



Measurement for Improvement versus Scientific Measurement

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No conflicts of interest to disclose

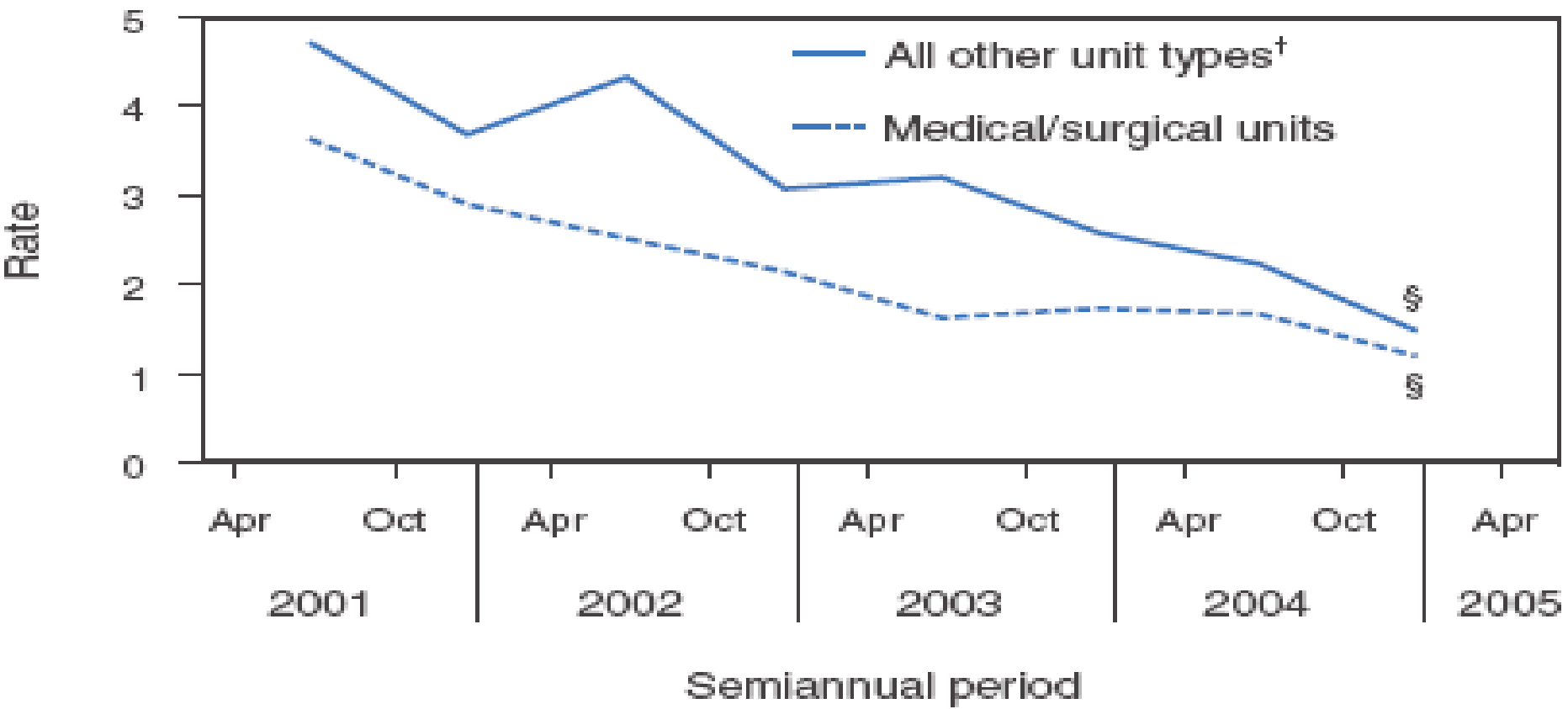
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Objectives

- Show that HAI surveillance data have been used to measure improvement
- Describe why definitions used for surveillance are different from those used for research or clinical diagnosis and management
- Describe the characteristics of surveillance definitions that can be used for inter-hospital comparison in an era of public accountability

FIGURE. Central line–associated bloodstream infection rate* in 66 intensive care units (ICUs), by ICU type and semiannual period — southwestern Pennsylvania, April 2001–March 2005



* Pooled mean rate per 1,000 central line days.

