity with prompt removal of unnecessary lines

* Not useful in neonates as femoral lines rarely used



Chlorhexidine
2% in alcohol

Hypothesis

- By implementing a care bundle for central line insertion/maintenance, the incidence of catheter associated blood stream infections in the NICU will decrease.

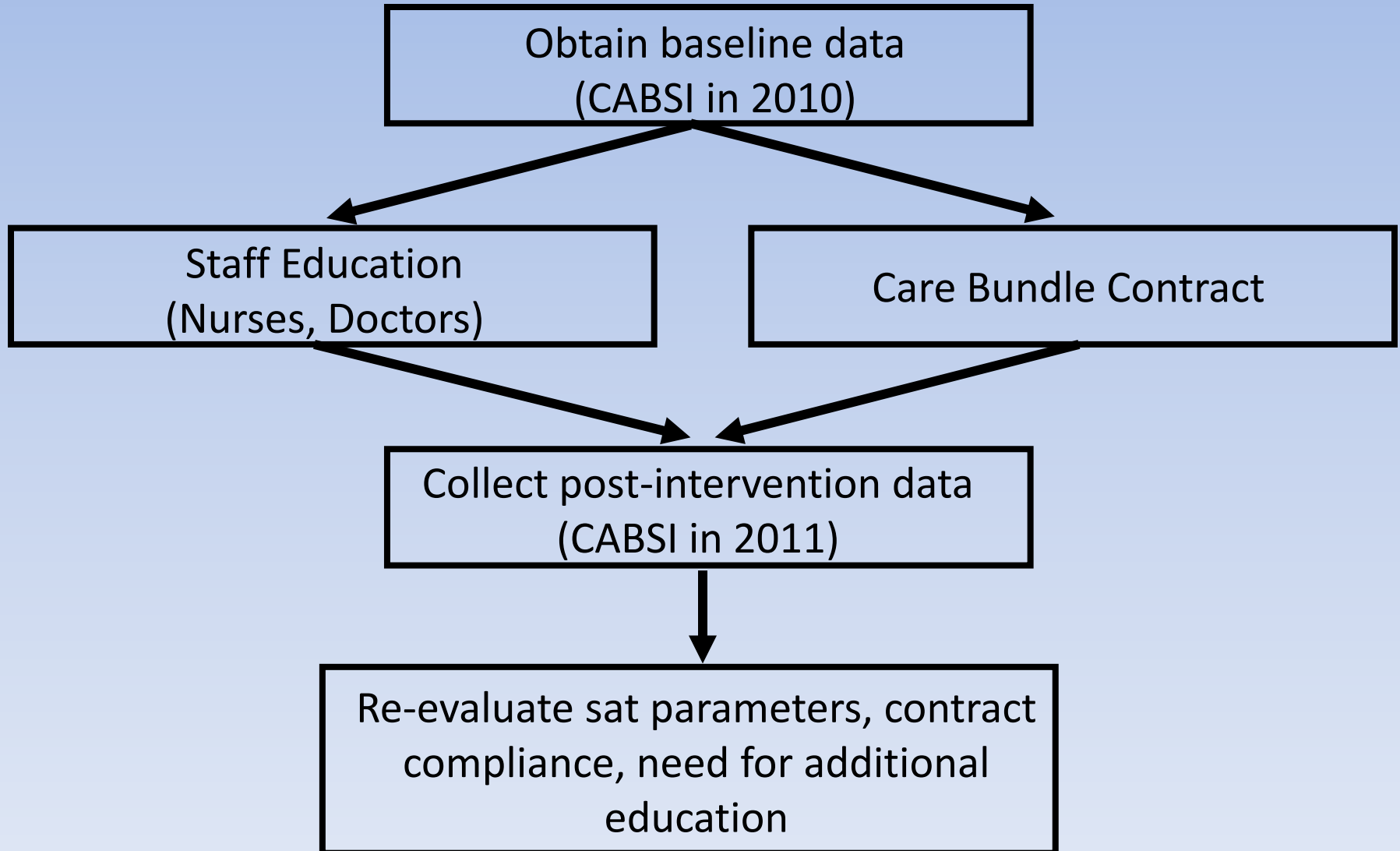
Aim Statement

- To reduce the rate of catheter associated blood stream infections by 50% through implementing a care bundle for insertion and maintenance of central venous catheters.

PICO Method

- **Patient population:** all neonates requiring central venous catheter insertion
- **Intervention:** implementing care bundle for central line insertion and maintenance
- **Comparator:** earlier CABSI rates prior to implementation of care bundle
- **Outcome:** to reduce the incidence of CABSI in the neonatal unit

Conceptual Model



Team Members

- Team leaders : Dr Chan Lee Gaik, Dr David Ng
- Systems leaders: NICU nurse managers
- Day-to-day Leaders
 - Neonatologists, pediatricians
 - Medical Officers
 - NICU nursing staff

PDSA Cycles

1. 2011 April

- P Establish baseline (CABSI in 2010), Define catheter days
- D Begin data collection & dev care bundle
- S Review compliance to bundle
- A Problems with staff education and lack of dressing sets identified

2. 2011 May-June

- P List of all health care providers in NICU, devised an EPIQ set
- D Begin staff education, print compliance to care bundles and paste on notice board, request CSSD to provide EPIQ set
- S Checklist of completed education, review CABSI rates
- A Need to analyze each case of confirmed catheter related blood stream infection

3. 2011 July- Nov

- P Identify information needed to analyze each confirmed CABSI case
- D Root cause analysis performed for each confirmed CABSI case. Data collection continued.
- S Review CABSI rates, compliance to care bundle
- A Some improvement noted

EPIQ Set



Patient's sticker



Sarawak General Hospital NICU Central Venous Catheter (CVC) Insertion Checklist

Central Venous Catheter Insertion Checklist

Date : _____					
Type of Catheter Central Line ☐ PICC Line ☐		Insertion site Umbilical artery/vein ☐ Scalp vein ☐ Antecubital fossa vein ☐ Long saphenous vein ☐ Femoral vein ☐ Others : _____ ☐		Site Inserted Left ☐ Right ☐ Left ☐ Right ☐ Left ☐ Right ☐ Left ☐ Right ☐	
Is the procedure : ☐ Elective procedure ☐ Repositioning ☐ ☐ Emergency procedure					
Procedural Checklist Before the Procedure			YES	YES (After reminder)	
• The operator performed a procedural pause Mark/assess site Position patient correctly for procedure Assemble equipment/verify supplies			☐	☐	
• The operator performed a surgical scrub			☐	☐	
• The operator (and supervisor) wore cap, mask, sterile gown and sterile gloves			☐	☐	
• Chlorhexidine 2% in alcohol was applied to the insertion site and allowed to dry before the procedure was progressed. (For premature babies < 1 kg, Chlorhexidine 2% in aqueous solution should be used instead)			☐	☐	
• Sterile drapes were placed to create a sterile operating field.			☐	☐	
During the Procedure					
Number of skin punctures: 1 ☐ 2 ☐ 3 ☐ ≥4 ☐					
A sterile field was maintained throughout the procedure			☐	☐	
The assistant followed the same precautions (hand washing, mask, gloves, gown)			☐	☐	
After the Procedure					
A sterile CVC dressing was placed over the insertion site (not applicable for UAC/UVC insertion)			☐	☐	
Name of Operator : _____					
Name of Assistant : _____					
Name of Observer : _____					



Date : _____

Shift : _____

Name of operator : _____

Name of observer : _____

Observation	Yes	Yes (after reminder)
1. The operator took off hand <u>jewellery</u> /watch before performing hand scrub		
2. The operator performed adequate hand hygiene		
3. The operator wore a cap and mask		
4. The operator opened up the TPN set and sterile gown set without contaminating the set		
5. The operator performed adequate hand hygiene and wore sterile gloves & gown		
6. TPN tubing was connected to the solution and primed without contamination		
7. TPN trolley taken out. Operator took off old gloves and performed adequate hand hygiene again.		
8. The operator wore a new set of sterile gloves		
9. The operator placed gauze below the tubing while the assistant disconnected the old tubing.		
10. The operator scrubbed the tubing connection with alcohol wipes/CHG for 30 seconds		
11. The operator connected the new tubing to the central venous catheter without contamination		
12. The tubing was labeled with the time and date		
13. The need for line use has been reviewed and recorded today		
14. The dressing is intact and not soiled		
15. If a gauze dressing was used during insertion for <u>hemostasis</u> , the gauze dressing was removed within 24 hours after it was placed. (only for PICC lines)		

