Findings from the Virginia Department of Health (VDH) 2010 Central Line-Associated Bloodstream Infection (CLABSI) Data Audit Project

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Learning Objectives

1) Quantify the CLABSI case status discrepancies identified by the data validation specialists

2) Describe issues leading to the misclassification of CLABSI events

3) Identify lessons learned regarding CLABSI surveillance and quality assurance methods

4) Learn how the CLABSI data audit project aligns with state and federal HAI reporting initiatives and the VDH HAI Program

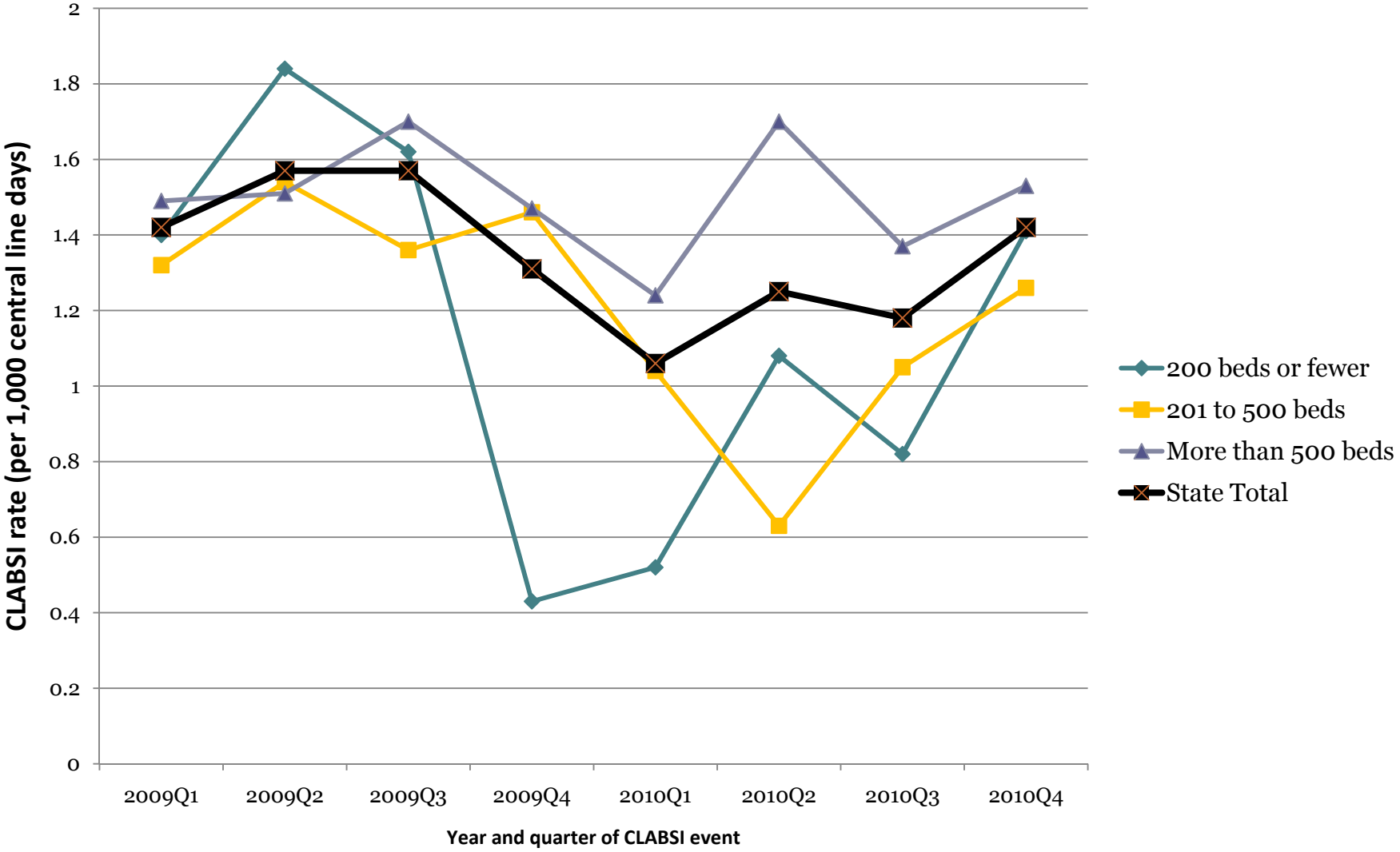
Outline of Today's Webinar

- Introduction
- Methods
- Results
- Discussion
- Next Steps

Impetus for CLABSI Audit

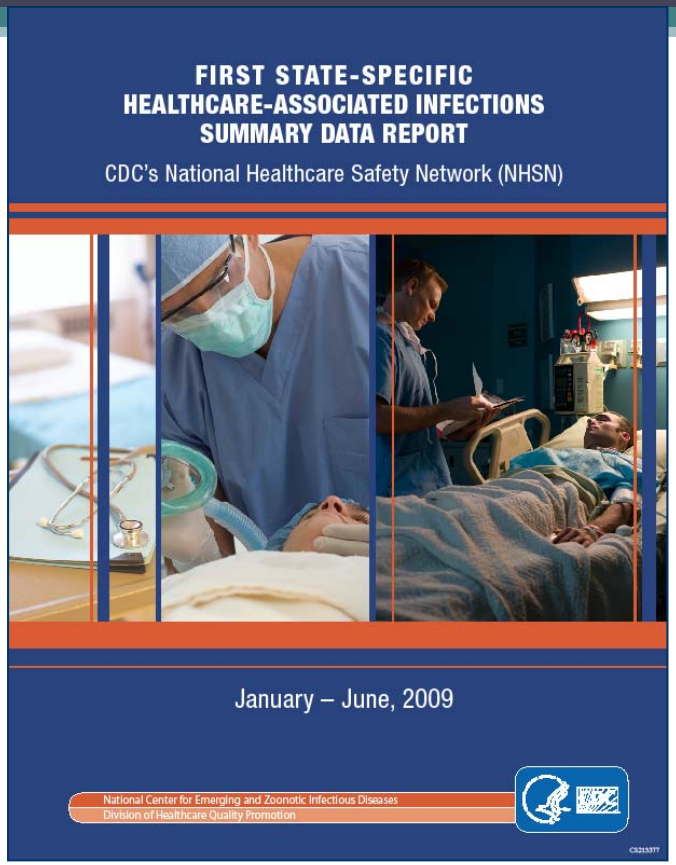
- July 2008: Virginia state mandate to report central line-associated bloodstream infections (CLABSIs) in adult intensive care units using the National Healthcare Safety Network (NHSN)
- 2009: CDC HAI American Recovery and Reinvestment Act (ARRA) grant
  - Goal to enhance surveillance
- 2010: Virginia acute care needs assessment
- 2010-2011: CDC publication of state-specific infection reports using standardized infection ratio (SIR)