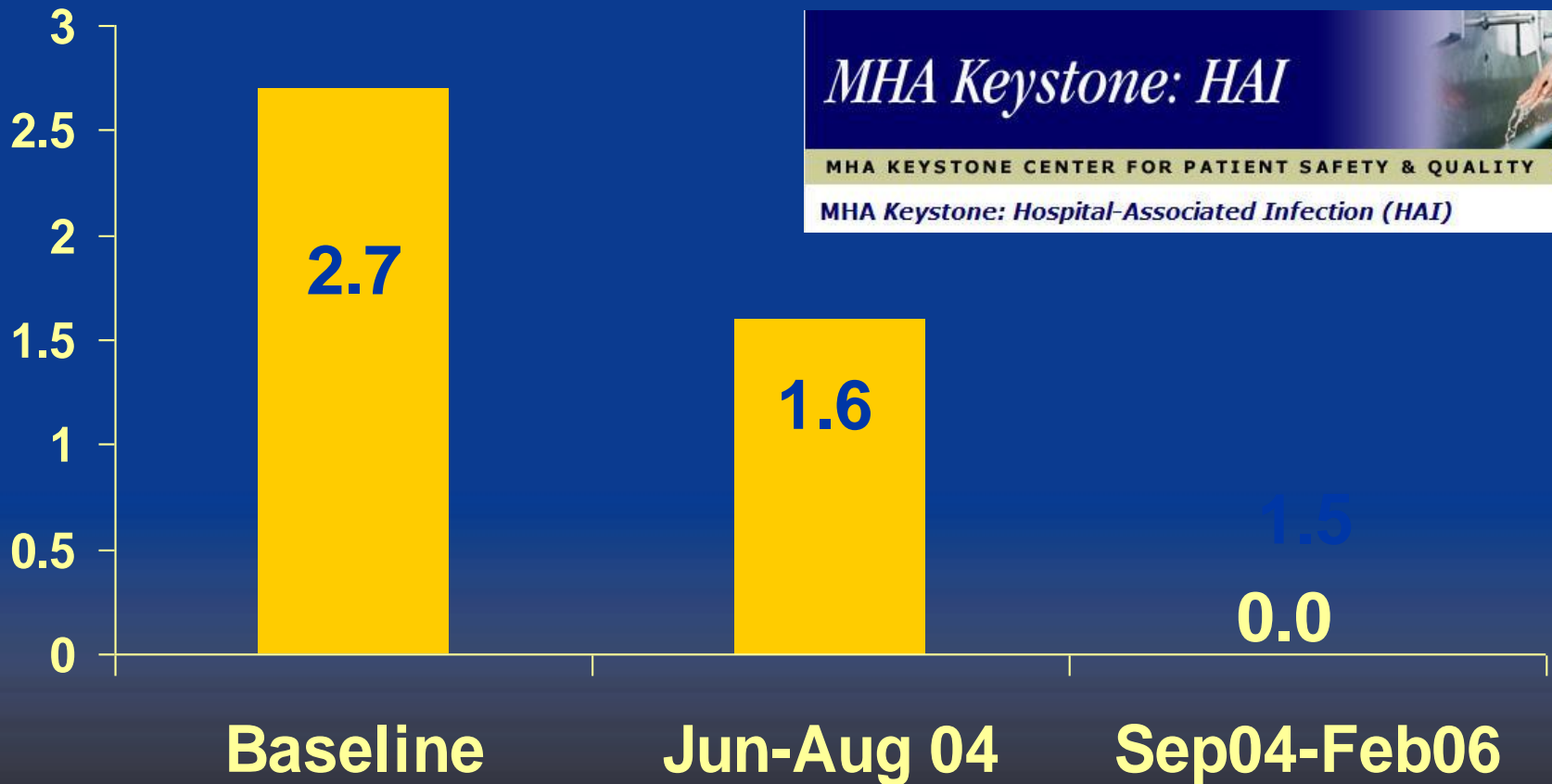
† Includes cardiothoracic, coronary, surgical, neurosurgical, trauma, medical, burn, and pediatric intensive care units.

