Update on Prevention Epicenter Program
June 12, 2008

Division of Healthcare Quality Promotion
Centers for Disease Control and Prevention
Atlanta, GA, USA

Overview of Prevention Epicenters Program

- Started 1997 as a way to work directly with academic partners to address important scientific questions regarding the prevention of healthcare-associated infections, antibiotic resistance, and other adverse events associated with healthcare

- New Prevention Epicenters named every five years based on peer-reviewed applications

Current Prevention Epicenter Investigators

(starting February 2006)

- The current Prevention Epicenter principal investigators are:
  - Victoria Fraser, M.D., Washington University, St. Louis, Missouri
  - Richard Platt, M.D., M.S., Harvard Pilgrim Healthcare, Boston, Massachusetts
  - Matthew Samore, M.D., University of Utah, Salt Lake City, Utah
  - Kurt B. Stevenson, M.D., M.P.H, The Ohio State University, Columbus, Ohio
  - Robert Weinstein, M.D., The Cook County Bureau of Health Services and Rush University Medical Center, Chicago, Illinois

Enhanced Inpatient SSI Surveillance

CDC Prevention Epicenters II
June 11, 2008
Atlanta

Identifying SSI using antibiotic exposure +/- discharge codes

- Premise: Routinely collected inpatient pharmacy and discharge diagnosis codes are more sensitive and more efficient than traditional SSI surveillance.
- Focus on SCIP procedures

Methods

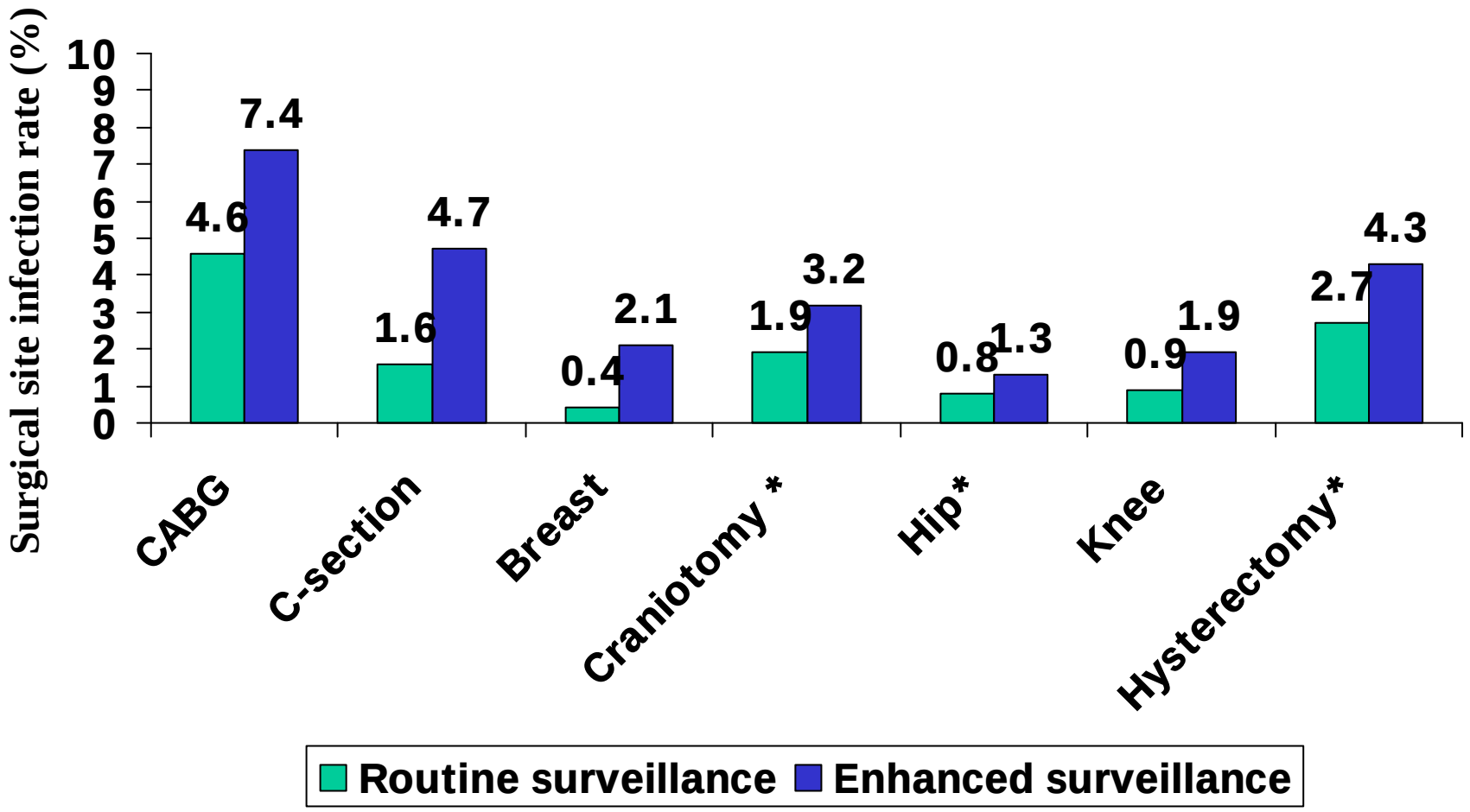
- Subjects:
  - All procedures with SSI identified by routine surveillance
  - A random sample of 200 other procedures at each hospital
- Medical records were retrospectively re-reviewed for:
  - Antibiotic exposure and ICD-9 codes
  - Reassessment of SSI classification using NHSN criteria