CLABSI rate by bedsize category and quarter, Virginia, 2009-2010

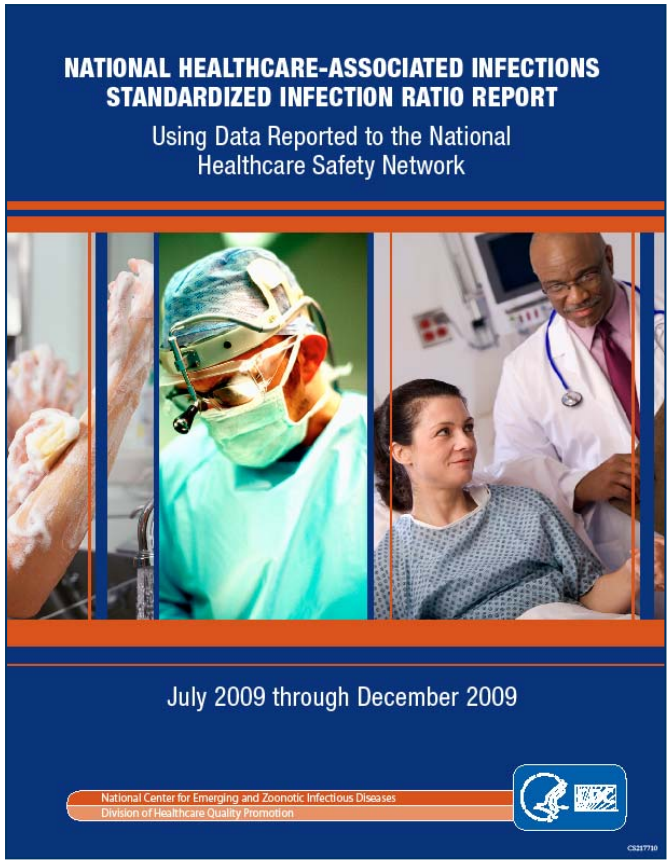


Central Line-Associated Bloodstream Infections (CLABSIs) Reported by Facilities in Virginia with Adult Intensive Care Units, by Bedsize Category
Quarter 4, 2010

Facility Name	Composite*	Number of CLABSIs	Central Line Days	CLABSI Rate (per 1,000 Central Line Days)**
≤200 Licensed Beds				
Alleghany Regional Hospital	yes	0	38	0
Bedford Memorial Hospital (Carillion)		0	29	0
Bon Secours Mary Immaculate Hospital		0	141	0
Bon Secours Richmond Community Hospital		0	157	0
Bon Secours St. Francis Medical Center		1	400	2.5
Buchanan General Hospital		0	11	0
Carilion Franklin Memorial Hospital		0	35	0
Carilion Giles Memorial Hospital		0	12	0
Carilion New River Valley Medical Center		0	461	0
Carilion Stonewall Jackson Hospital		0	6	0
Clinch Valley Medical Center		0	106	0
Culpeper Regional Hospital		1	137	7.3
Fauquier Hospital		1	376	2.66
Halifax Regional Hospital		2	150	13.33
Henrico Doctors' Hospital - Parham		0	278	0
INOVA Fair Oaks Hospital		0	386	0
INOVA Loudoun Hospital		0	328	0
John Randolph Medical Center		0	234	0
Johnston Memorial Hospital		0	92	0
Lee Regional Medical Center		0	7	0
Martha Jefferson Hospital		2	250	8
Montgomery Regional Hospital		0	146	0
Norton Community Hospital		0	125	0
Prince William Hospital		2	521	3.84
Pulaski Community Hospital		0	76	0
Rappahannock General Hospital		0	41	0
Reston Hospital Center	yes	0	714	0
Riverside Tappahannock Hospital		0	32	0
Riverside Walter Reed Hospital		0	184	0
Russell County Medical Center		0	18	0
Sentara Bayside Hospital		0	372	0
Sentara Obici Hospital		1	583	1.72
Sentara Potomac Hospital		0	390	0
Sentara Williamsburg Regional Medical Center		0	173	0
Shenandoah Memorial Hospital		0	11	0
Shore Memorial Hospital		0	108	0
Smyth County Community Hospital		0	46	0
Southern Virginia Regional Medical Center		0	63	0
Southside Community Hospital		0	102	0
Spotsylvania Regional Medical Center		0	143	0
Stafford Hospital Center		1	121	8.26
Tazewell Community Hospital (Carillion)		0	14	0
Twin County Regional Hospital		0	146	0



Virginia standardized infection ratio (SIR) = 0.83
17% fewer infections observed than expected
Statistically significant



Virginia SIR = 0.80
20% fewer infections observed than expected
Statistically significant

Standardized Infection Ratio (SIR)

- A summary measure used to track HAIs at a national, state, or local level over time
- Adjusts for patients of varying risk within each facility
- SIR compares the actual number of HAIs reported to the baseline U.S. experience
- An SIR >1.0 indicates that more HAIs were observed than predicted
  - Statistical significance testing is important!

Calculation of SIR

Type of ICU	# CLABSI	# CL Days	CLABSI Rate	NHSN Rate	Expected # CLABSIs
Medical Cardiac	2	380	5.26	2.0	0.76
Medical	1	257	3.89	2.6	0.67
Med/Surg	3	627	4.78	1.5	0.94
Neuro-surgical	2	712	2.81	2.5	1.78
Total	8	1976	4.05		4.15

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

$$\frac{8}{4.15} = 1.93$$

Example – Overall CLABSI SIR

Org ID	Summary Yr	Infection Count	Number Expected	Central Line Days	SIR	SIR p-value	95% Confidence Interval
10018	2009	9	7.191	3786	1.25	0.2962	0.653, 2.184

- During 2009, there were 9 CLABSIs identified in our facility, and we observed 3786 central line days from the locations from which the CLABSIs were reported.
- Based on the NHSN 2006-2009 baseline data and the composition of locations in the facility, 7.191 CLABSIs were expected.
- This result is an SIR of 1.25 (9/7.191), signifying that during this time period, our facility identified 25% more CLABSIs than expected.
- The p-value and 95% confidence interval indicate that the number of observed CLABSIs is not significantly higher than the number of expected CLABSIs.

Virginia Data Audit Objectives

- To assess the accuracy of selected central line-associated bloodstream infections (CLABSI) reported to the National Healthcare Safety Network (NHSN) on patients in adult intensive units hospitals between January 1, 2010 and June 30, 2010
- To identify issues leading to misclassification of CLABSIs
- To evaluate current surveillance methods used to detect infections and associated denominators
- To use the results to provide educational materials and lessons learned to infection preventionists across the Commonwealth