§§ p<0.001.



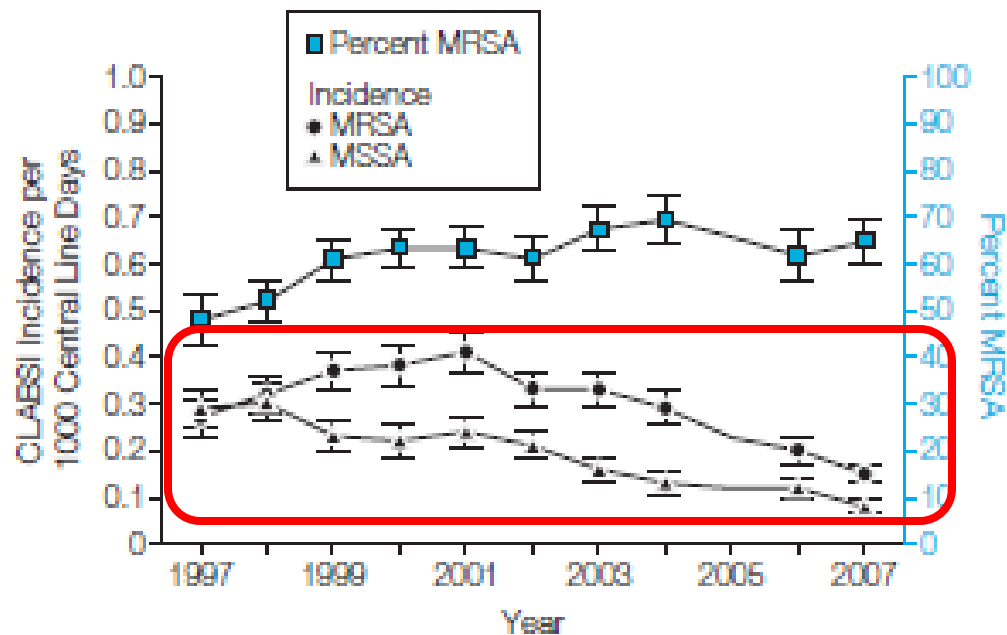
Keystone ICU CLABSI Rates*

All ICUs combined



*per 1000 central line-days Pronovost P et al. NEJM 2006;355:2725-32.

Figure 1. Trends in Percent MRSA and Incidence of *Staphylococcus aureus* Central Line–Associated Bloodstream Infections in Intensive Care Units—National Nosocomial Infections Surveillance System, 1997-2004; National Healthcare Safety Network, 2006-2007



No. of Units 491 514 552 544 520 506 498 478 n/a 488 1039

49.6%

Data are aggregated for the 7 intensive care unit types evaluated. Pooled mean percent methicillin-resistant *Staphylococcus aureus* (MRSA) is calculated as the MRSA central line–associated BSI (CLABSI) incidence divided by the sum of the MRSA CLABSI incidence and the methicillin-susceptible *S aureus* (MSSA) CLABSI incidence. CLABSI incidence for 2005 is estimated from log-linear models of the annual CLABSI trend. (No 2005 data are available from either surveillance system.) Error bars indicate 95% confidence intervals.

Burton DC et al. JAMA 2009;301(7):727-736.



Surveillance vs. Research Definitions

- Both should be highly sensitive and specific; clinically credible
- Research definitions are applied in controlled conditions
 - High sensitivity and PPV
- Surveillance definitions are applied under non-controlled conditions
 - Suboptimal sensitivity, PPV, and inter-rater reliability



Example: Ventilator-associated Pneumonia (VAP)

- Surveillance definitions used until 2002 were presence of positive chest Xray plus either new onset of purulent LRT secretions or change in character of LRT secretions or (much less commonly) positive culture of blood or minimally contaminated lower respiratory specimen or biopsy or other positive lab test



NNIS Evaluation Study: VAP

- Among infections reported by trained IP through surveillance
 - 68% sensitivity
 - 89% PPV
 - 97.8% specificity
- Among infections reported by study data collectors
 - 95% sensitivity
 - 49% PPV
 - 72.9% specificity