Central Venous Catheter Maintenance Checklist 1



Sarawak General Hospital NICU Central Venous Catheter Maintenance Bundle

(For Umbilical Artery Catheter Blood Sampling)

Date : _____

Shift : _____

Name of operator : _____

Name of observer : _____

Observation	Yes	Yes (after reminder)
1. The operator gathered and prepared the tools needed to access the central line		
2. The operator took off hand <u>jewellery</u> /watch before performing hand scrub		
3. The operator performed adequate hand hygiene		
4. The operator wore a clean glove		
5. The operator cleaned the stopper with alcohol wipes/CHG for 30 seconds		
6. The operator aspirated out the first blood sample, which contained <u>heparinized</u> blood.		
7. The operator aspirated out the second blood sample for analysis		
8. The operator flushed back the <u>heparinized</u> blood into the UAC (only applicable for premature infants. Blood was discarded for the term babies)		
9. The operator flushed the UAC with heparin saline		
10. The operator placed the stopper back on the UAC		

Central Venous Catheter Maintenance Checklist 2

Daily Review of Necessity of the Central Catheters



Day	Central Line Needed	Central Line Not Needed
Day 1		
Day 2		
Day 3		
Day 4		
Day 5		
Day 6		
Day 7		
Day 8		
Day 9		
Day 10		
Day 11		
Day 12		
Day 13		
Day 14		

Daily Review of Necessity of Central Catheters

Outcome Measures

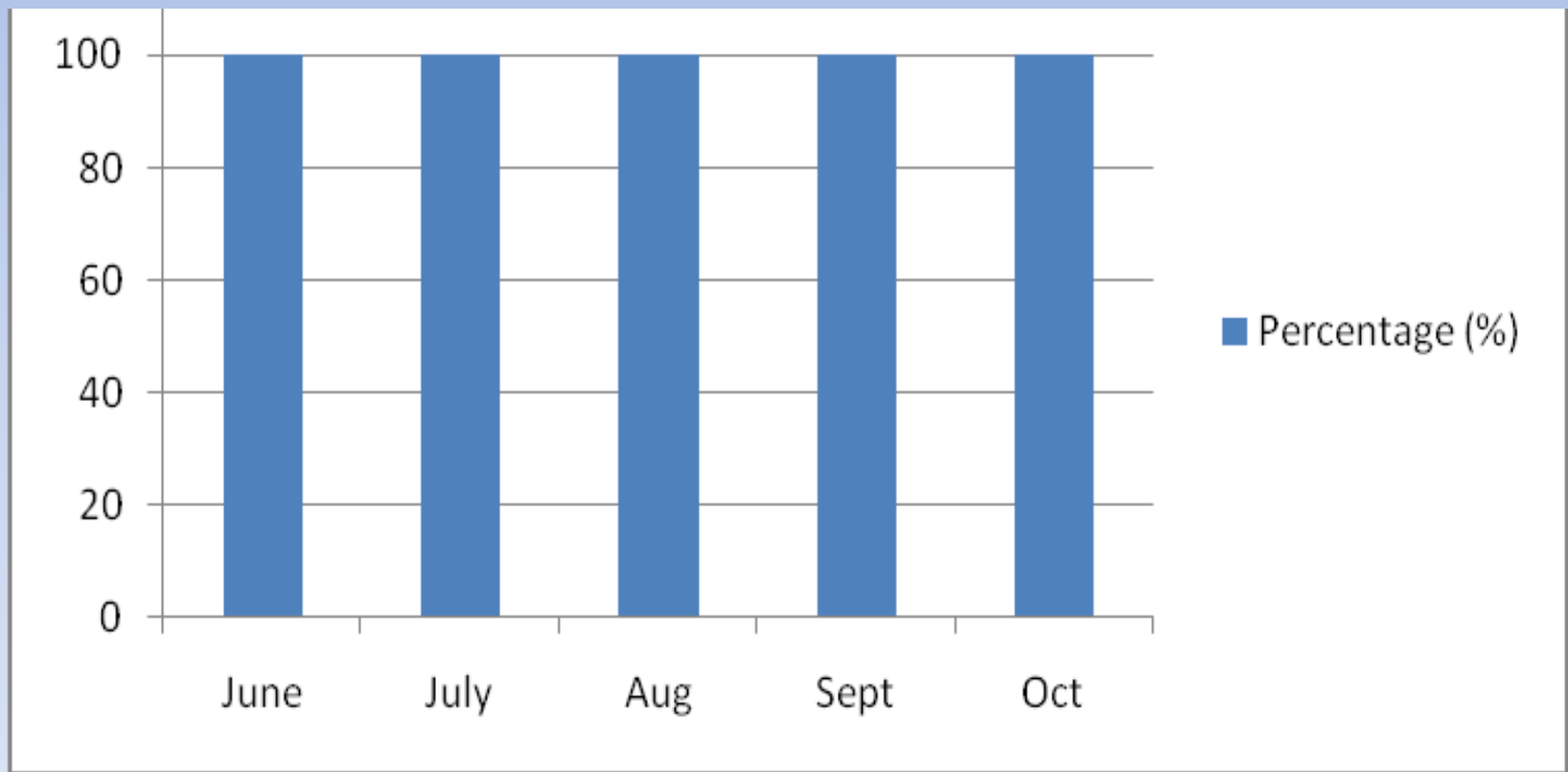
- Incidence of catheter associated blood stream infection

Catheter Associated Blood Stream Infection Rates

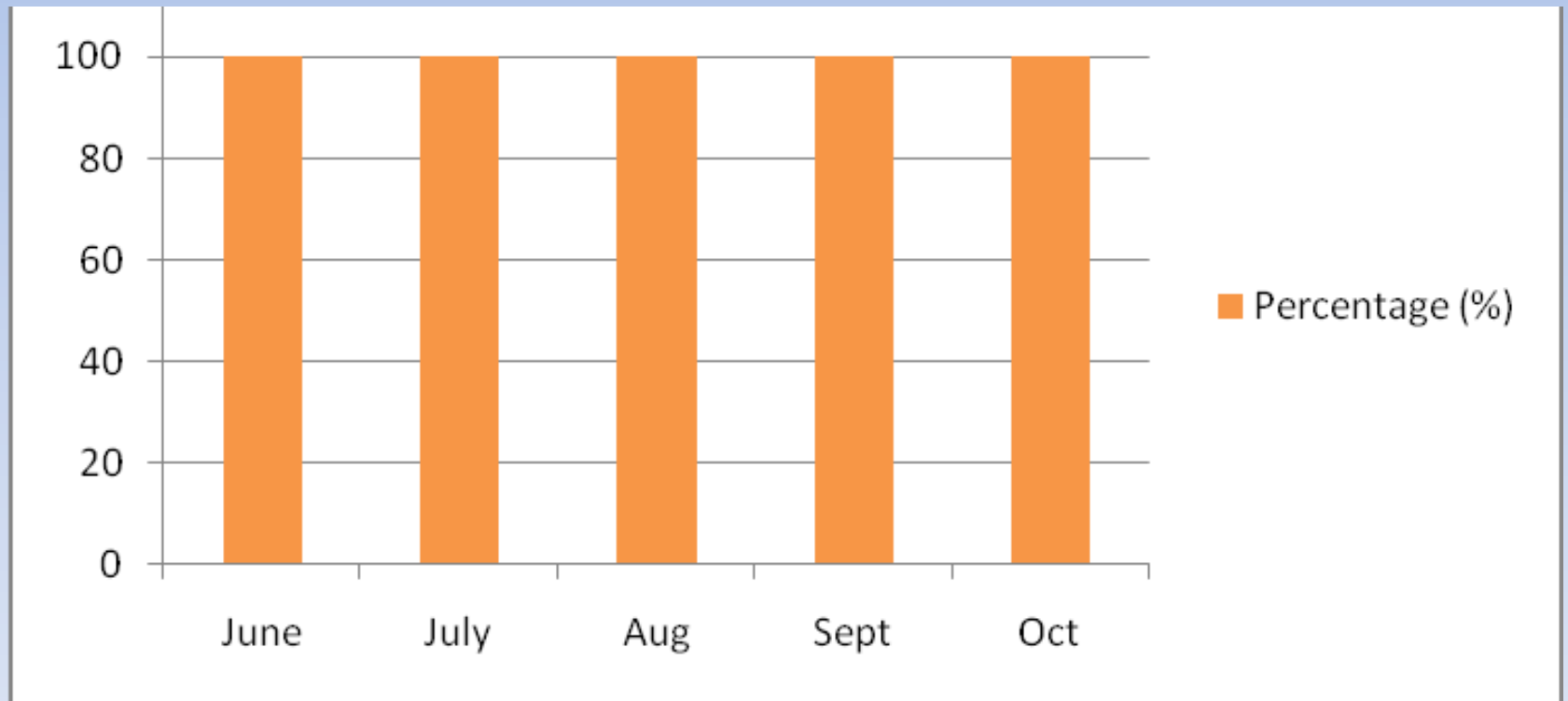
- The CABSI rate per 1000 central line days
= $\frac{\text{Number of CABSI}}{\text{Number of central line days}} \times 1000.$