Responsibilities

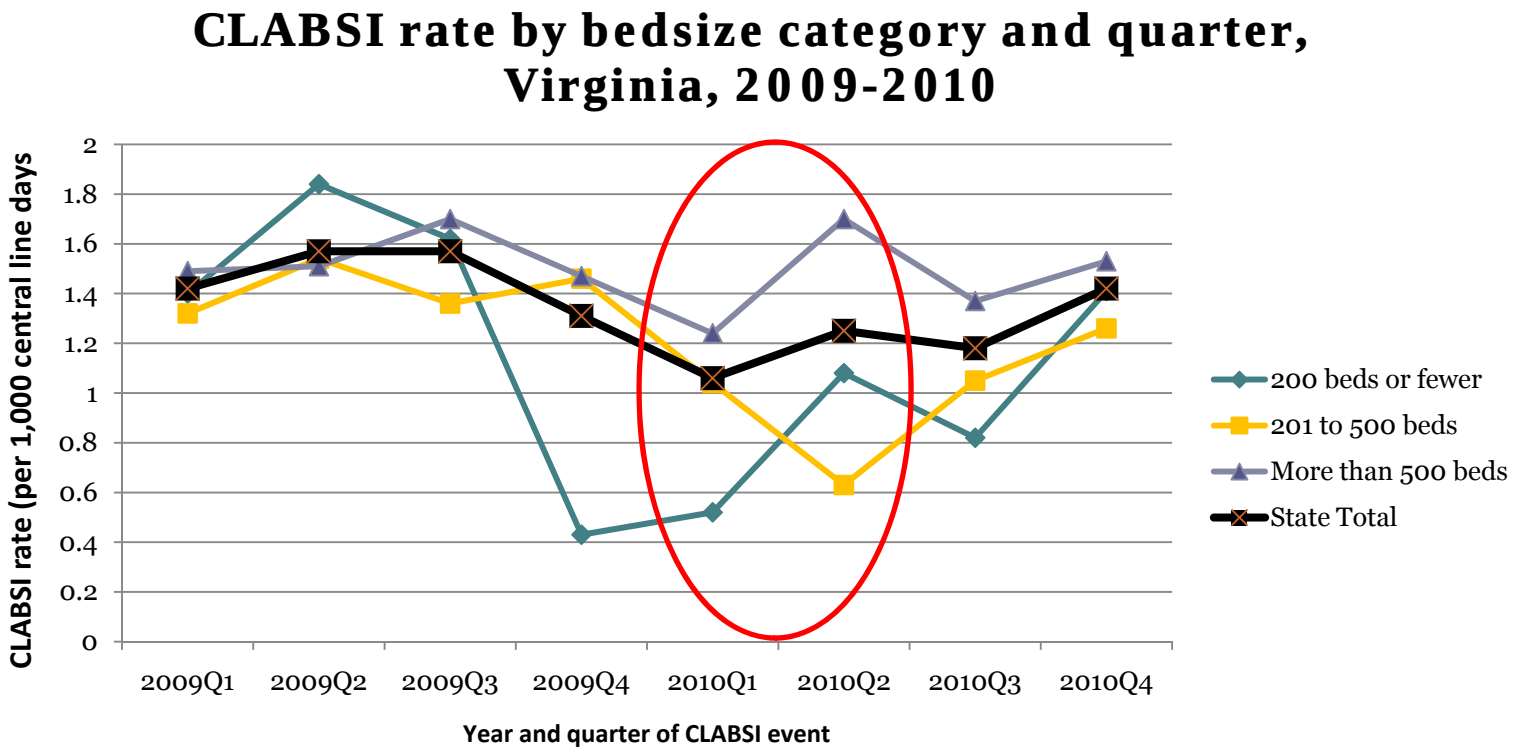
- Virginia Department of Health
  - Development of CLABSI audit protocol
    - Review protocols from other states that have done validation studies
    - Collaborate with APIC-VA and Virginia Hospital and Healthcare Association (VHHA)
    - Select hospitals and charts for review
- VHHA
  - Hire Validation Specialists and other staff

Responsibilities (cont'd)

- Validation Specialists
  - Have previous experience in infection prevention and chart review
  - Coordinate and conduct site visits with participating hospital
  - Conduct chart reviews and process interviews at each hospital
- Consultant – Mary Andrus
  - Train Validation Specialists
  - Consult on difficult cases
  - Coordinate training
  - Present audit results to all hospitals

Methods – Chart Selection

- Time period under review: January 1, 2010 through June 30, 2010

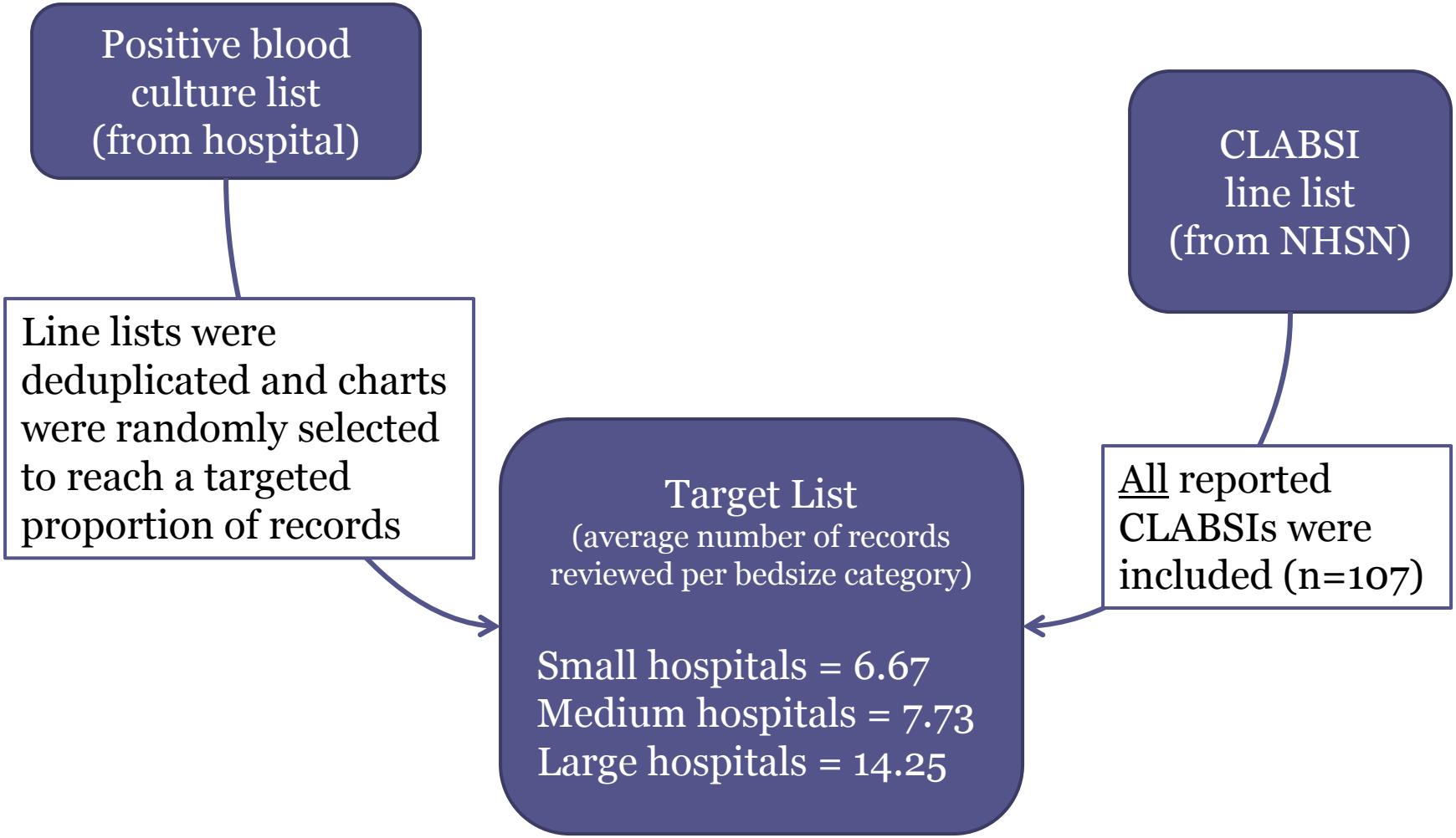


Methods – Hospital Selection

Selected facilities	# records reviewed	Average # records reviewed per hospital
18 small (<200 beds)	120	6.67
11 medium (201-500 beds)	85	7.73
8 large (>500 beds)	114	14.25