Identifying SSI using antibiotic exposure +/- discharge codes

Procedure	Antibiotic duration during index hospital stay	Discharge diagnosis code	Readmit with antibiotics during 30 days
CABG	**≥9 days**		+
C-sect	**≥2**	+	+
Breast	**≥6**		+
Craniotomy	**≥6**		+
Hip replacement	**≥7**	+	+
Knee replacement	**≥7**	+	+
Hysterectomy	**≥3**	+	+

Colon and vascular procedures: pending

SSI rates based on routine surveillance vs. enhanced surveillance



*Preliminary data

Eastern Massachusetts Prevention Epicenter

Conclusions

- Routine surveillance failed to detect some SSIs.
- Focused surveillance among the smaller group who met the antibiotic exposure and/or discharge code criteria was more sensitive than routine surveillance for detecting SSI.
- In many hospitals, this method would require less effort than routine surveillance of all patients.

Ranking Hospitals by SSI Risk Using Medicare Claims

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The National Medicare (CMS) Project: Overview

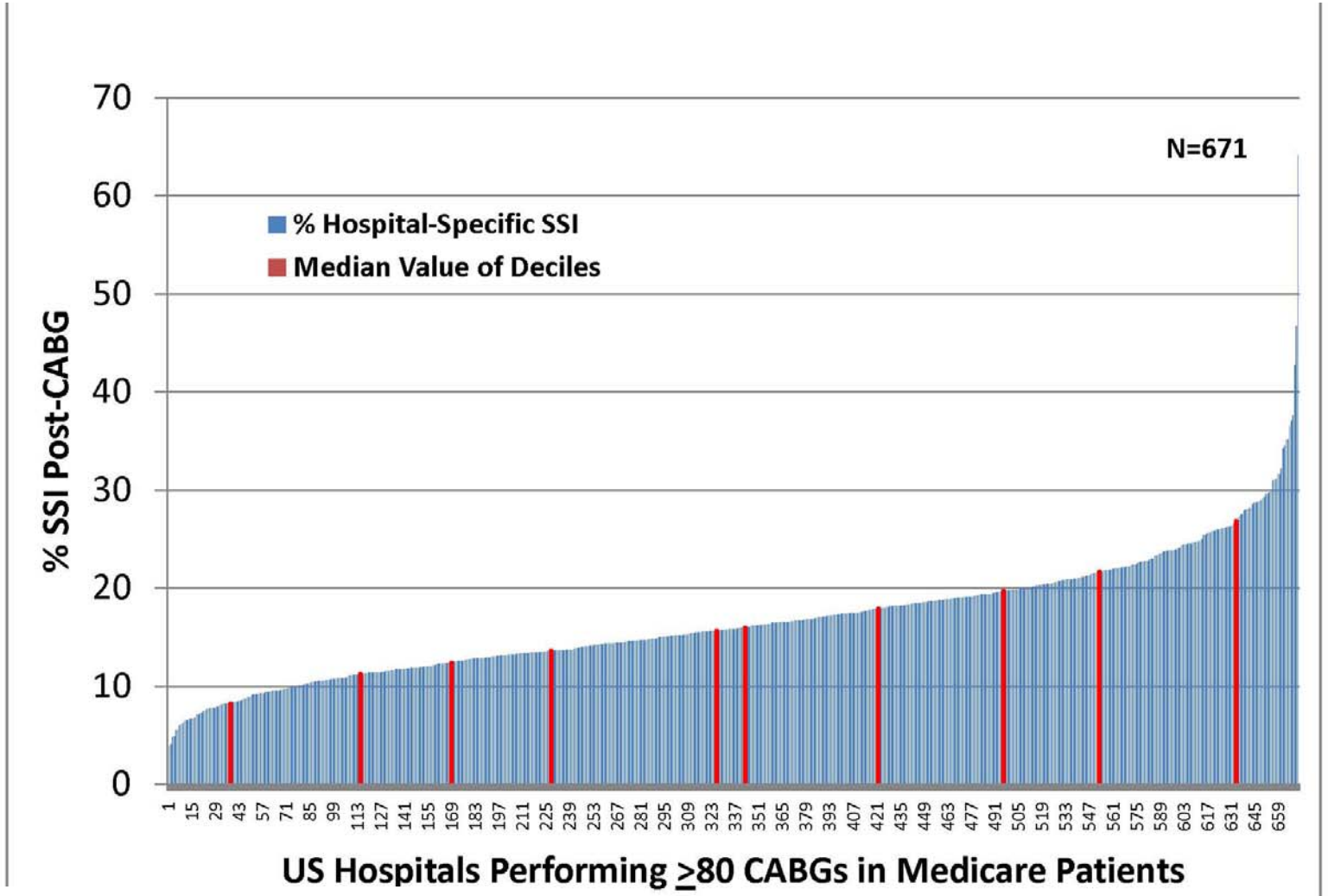
- **Hypotheses:**
  - Medicare claims can be used to standardize identification of possible surgical site infections (SSI) following coronary artery bypass graft surgery (CABG).
  - Hospital-specific SSI rates based upon Medicare claims can be used to rank hospitals

- **Background:**
  - Traditional identification of SSIs are hospital-dependent, incomplete, and non-uniform
  - The CDC Epicenters have developed claims-based indicators of SSI to distinguish between hospitals with high SSI rates vs those with low rates.

Project Goals

- Apply an algorithm using selected claims codes to 2005 Medicare claims to identify SSIs
- Identify hospital outliers with high SSI risk post-CABG
- Code refinement using Epicenters as test bed
- National validation in US hospitals

CABG SSI rankings of 671 U.S. hospitals in 2005 – CMS claims



Hospital scores are unadjusted.
Deciles are adjusted for Romano score, age, gender, and minimally invasive CABG

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National Validation
Epicenters-CMS Partnership

- CMS requests records from flagged patients in a sample of hospitals in top and bottom decile
- Assess SSI by NHSN criteria
- Assess if validated SSI% in top decile is different from those in bottom decile
- 2,500 charts
- Summer 2008

Multicenter Comparison of Electronic Algorithms for Central Line-Associated Bloodstream Infection (CLABSI) Surveillance in Intensive Care Units