RESULTS

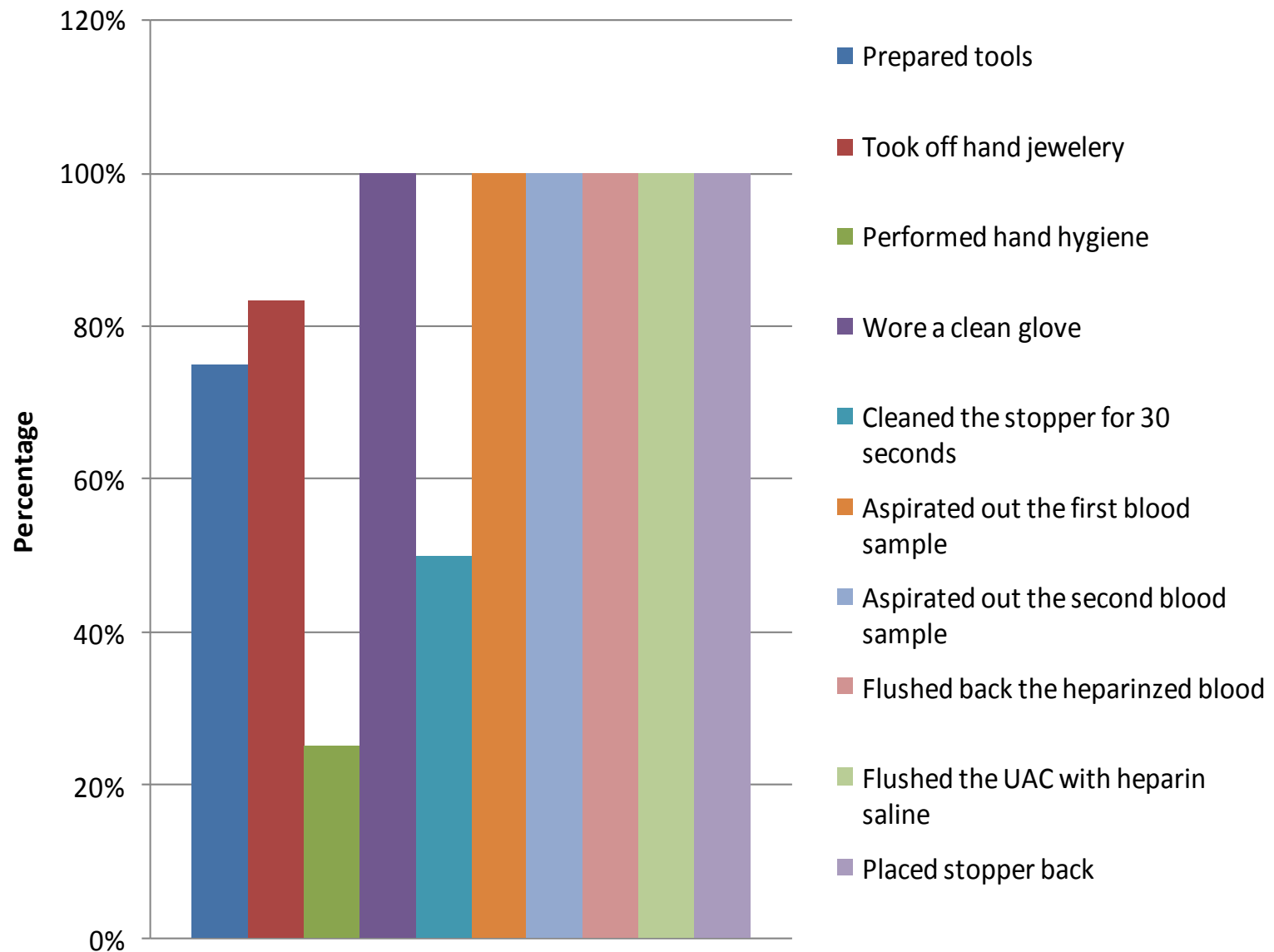
Compliance to Central Venous Catheter Insertion Bundle June – Oct 2011



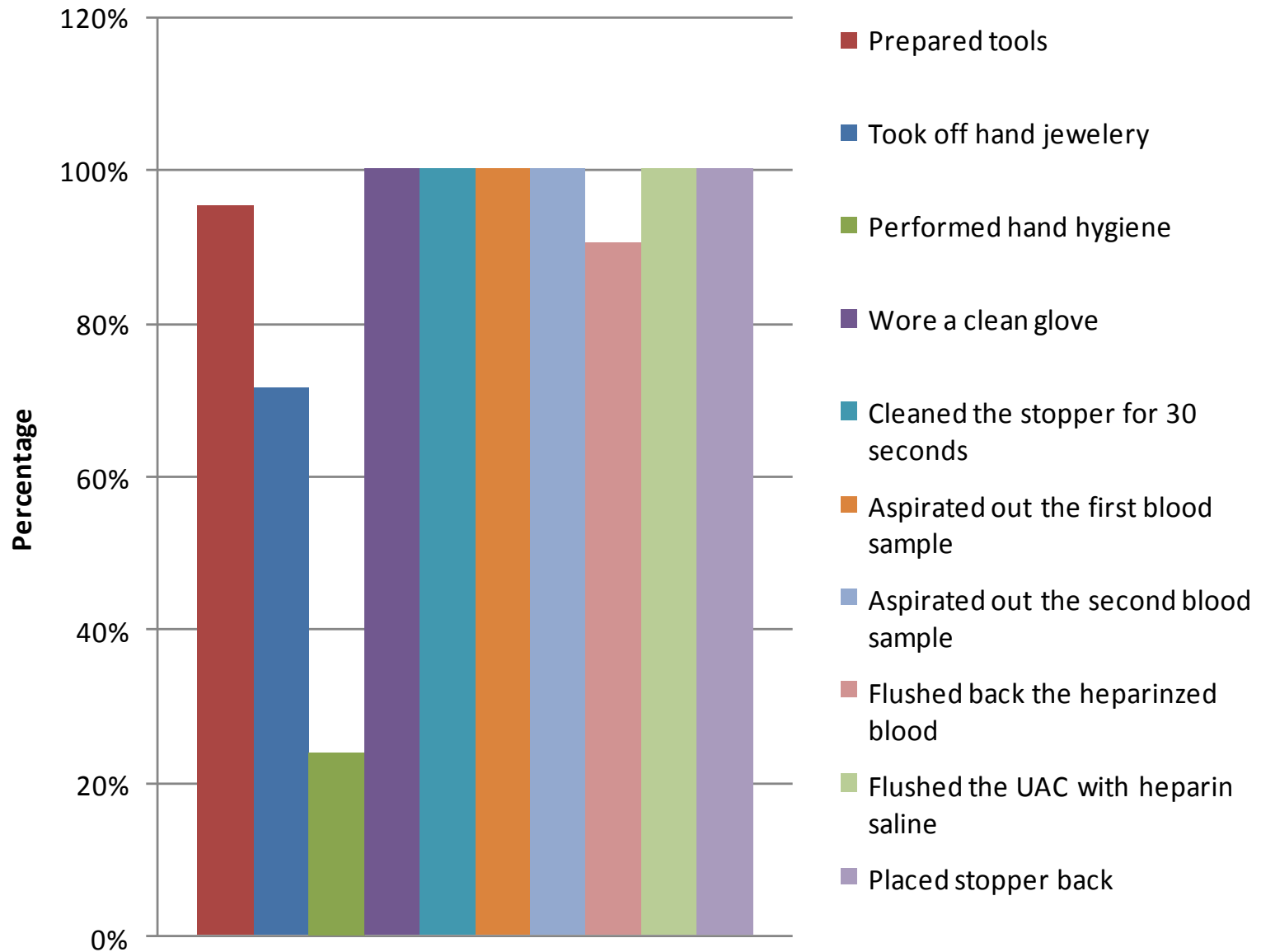
Compliance for Central Venous Catheter Maintenance Bundle (1) June-Oct 2011