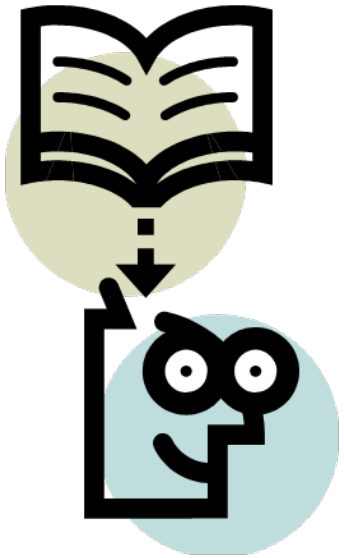
Total: 37 hospitals,
319 records

Steps for Record Selection



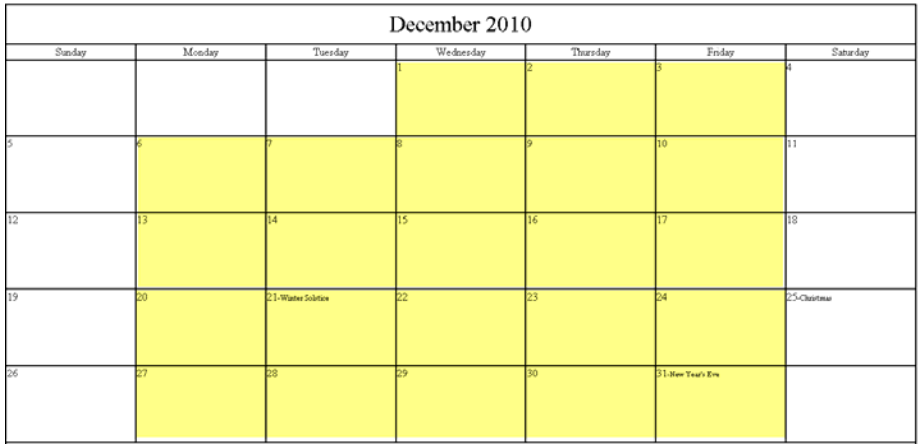
Audit Training – October 12, 2010

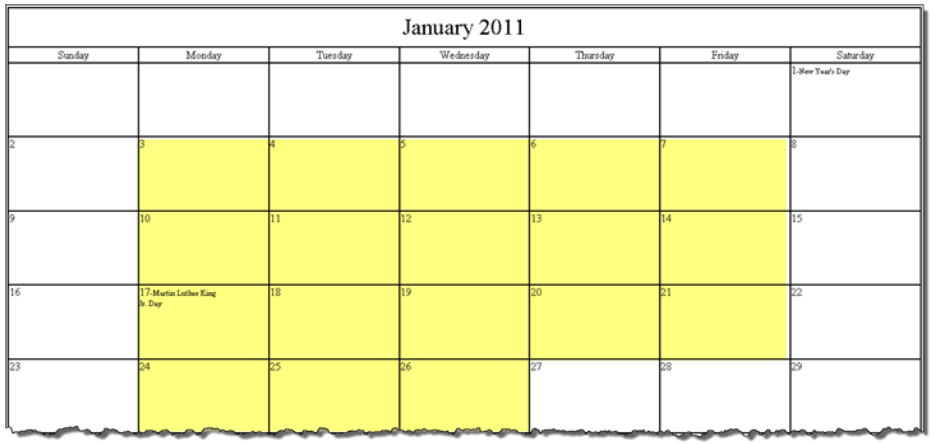
- Conducted by Mary Andrus, Surveillance Solutions Worldwide, Inc.
- Auditors and VDH staff participated
- Content:
  - NHSN overview
  - BSI definition and data collection protocol
  - Audit format and directions
  - Interview process
  - Other CDC/NHSN definitions
  - Case studies and practice



Hospital Visits by Validation Specialists

November 22 – January 26





Responsibilities During Chart Audit

- Hospital Staff
  - Give access to appropriate hospital areas and medical records including security issues
  - Open and navigate electronic medical records where necessary
  - Provide privacy to auditor
  - Arrange interview with data collection staff at the end of the review
- Validation Specialist
  - Conduct chart review - blinded to reported cases
  - Interview staff for determination of appropriate collection of infection and denominator data

Primary Bloodstream Infection (BSI)

NHSN National Healthcare Safety Network

Facility ID: 010104	
*Patient ID: 160001	
*Event Type: BSI	*Date of Event: 02/19/2011
*Date Admitted to Facility: 02/10/2011	*Location: SICU

Risk Factors

If ICU/Other locations, Central line: (Central line at the time of or within previous 48 hours of blood culture) (Yes) No

Location of Device Insertion: ED

Date of Device Insertion: 02/ 11/ 2011

Event Details

*Specific Event: Laboratory-confirmed

*Specify Criteria Used:

Signs & Symptoms (check all that apply)

Any patient

√ Fever

☐ Chills

☐ Hypotension

≤1 year old

☐ Fever

2/19 1400 BC= CNS
2/19 1430 BC = S. epi

Laboratory (check one)

☐ Recognized pathogen from one or more blood cultures

√ Common skin contaminant from ≥2 blood cultures

Primary Bloodstream Infection (BSI)

Pathogen #	Gram-positive Organisms										
1	Coagulase-negative staphylococci	**VANC** S I R N (specify): _____									
_____	*Enterococcus faecalis*	**AMP** S I R N	**DAPTO** S I R N	**LNZ** S I R N	**PENG** S I R N	**VANC** S I R N					
_____	*Enterococcus faecium*	**AMP** S I R N	**DAPTO** S I R N	**LNZ** S I R N	**PENG** S I R N	**QUIDAL** S I R N	**VANC** S I R N				
_____	*Staphylococcus aureus*	**CLIND** S I R N	**DAPTO** S I R N	**ERYTH** S I R N	**GENT** S I R N	**LNZ** S I R N	**OX** S I R N	**QUIDAL** S I R N	**RIF** S I R N	**TMZ** S I R N	**VANC** S I R N
Pathogen #	**Gram-negative Organisms**										
_____	*Acinetobacter* spp. (specify) _____	**AMK** S I R N	**AMPSUL** S I R N	**CEFEP** S I R N	**CEFTAZ** S I R N	**CIPRO** S I R N	**GENT** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	**PIPTAZ** S I R N	**TOBRA** S I R N
_____	*Escherichia coli*	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N		
	Enterobacter	**AMK**	**CEFEP**	**CEFOT**	**CEFTAZ**	**CEFTRX**	**CIPRO**	**IMI**	**LEVO**	**MERO**		

Resolution of Discrepant Cases

- VDH staff compared reported CLABSIs (from NHSN) to those identified in the audit
- Letter sent to each hospital, outlining summary of findings and process of resolution for discrepancies
- Validation specialist and hospital discussed disagreements
- Contacted consultant (Mary Andrus) when hospital and validation specialist could not agree
- Hospitals made changes to NHSN data entry as appropriate

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI	3	209	212
	Total	110	209	319

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI	3	209	212
	Total			319

A total of 319 CLABSI records were reviewed

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		C	no SI	Total
Hospital Reporting	Reported CLABSI			107
	Reported no CLABSI			212
	Total	110	209	319

Auditors reviewed a total of 107 patients that were reported to NHSN by the hospitals as CLABSI

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI		209	212
	Total		9	319

Bloodstream infections that were reported by the hospital and confirmed by the audit

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI	3	2	212
	Total	110		319

There were no CLABSI cases that were reported to NHSN that were not confirmed by the audit

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI			107
	Reported no CLABSI			212
	Total	110	209	319

Total number of positive blood cultures reviewed by auditors

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Au CL
Hospital Reporting	Reported CLABSI	107	
	Reported no CLABSI	3	
	Total	110	2

Positive blood cultures that were identified as CLABSI by audit, but were not reported by the hospital to NHSN

Results - CLABSI Audit

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI	3	209	212
	Total	110		319

Positive blood cultures that were <u>not</u> identified as CLABSI by audit, and were <u>not</u> reported by the hospital to NHSN

CLABSI Misreported Cases

- Total of 3 reporting errors:
  - 3 under-reported
- 34 hospitals had no identified CLABSI reporting errors
  - 2 small hospitals had one error each
  - 1 medium hospital had one error
- Misreported cases
  - 1 case was identified as a 2° BSI when it actually met the criteria for a CLABSI
  - 2 cases appear to have been overlooked

Secondary BSI

- A culture-confirmed BSI associated with a documented HAI at another site
- If a primary infection is cultured, the secondary BSI must yield culture of same organism and exhibit the same antibiogram as the primary HAI site