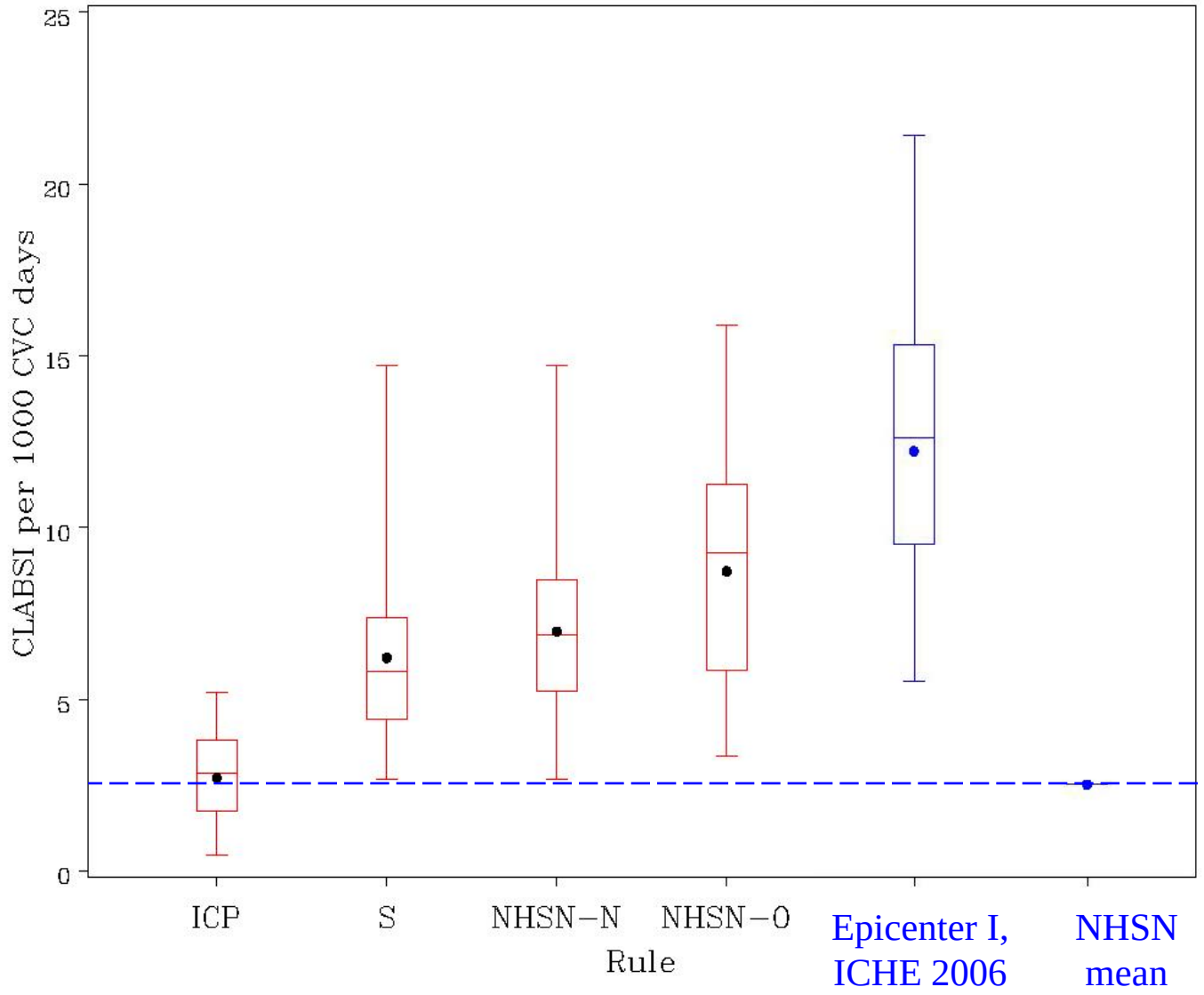
Michael Y. Lin, Bala Hota, Keith F. Woeltje, Joshua Doherty, Kurt B. Stevenson, Yosef Khan, Yingxu Xiang, Robert A. Weinstein, William E. Trick, for the CDC Prevention Epicenter Program