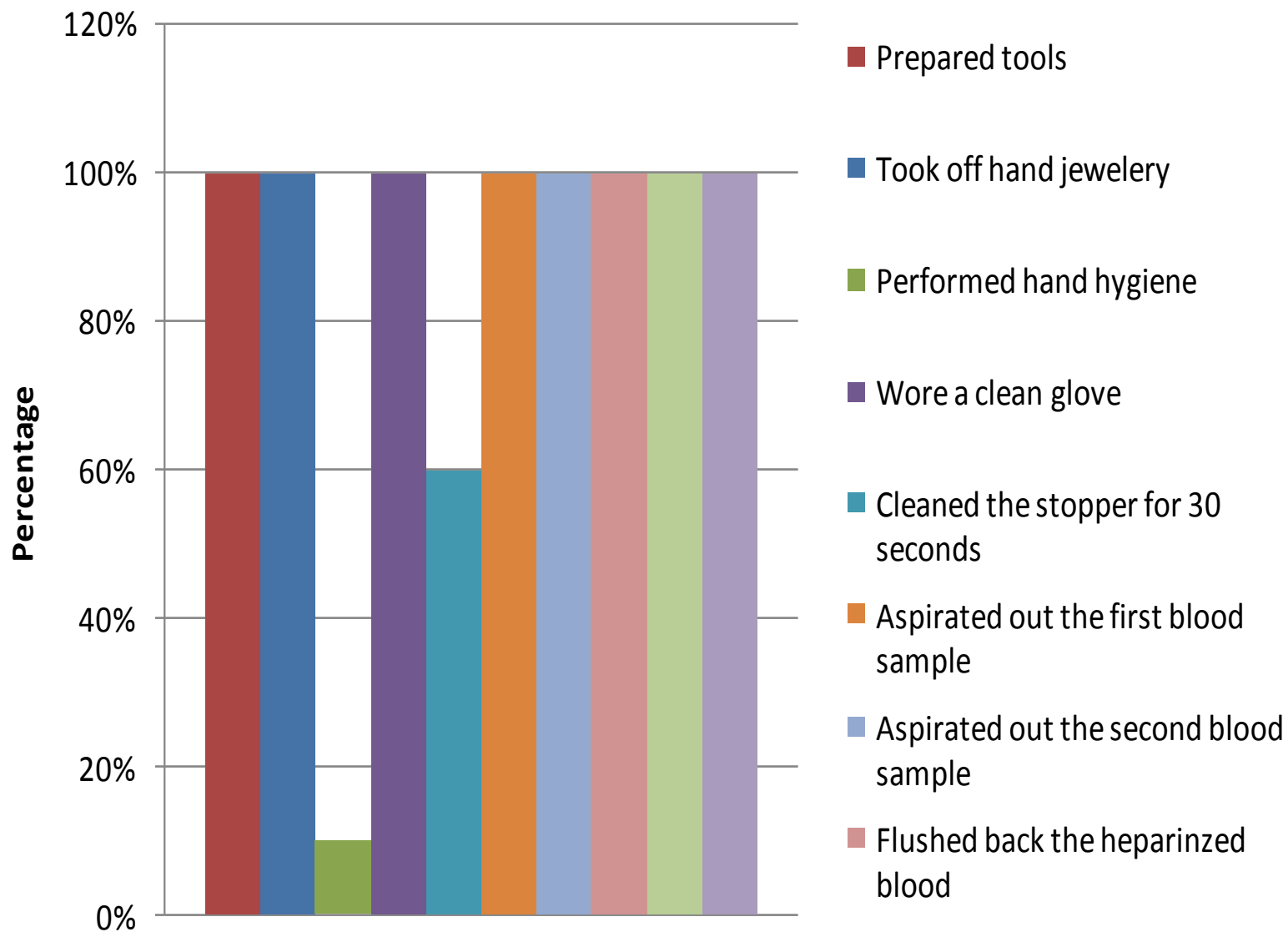
Compliance for Central Venous Catheter Maintenance Bundle (2) June 2011



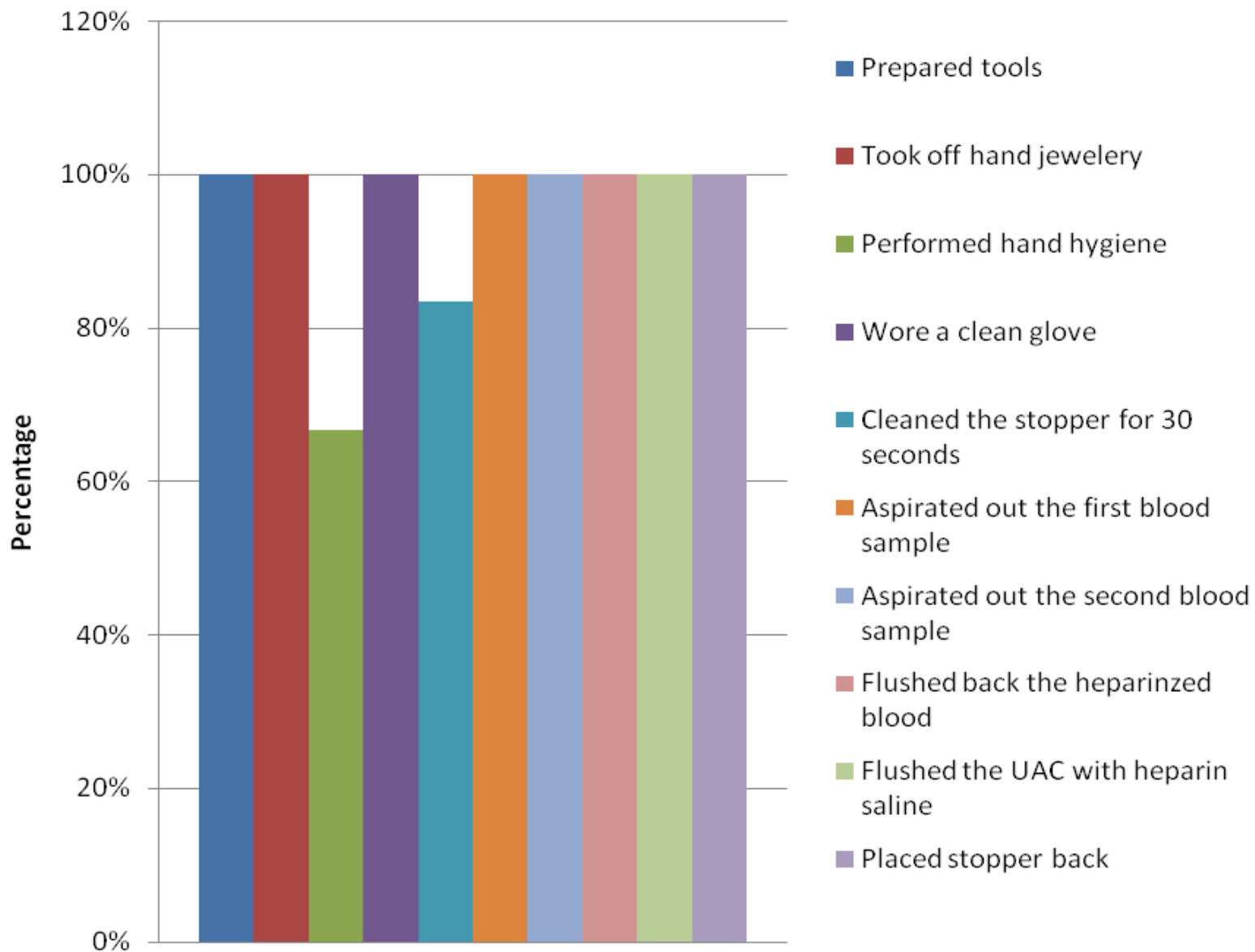
Compliance for Central Venous Catheter Maintenance Bundle (2) July 2011