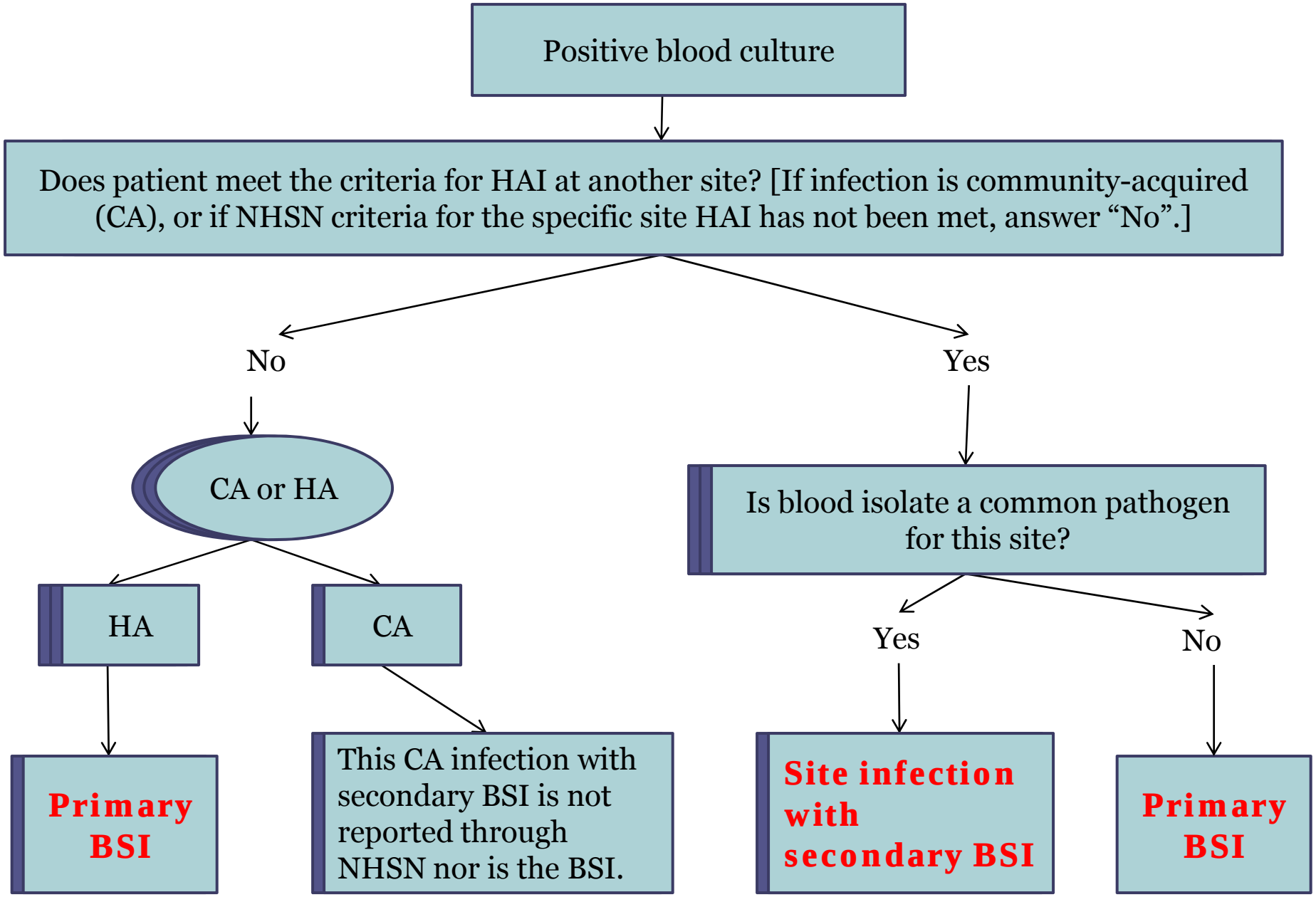
Example: Mrs. Jones grows E. coli in her urine (>100,000 col/cc) and in her blood. Both organisms have the same antimicrobial susceptibility pattern. The UTI is reported with a secondary BSI.

Example: Mr. Smith grows *A. baumanii* in his surgical wound which is resistant to amikacin and levofloxin but sensitive to other tested antimicrobials. He is also growing *A. baumanii* in his blood, but it is susceptible to amikacin.

Secondary BSI (cont'd)

- If an infection is identified and no culture is used to meet the infection criteria **and** a blood culture is positive, then the first infection is considered primary and the bloodstream infection is reported as secondary.
- The organism cultured from the blood is reported as the organism for the primary site.

Example: 6 days postoperatively, Miss Green has an abdominal abscess, confirmed by CT scan. On the same day, her blood is drawn and grows *Bacteroides fragilis*. The infection is reported as an SSI-GIT (organ space SSI) with a secondary BSI. The organism is reported *as B. fragilis*


Positive blood culture
Does patient meet the criteria for HAI at another site? [If infection is community-acquired (CA), or if NHSN criteria for the specific site HAI has not been met, answer "No".]
No
Yes
CA or HA
Is blood isolate a common pathogen for this site?
HA
CA
Yes
No
Primary BSI
This CA infection with secondary BSI is not reported through NHSN nor is the BSI.
Site infection with secondary BSI
Primary BSI

Results

Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	**107**
	Reported no CLABSI	3	209	**212**
	Total	**110**	**209**	**319**

Agreement Disagreement

Analysis - CLABSI

Sensitivity: The probability that an individual who has a true CLABSI is reported by the hospital as having a CLABSI

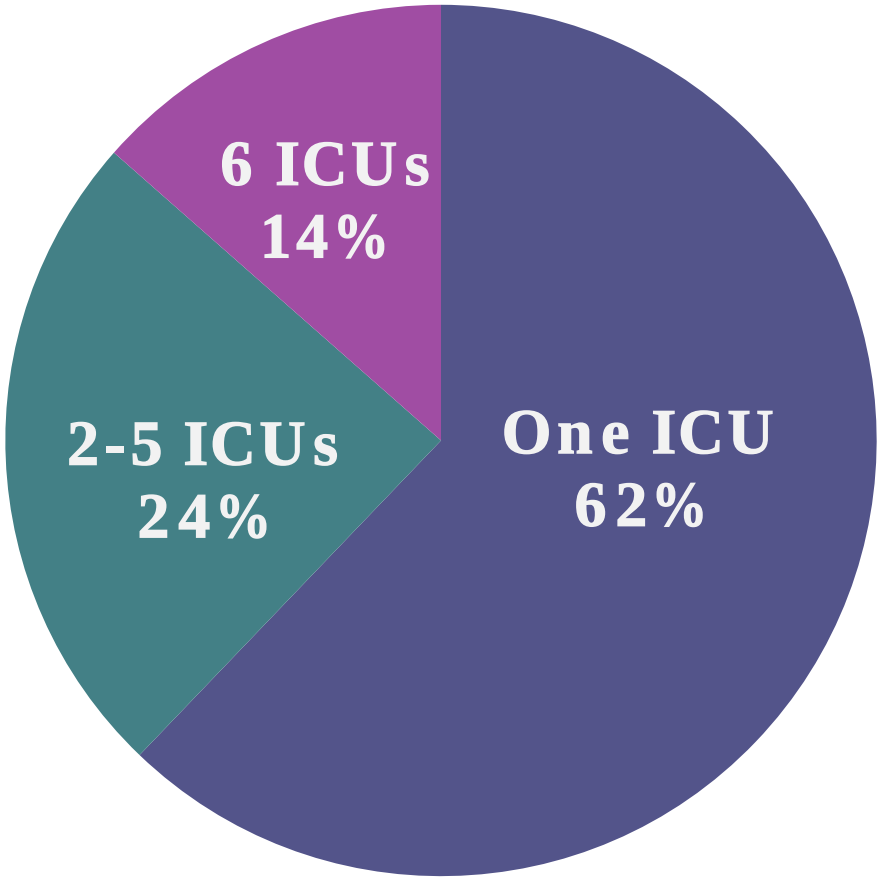
Specificity: The probability that an individual who does not have a CLABSI is not reported as a CLABSI