Study Aim

To determine whether electronic algorithms could be an acceptable surrogate for manual surveillance by ICPs in measuring central line-associated bloodstream infection rates

Design

- 4 medical centers, 2004-2006
  - Rates aggregated by ICU over 12-month periods
  - 20 ICUs
  - 47 unit-periods
    - 311,602 patient-days
    - 210,684 central-line-days
- Prospective ICP determinations
  - NHSN surveillance definitions
- Electronic algorithms applied retrospectively


CLABSI per 1000 CVC days
25
20
15
10
5
0
ICP
S
NHSN−N
NHSN−O
Rule
Epicenter I, ICHE 2006
NHSN mean

Phase II of BSI Algorithm Project

Primary Objective

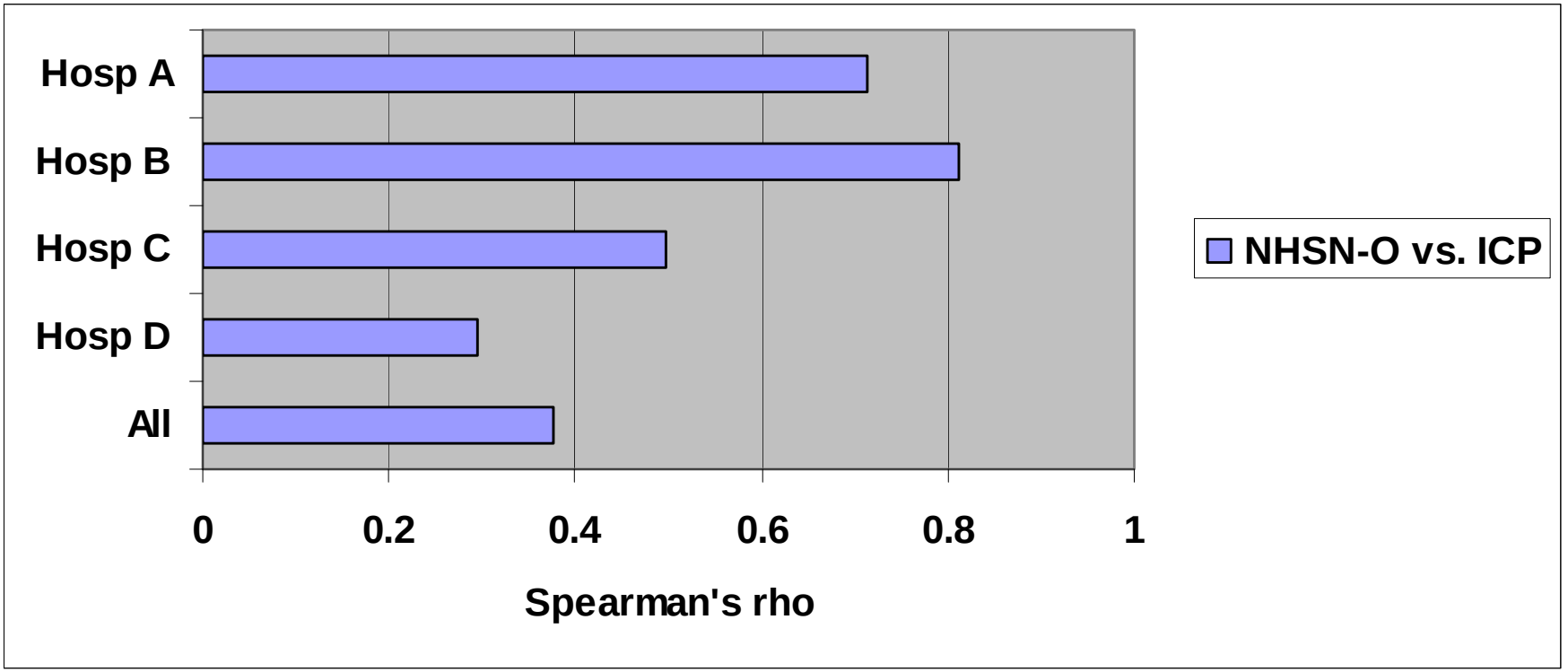
Assess the sources of variability between ICP and algorithmic central-line associated bloodstream infection (CLABSI) determinations