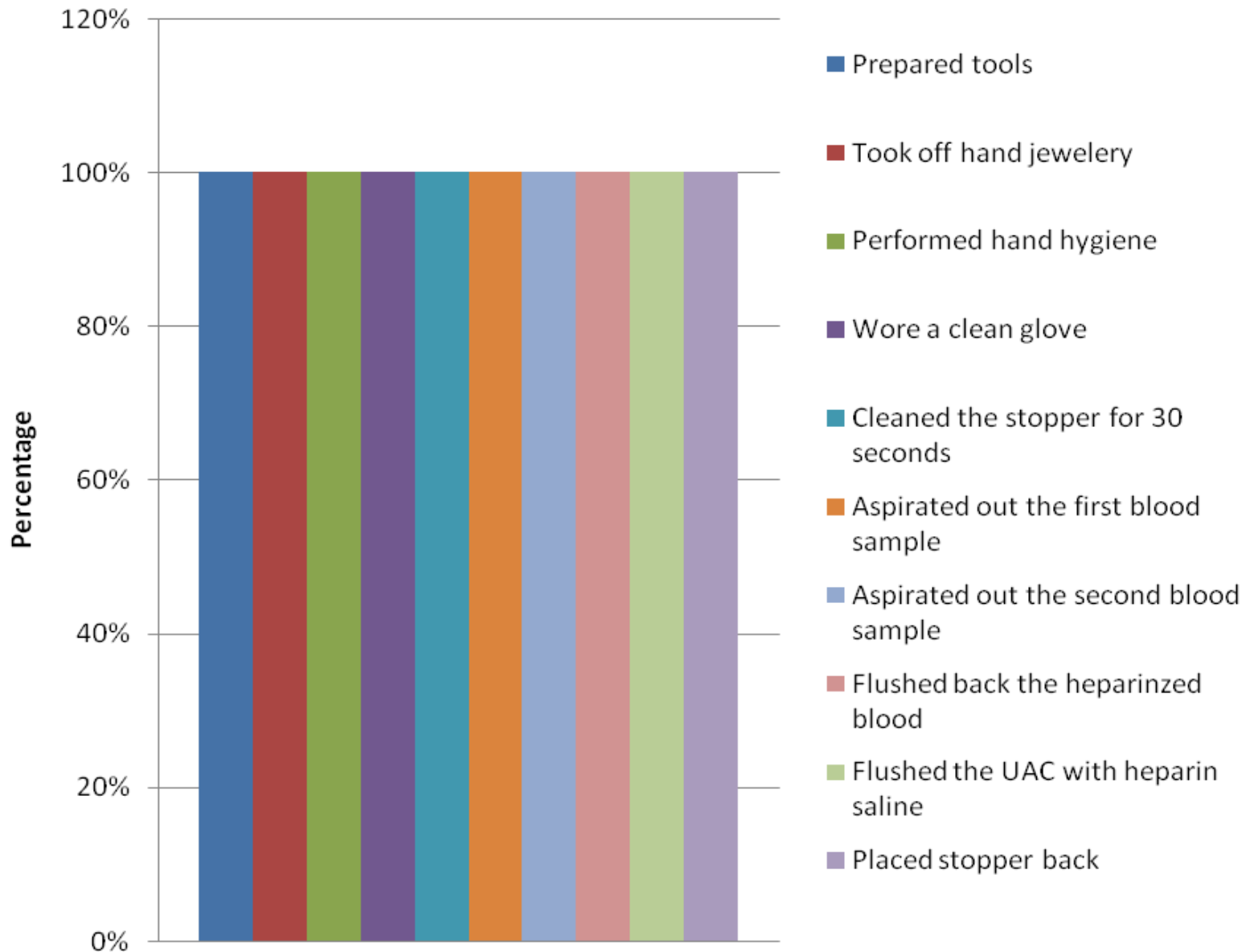
Compliance for Central Venous Catheter Maintenance Bundle (2) August 2011



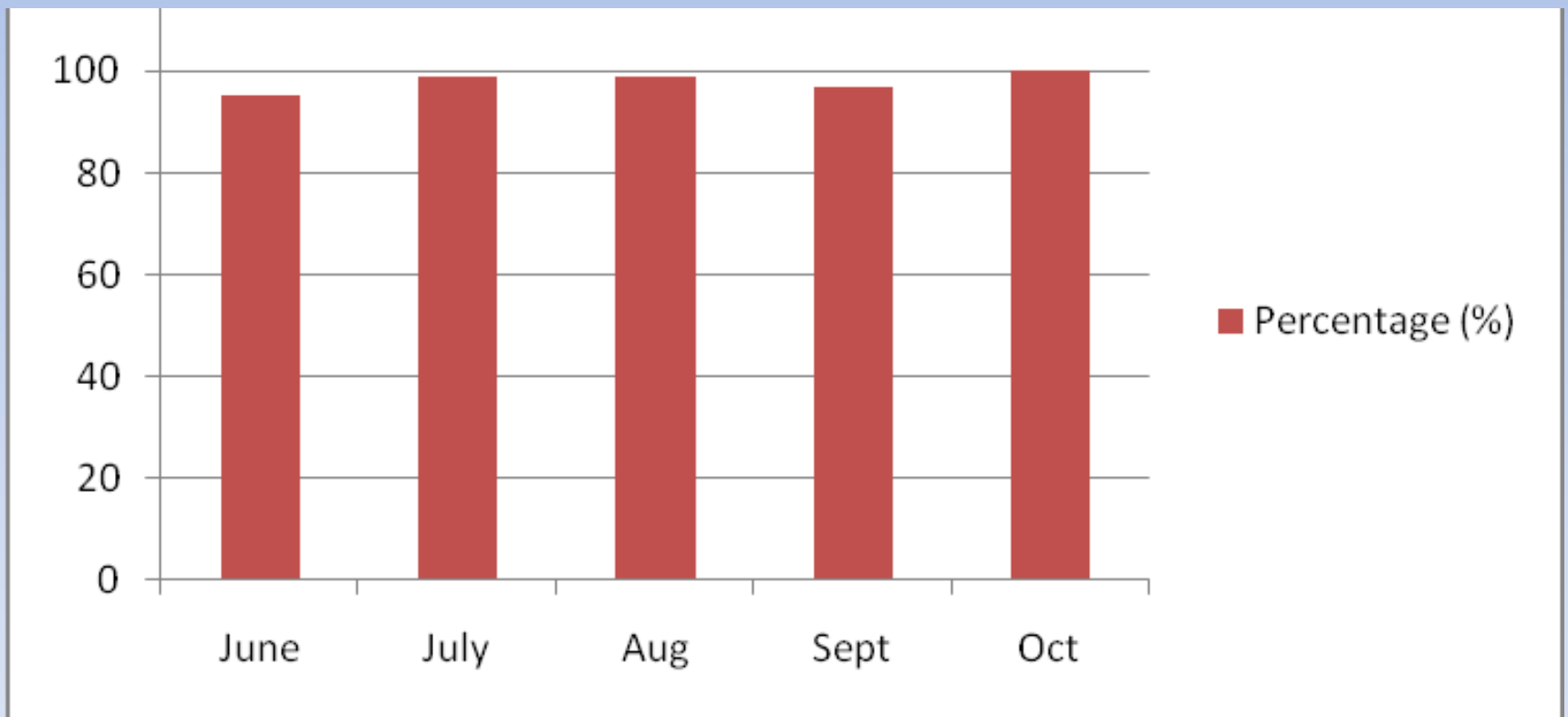
Compliance for Central Venous Catheter Maintenance Bundle (2) September 2011