Positive Predictive Value (PPV): The probability that a person has a CLABSI given that a CLABSI is reported

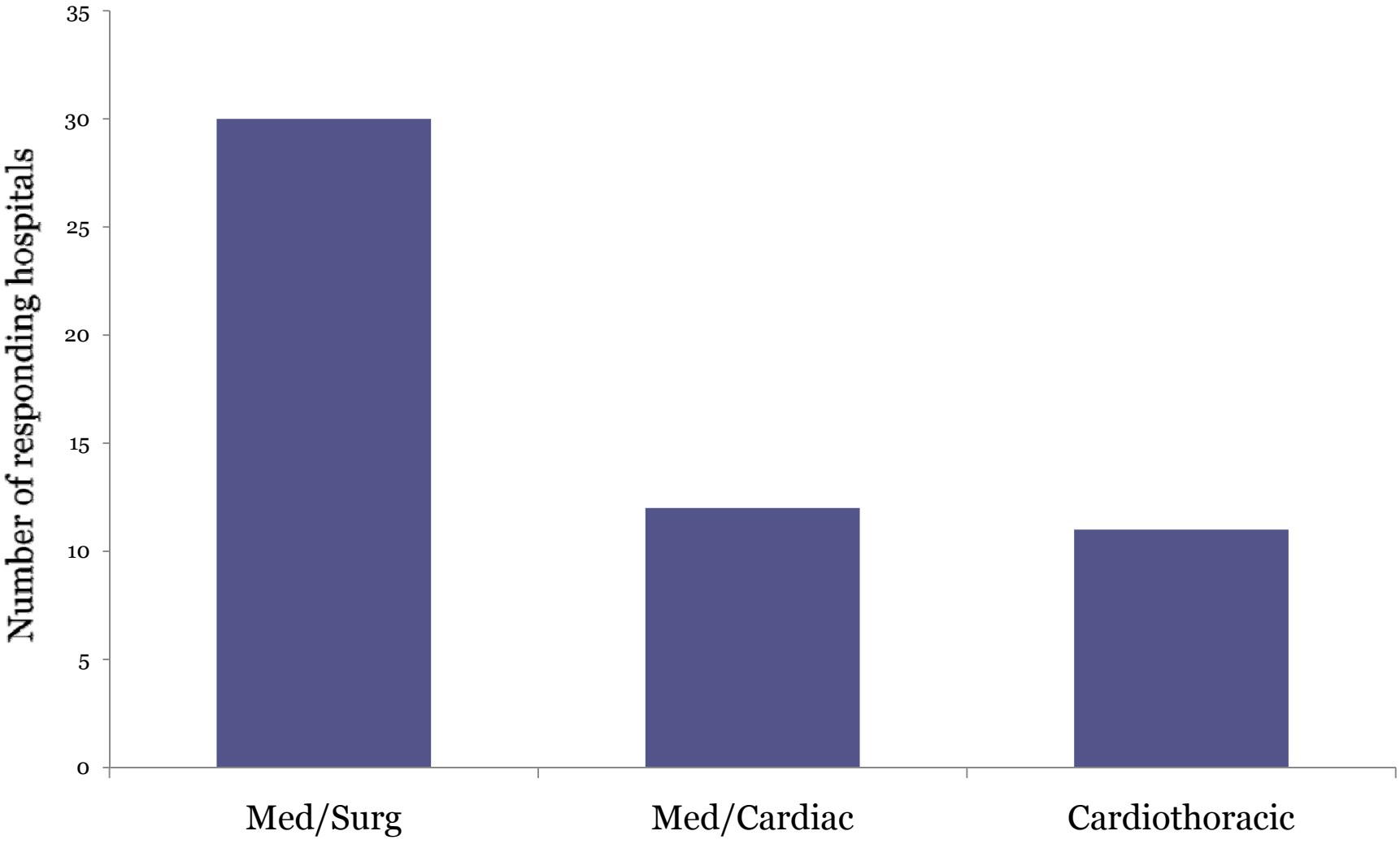
Negative Predictive Value (NPV): Probability that a person does not have a CLABSI if a CLABSI is not reported

	Estimated Value
Sensitivity	97%
Specificity	100%
Positive Predictive Value (PPV)	100%
Negative Predictive Value (NPV)	98.5%