Secondary Objectives

Determine whether the second ICP review more often agrees with electronic or prior manual determinations

Extrapolate results from second ICP review to entire sample; calculate unit-specific BSI rates and compare to those determined by prior manual and electronic determinations

Rank Order Correlations: Electronic (NHSN-O) Versus ICP Rates



A Simulation Approach to CLA-BSI Surveillance

- Computer simulation of hospitalized ICU patients who have catheters placed and removed, and who develop infections and have cultures drawn
- Also simulated are ICPs, each of whom has their own surveillance performance characteristics
- After patient discharge, surveillance is performed on simulated data using two methods: traditional (subjective) criteria applied by simulated ICPs, and automated (objective) criteria similar to Chicago's

A Simulation Approach to CLA-BSI Surveillance

- Benefits of simulation:
  - Allows comparison of each surveillance method with a true gold standard ("truth") rather than each other
  - Allows us to examine the trade-off between *validity* and *reliability* between the two methods
  - Allows us to examine performance at estimating *true CLA-BSI rates* as well as estimating *true hospital rank order*
  - Preservation of rank order was assessed using Kendall's Tau rank correlation method
    - Measure of the proportion of concordant pairs between two sets

Results

Mean Rate Estimates

	CRBSI/1,000 catheter-days
True CRBSI Rate	4.42 ± 0.71
SC Estimated Rate	3.71 ± 0.59
OS Estimated Rate	6.09 ± 0.82

Sensitivity/Specificity

	Sensitivity	Specificity
SC Criteria	62.5% ± 7.2%	94.7% ± 2.1%
OS Criteria	82.4% ± 6.2%	86.4% ± 2.7%

Preservation of Rank Order

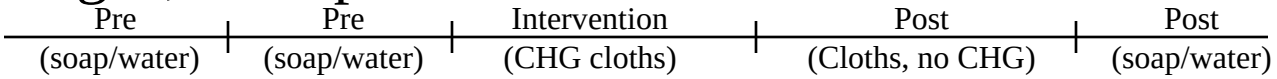
	Kendall Tau
SC Criteria	0.4048
OS Criteria	**0.4844**

Surveillance Methods
SC = subjective clinical (ICP)
OS = objective simplified

- Results suggest that objective criteria, while less accurate than subjective criteria at estimating an individual facility's true CRBSI rate, appear to provide more accurate estimates of the true differences in CRBSI rates between institutions

Reducing Infections by Daily Chlorhexidine (CHG) Bathing

- ICU-based Intervention
  - Daily skin cleansing
    - 2% CHG-impregnated cloths
    - No rinse
    - Avoiding CHG-incompatible lotions
- Outcomes
  - VRE transmission
  - Bloodstream infections
  - Multidrug-resistant organism incidence
- Three trial designs, 2 hospitals
  - Time series
  - Cross-over
  - effectiveness



Reducing Infections by Daily Chlorhexidine (CHG) Bathing

- Results
  - Major reduction in primary bacteremia, central venous catheter-associated bactermia, contaminated bloodsteram infections in Medical ICUs
  - Reduction in VRE cross-transmission and clinical incidence of MDRO from clinical cultures (VRE and MRSA) in Medical ICUs
  - No emergence of chlorhexidine resistance

Other Work

- Statewide *C. difficile* infection prevention collaborative
- Use of electronic data to measure *C. difficile* infection
- Use of electronic data to quantify antimicrobial use
- Use of electronic data to measure ventilator-associated pneumonia, and other ventilator-associated morbidity
- Electonic alerts for MRSA carriage
- Electronic alerts of unnecessary urinary catheter use