Example: VAP

- Since the 1970s, clinicians and researchers diagnosed VAP based on presence of positive CXR, fever, leukocytosis, and purulent LRT secretions
- In 1990s, researchers wanted a definition of that was not so subjective so added quantitative culture of bronchoscopically- and nonbronchoscopically-obtained LRT specimens

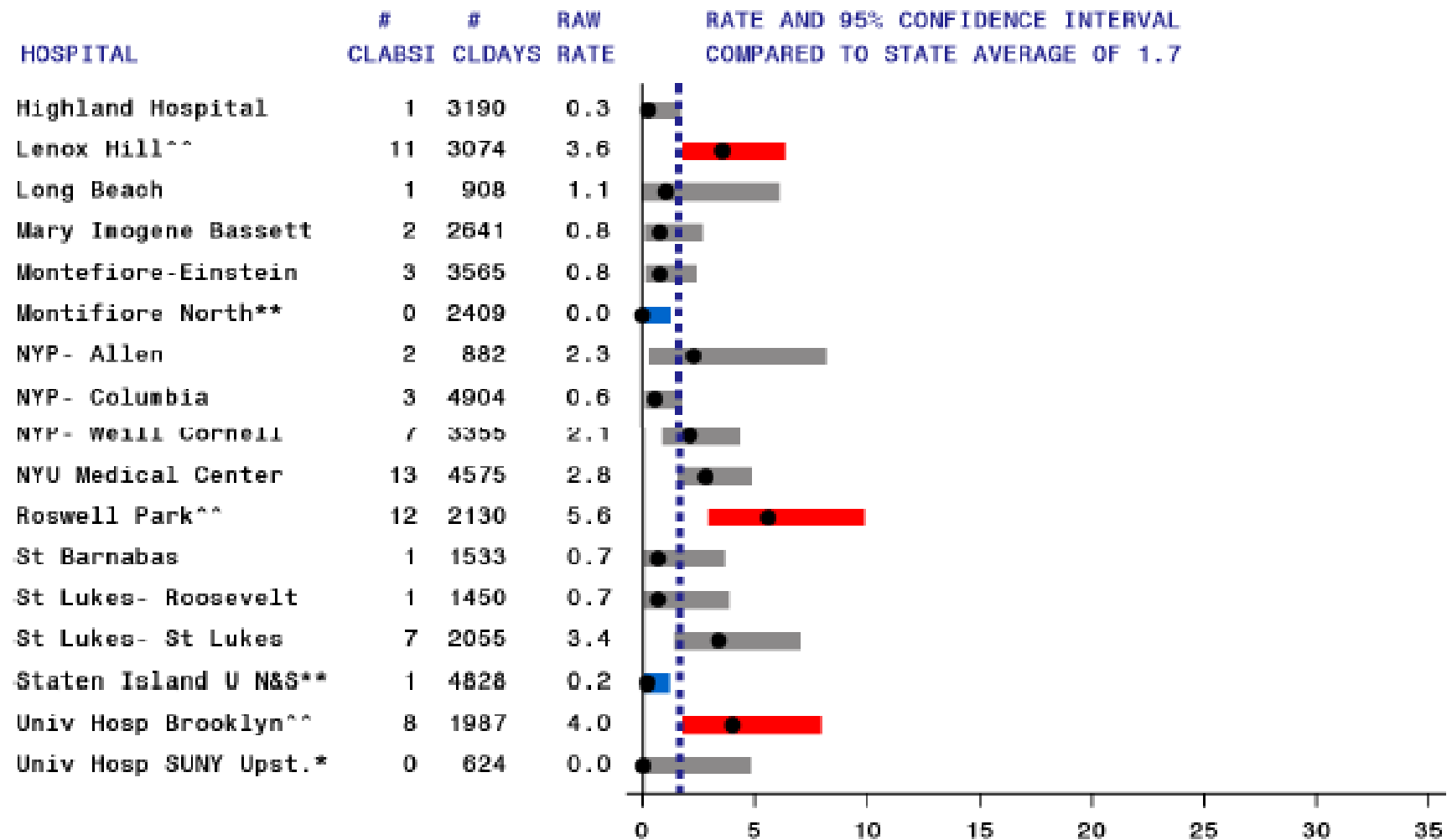


Example: VAP

- In 2002, we published new pneumonia criteria* that more closely aligned with the research/clinical criteria
- Well accepted until public reporting of VAP rates and pay-for-performance schemes began to appear
- Now working on a definition that includes only objective criteria; no chest xray findings