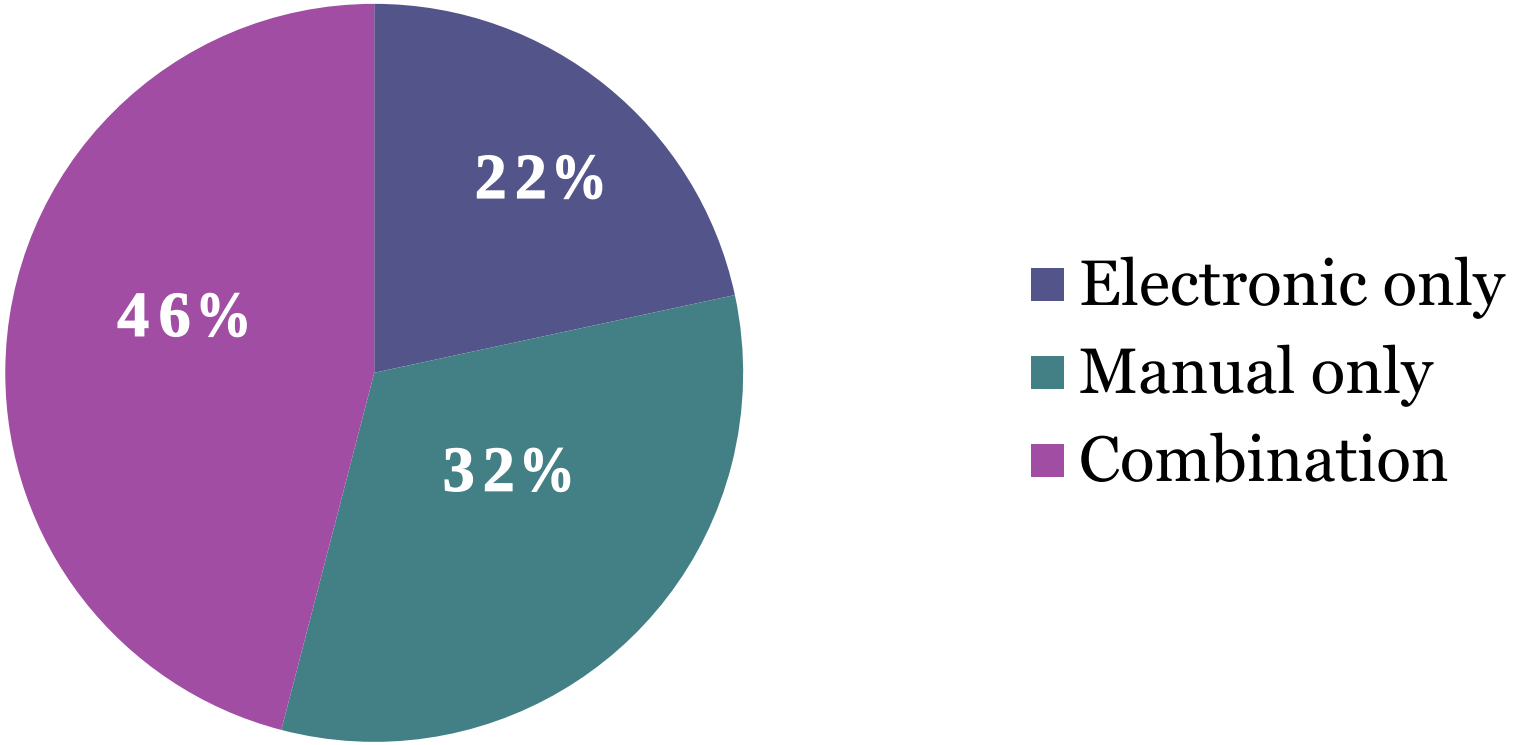
Number of ICUs Per Hospital



Common ICU Types

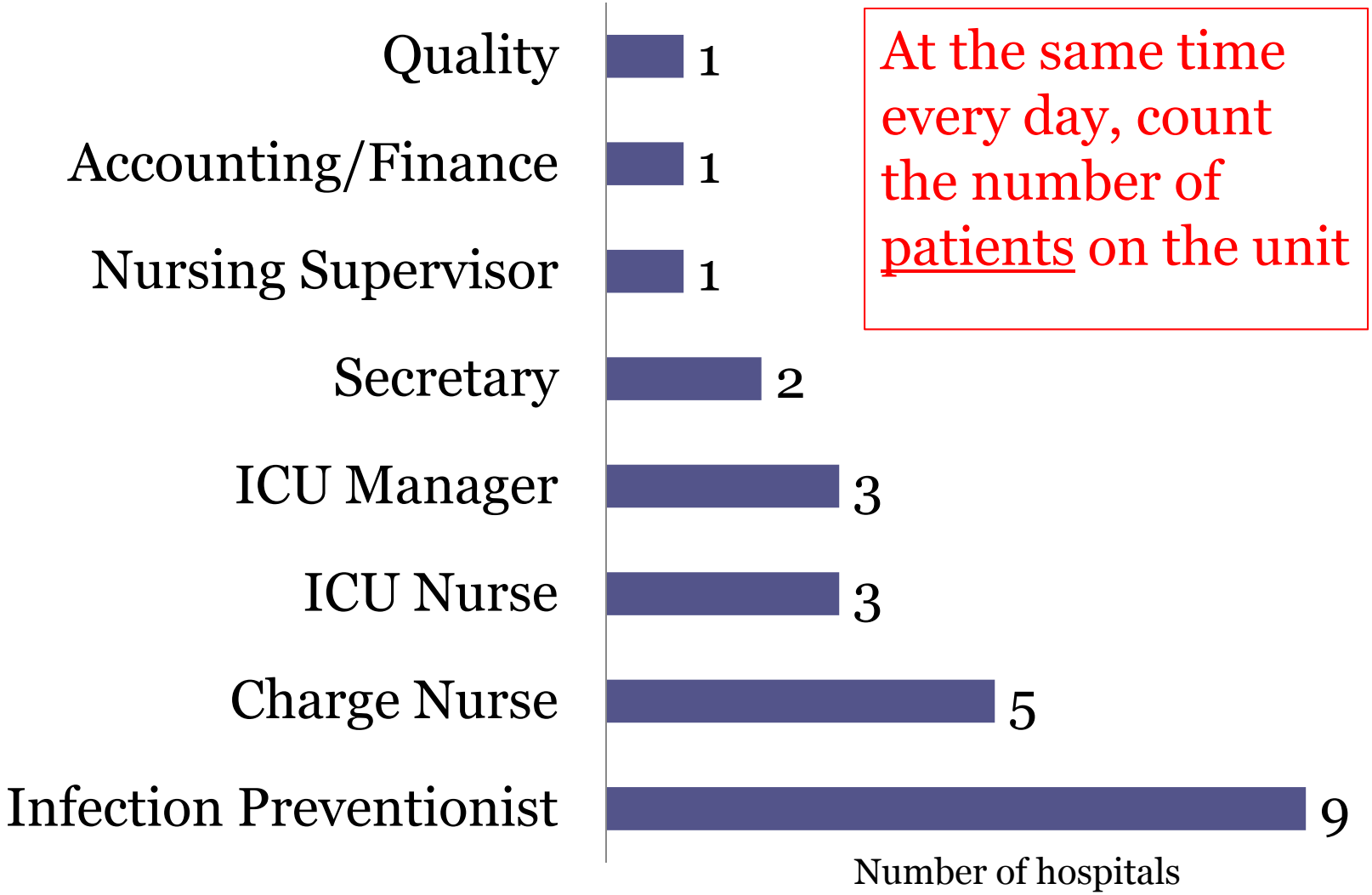


Collection of Patient Days and Central Line Days



Size of the facility did not correlate with electronic capacity.

Manual Collection of Patient Days - Who Collects Them?

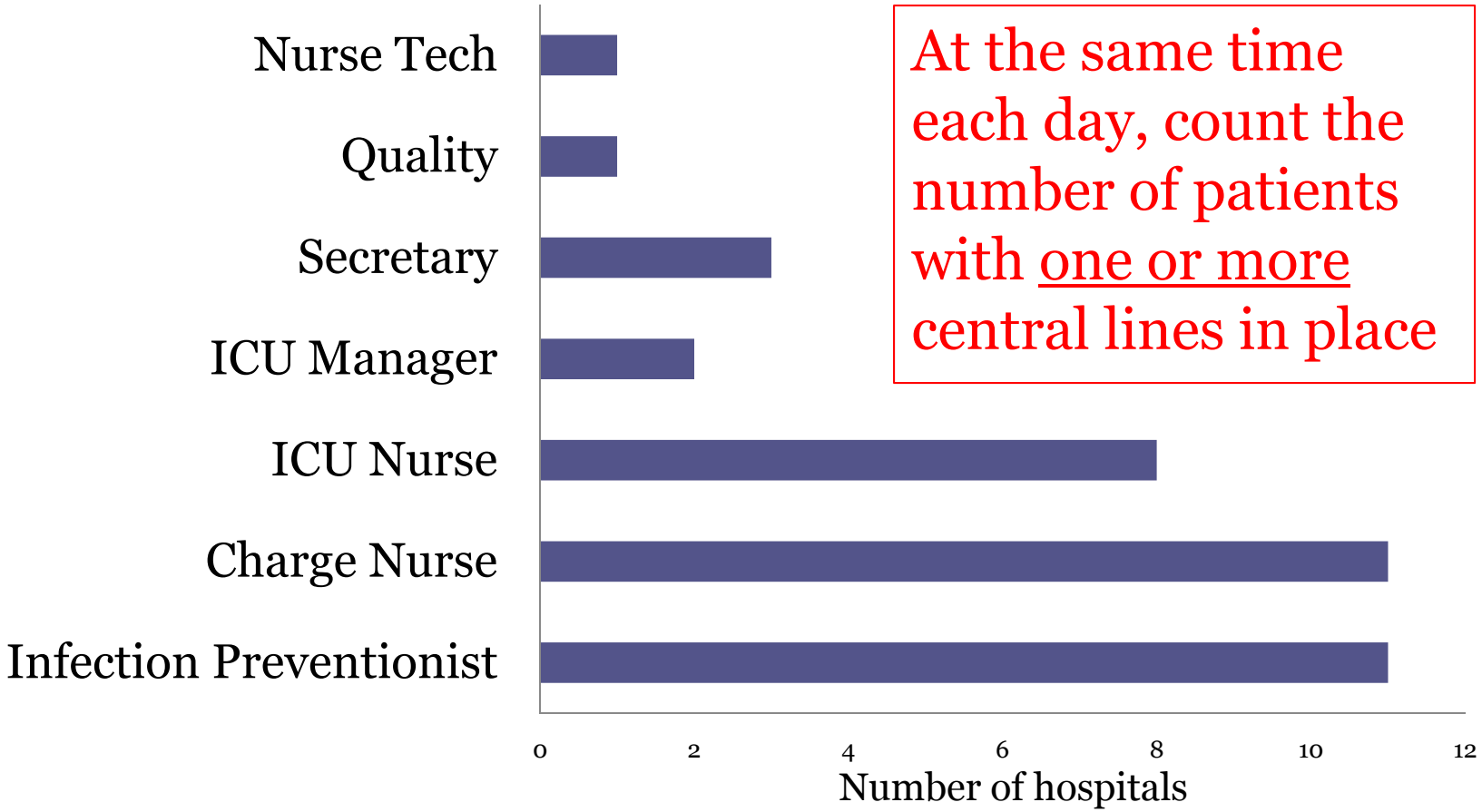


At the same time every day, count the number of patients on the unit

Counting Patient Days

- At the same time each day, count the number of patients on the unit
  - Use denominator forms
- In NICUs, patients are counted separately for each birthweight category
- Do not count patients who have not yet been admitted
- Do not count patients who have been discharged
- Do count patients who may be off the floor for tests (e.g., radiology, surgery, etc.) at the time the count is done
- The total is recorded in NHSN at the end of the month