Compliance for Central Venous Catheter Maintenance Bundle (2) October 2011



Compliance for Daily Review of Line Necessity June-Oct 2011



CABSI rate Year 2011



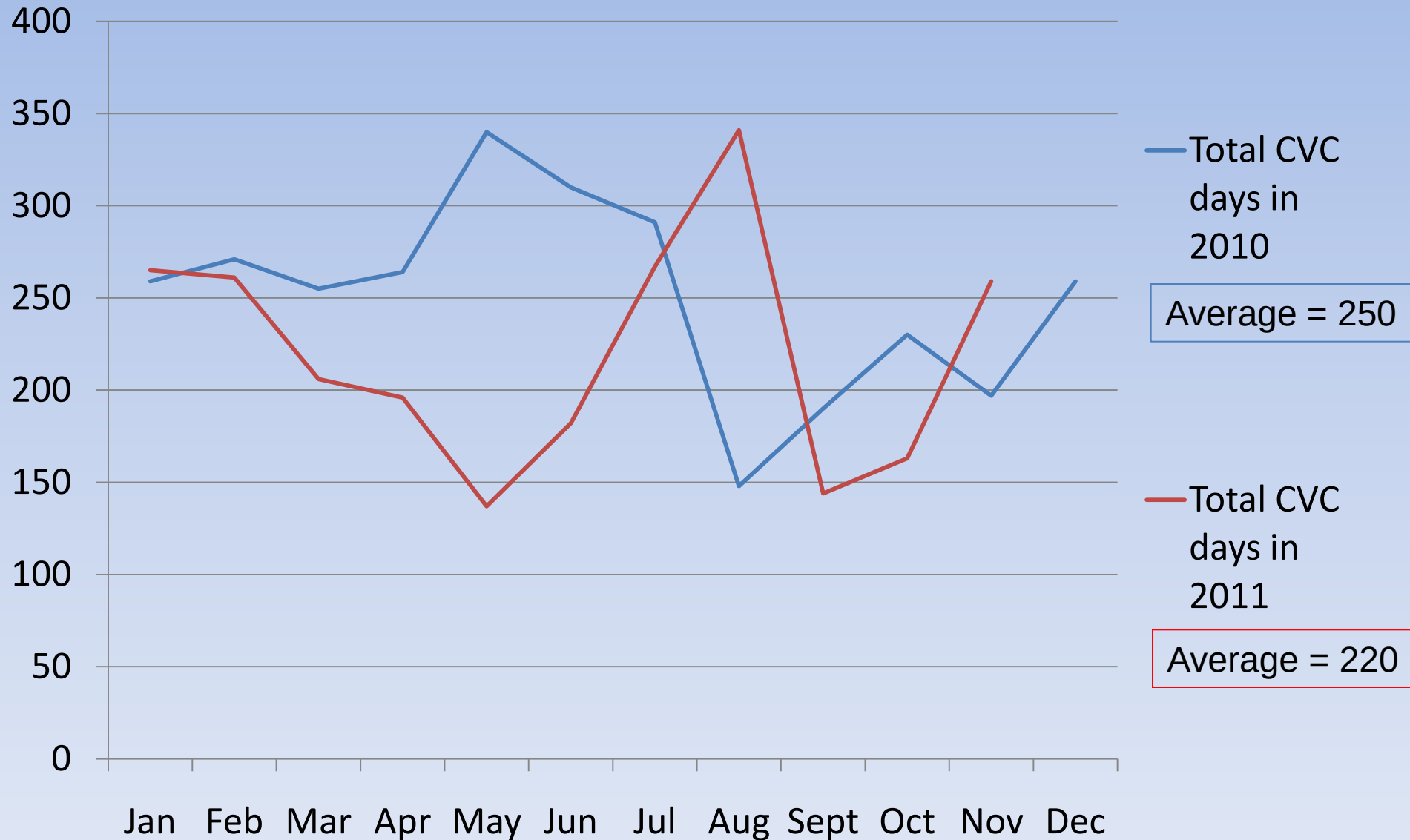
Comparison of CVC days by year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Total CVC days in 2010	259	271	255	264	340	310	291	148	190	230	197	259
Total CVC days in 2011	265	261	206	196	137	182	267	341	144	163	259	-

Total CVC days in 2010 = 3014

Total CVC days in 2011 = 2421 (excluding Dec 2011)

Comparison of CVC days by year



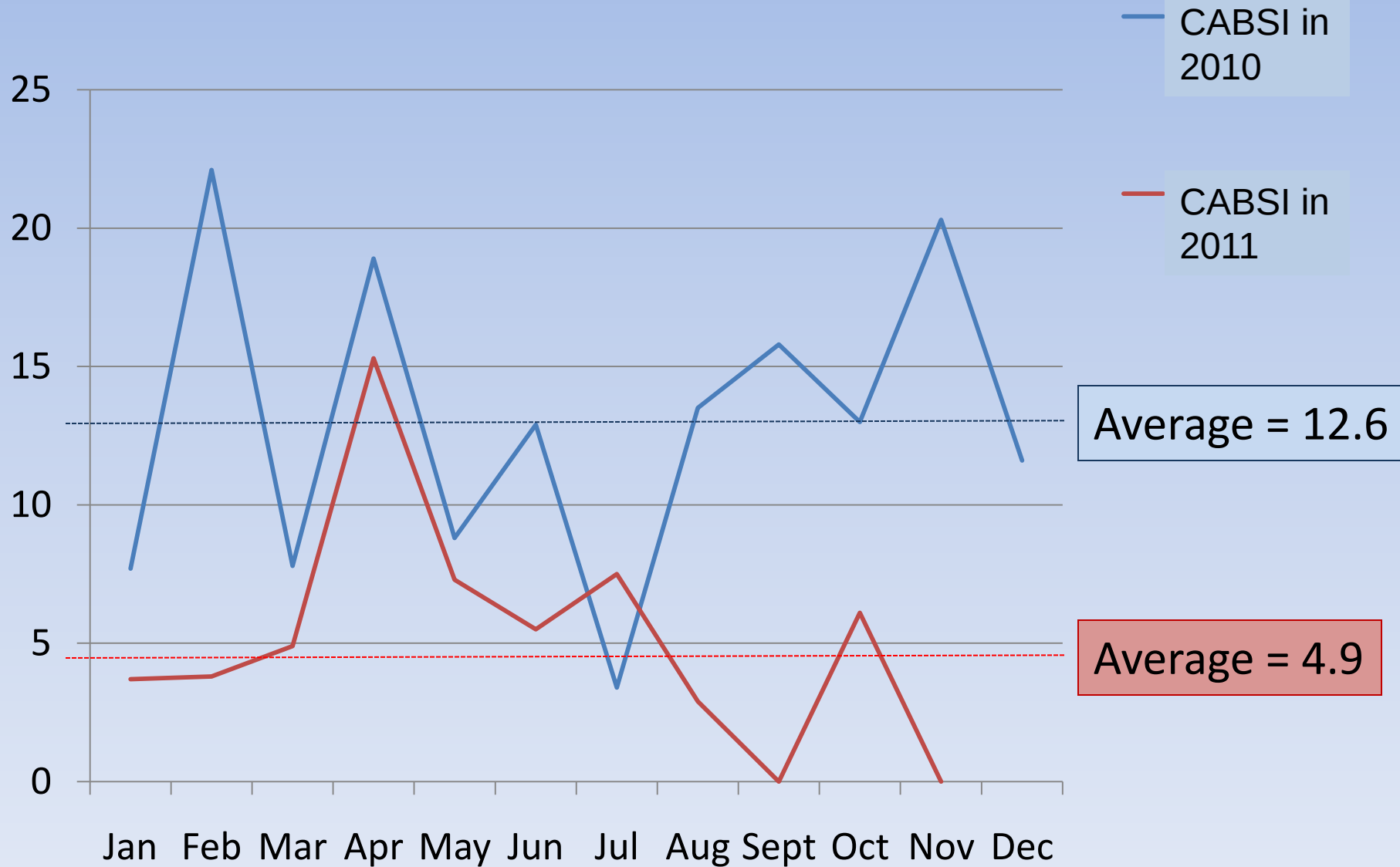
Comparison of CABSI rate by year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
CABSI per 1000 catheter days 2010	7.7	22.1	7.8	18.9	8.8	12.9	3.4	13.5	15.8	13	20.3	11.6
CABSI per 1000 catheter days 2011	3.7	3.8	4.9	15.3	7.3	5.5	7.5	2.9	0	6.1	0	-