*http://www.cdc.gov/nhsn/PDFs/pscManual/17pscNosInfDef_current.pdf

**Figure 15. Central Line-Associated Blood Stream Infection (CLABSI) Rates
Medical-Surgical Intensive Care Units in Major Teaching Hospitals, New York 2009**



| State Average. ● Infection rate. > Upper confidence limit exceeds graph area

—^^ Significantly higher than state average. —** Significantly lower than state average. — Average. —* Zero Infections, not significant.

Data reported as of August 25, 2010. Rates are per 1000 central line days (CLDAYS).

NA: Hospitals with less than 50 central line days.

Excludes untreated event with single pathogen contaminated specimen.



Improvements to Surveillance

- Increase clinical credibility of the data
 - Robust to criticism from hospitals and care teams being assessed
- Enhance reliability of case detection
 - Minimize variability applied to the surveillance process

Enhance Reliability of Case Detection

Quality of Traditional Surveillance for Public Reporting of Nosocomial Bloodstream Infection Rates

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PUBLIC REPORTING OF HOSPITAL-specific infection rates is widely promoted as a means to improve patient safety.^{1,2} Central line-associated bloodstream infection (BSI) rates are considered a key patient safety measure because such infections are frequent,³ lead to poor patient outcomes,⁴ are costly to the medical system,⁵ and are preventable.^{6,7} Publishing infection rates on hospital report cards, which is increasingly required by regulatory agencies, is intended to facilitate interhospital comparisons that inform health care consumers and provide incentive for hospitals to prevent infections.⁸ Interhospital comparisons of infection rates, however, are valid only if the methods of surveillance are uniform and reliable across institutions.^{9,10}

Most hospitals performing central line-associated BSI surveillance rely on infection preventionists (formerly known as infection control practitioners¹¹) to manually perform central line-associated BSI surveillance. The infection preventionists apply surveillance case definitions published by the Cen-

“In this study, we found strong evidence of institutional variation in central line-associated BSI surveillance performance among medical centers. Inconsistent surveillance practice can have a significant effect on the relative ranking of hospitals, which threatens the validity of the metric used by both funding agencies and the public to compare hospitals.”

Conclusions: Institutional variability of infection preventionist rates relative to a computer algorithm reference standard suggests that there is significant variation in the application of standard central line-associated BSI surveillance definitions across medical centers. Variation in central line-associated BSI surveillance practice may complicate interinstitutional comparisons of publicly reported central line-associated BSI rates. *JAMA*. 2010;304(18):2035-2041. doi:10.1001/jama.2010.2041

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- Different information available
- Documentation
- Diagnostic practices

Enhance Reliability of Case Detection

- Significant variations between reviewers exist for CLABSI ^{*(573,305)}
- Poor Inter-rater reliability for CLABSI centered around key issues ^{*(242,305,573)}
 - Differences in classifying secondary BSI
 - Differences in applying NHSN criteria regarding common commensal rules
 - Some differences in interpreting incubating on admission

242. Gaur, et al., Assessing Application of the National Healthcare Safety Network (NHSN) Central Line-Associated Bloodstream Infection (CLABSI) Surveillance Definition Across Pediatric Sites

305, Malpiedi, et al. Interobserver Variability in Bloodstream Infection Determinations Using National Healthcare Safety Network Definitions

573. Mayer, et al. Use of Electronic Reporting and Annotations by Infection Preventionists (IPs) to Describe Differences in the Application of Surveillance Criteria

Enhance Reliability of Case Detection

- Modify surveillance criteria to facilitate improved classification BSI and CLABSI
 - Simplify categorization of timing issues (not present/incubating)
 - Include a minimum duration of central line use criterion
 - Create “translocation” BSI event under consideration (2° BSI issue)



Summary

- Surveillance definitions have been used to measure improvement
- They are not the same as those used for research or clinical care
- However, in an era of public accountability, surveillance definitions need to be refined to minimize variability in case detection