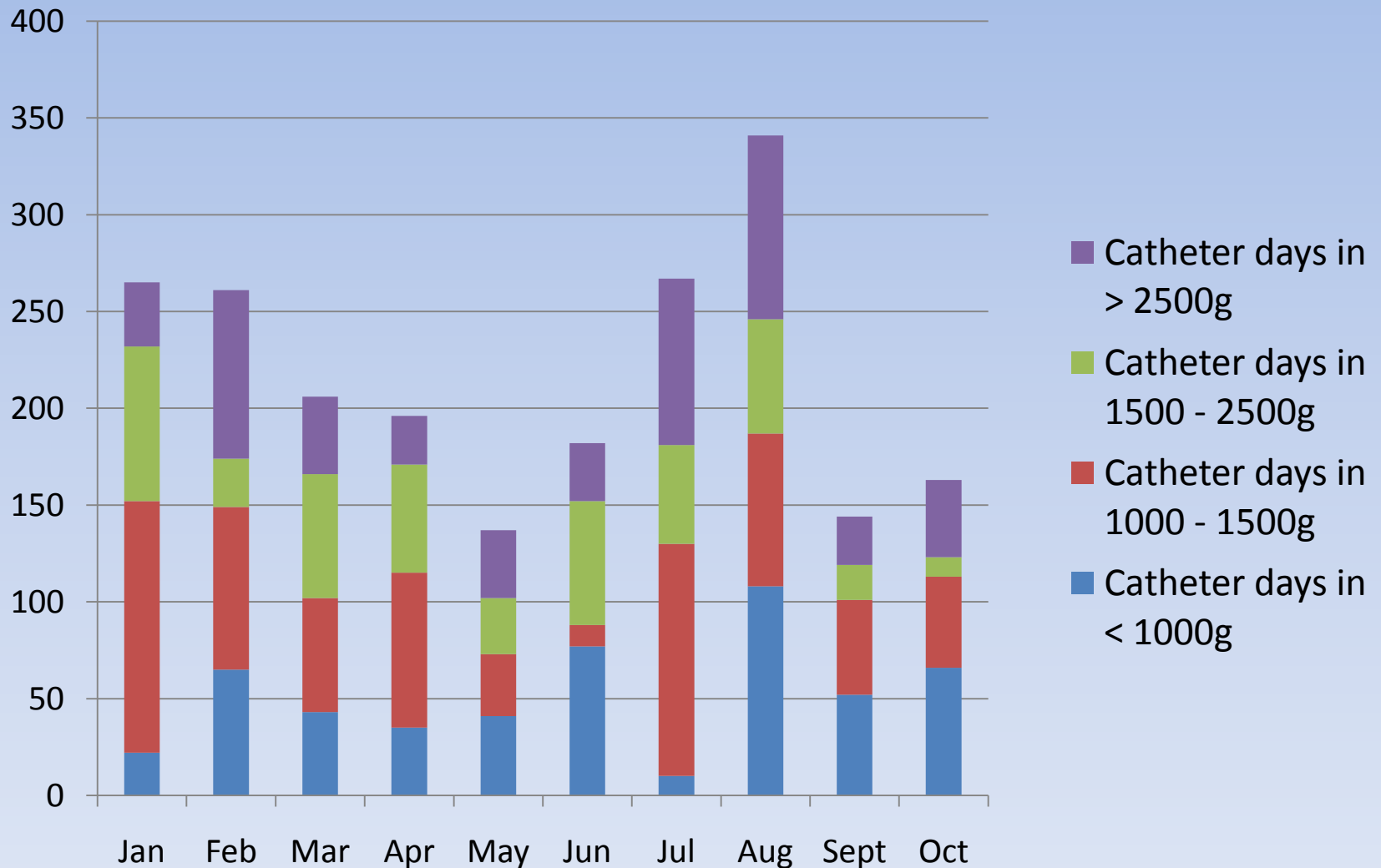
Total CABSI 2010 = 38 cases

Average CABSI rate 2010 = 12.6

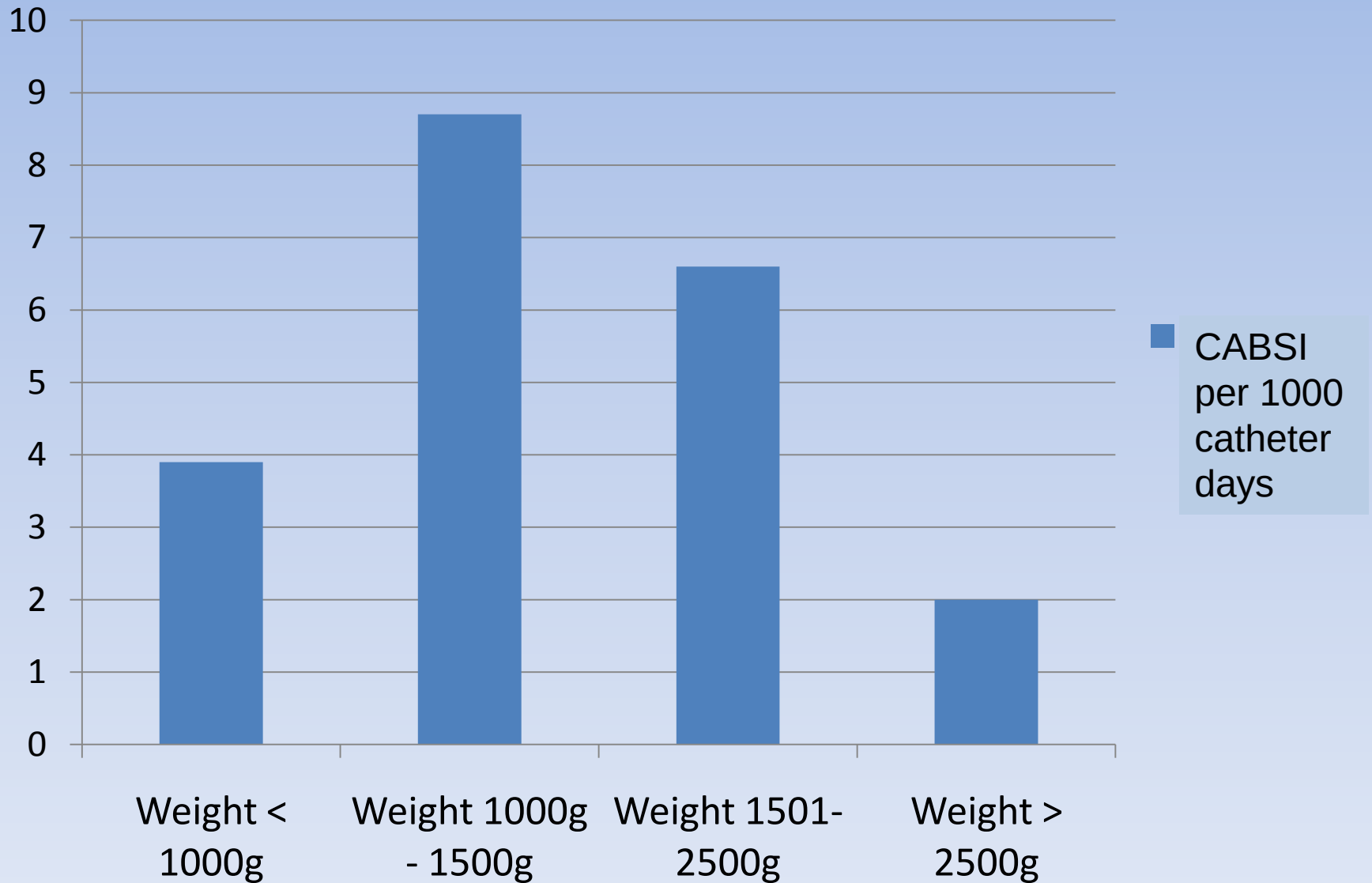
Comparison of CABSI rate by year



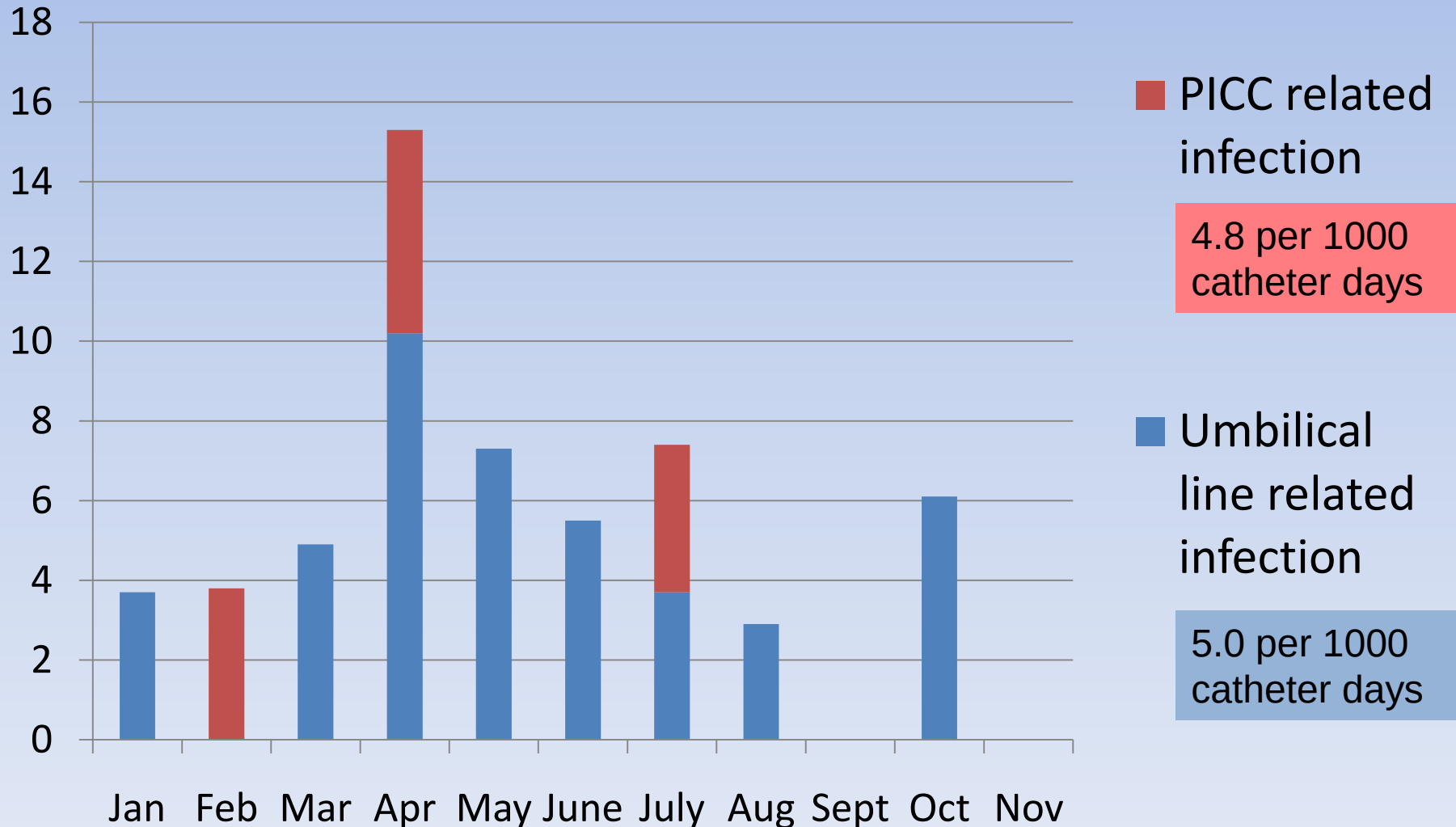
Catheter Days according to weight group



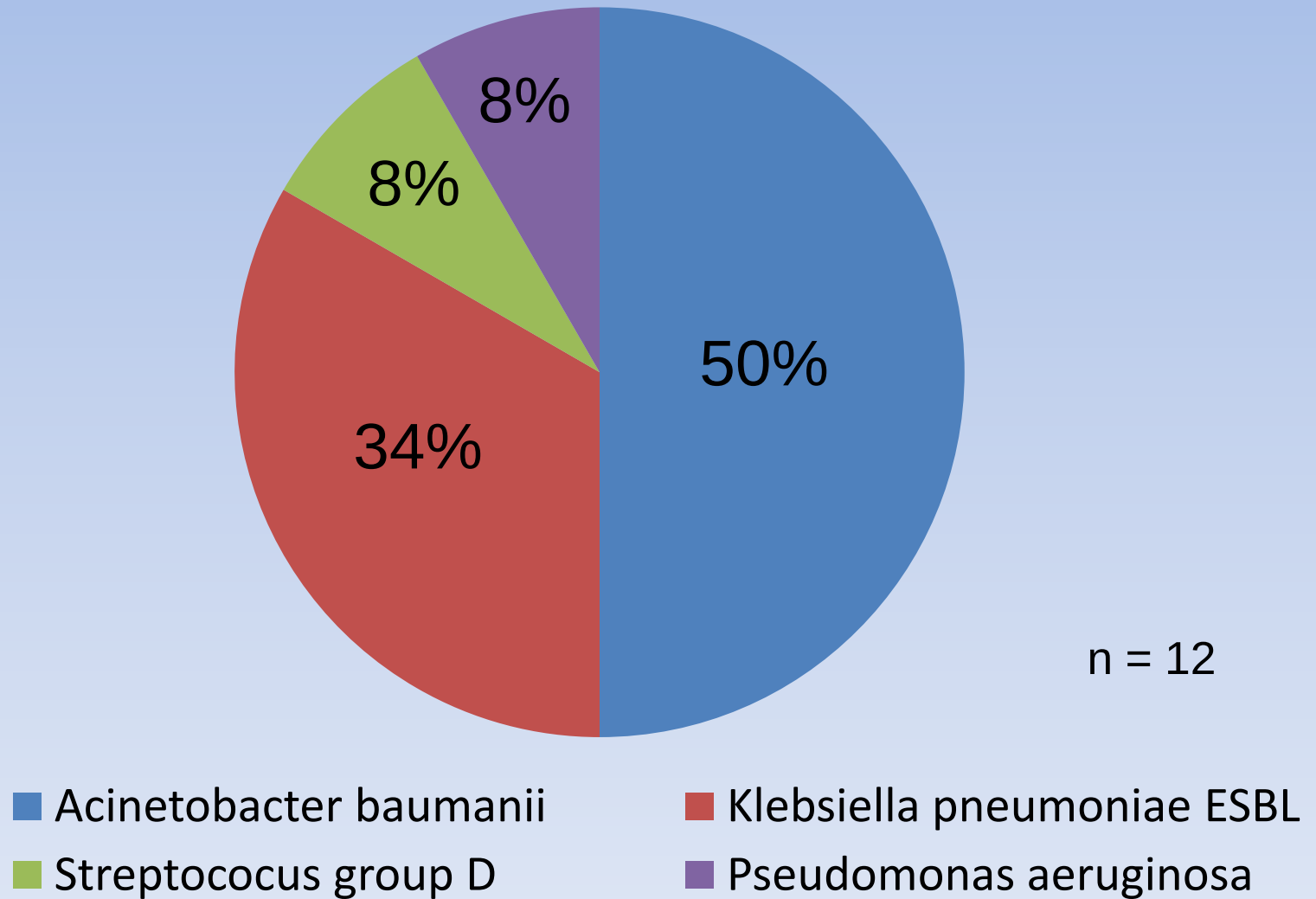
CABSI rates according to weight group



Comparison of CABSI rates vs Type of Central Catheter



Organisms causing CASBSI



Conclusion

- The care bundle helped to reduce the rates of CABSIs in the NICU
 - CABSIs for Jan – Nov 2011 = 4.9 per 1000 catheter days (reduction of 61% compared to 2010)
- Changes takes patience and time
- Insertion bundle compliance + daily maintenance care for central lines important to reduce catheter related blood stream infections.

THANK YOU