Manual Collection of Central Line Days - Who Collects Them?



At the same time each day, count the number of patients with one or more central lines in place

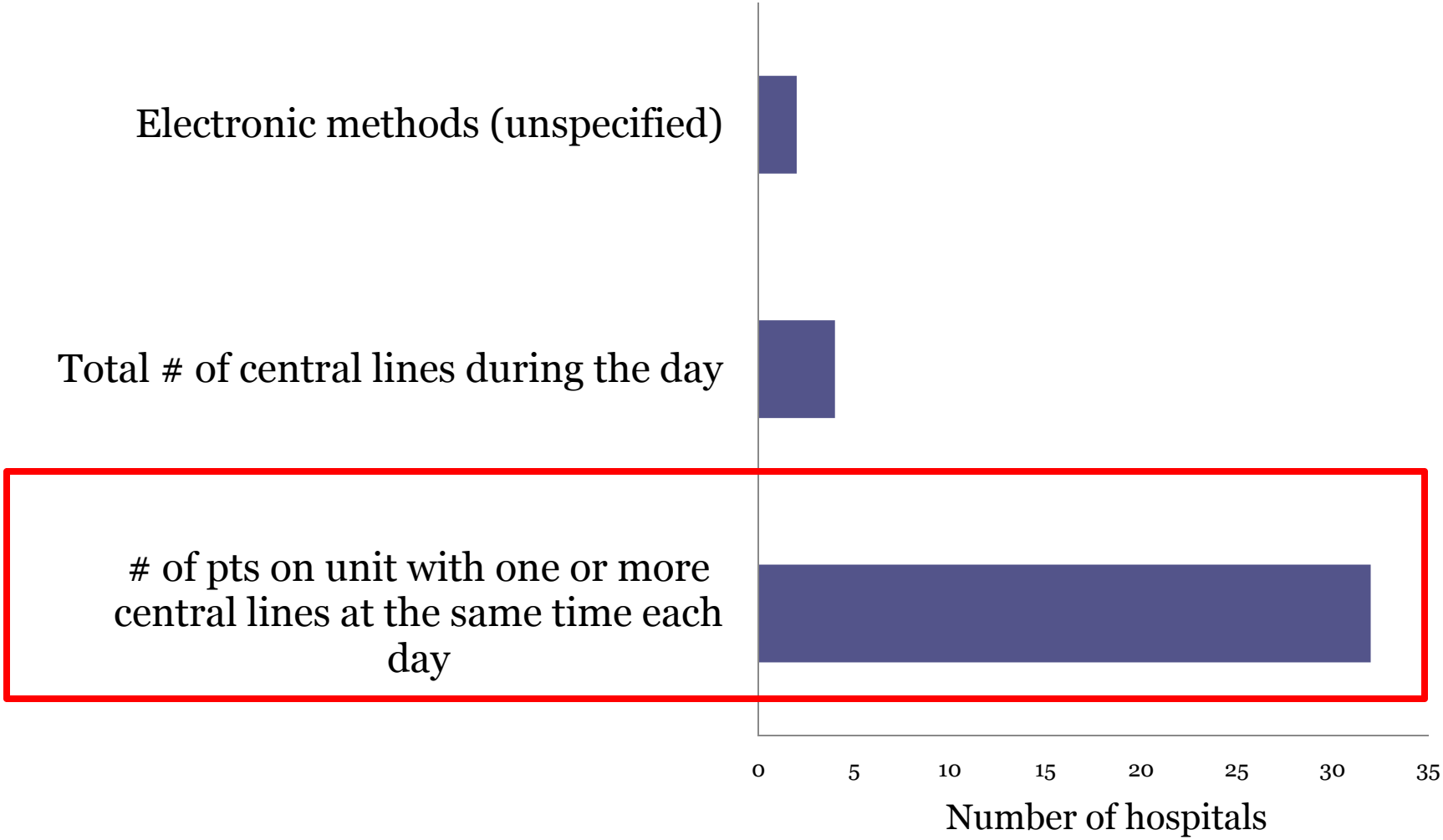
Charge Nurse usually collects the information while the IPs were more often involved in tallying information or retrieving collected data

Counting Central Line Days - (ICU) Examples

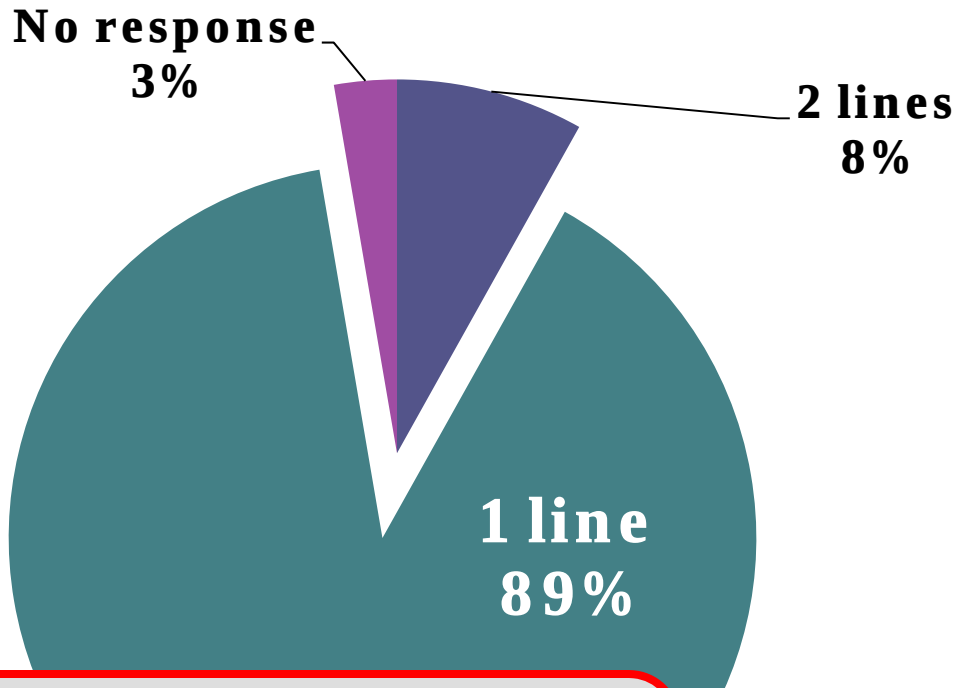
James is admitted today at 5 am and a subclavian central line is inserted. At noon today, one central line day is counted.

Gretchen was admitted 2 weeks ago. Today she has both a PICC line and a femoral central line. At noon today, one central line day is counted.

Method Used to Collect Central Line Days

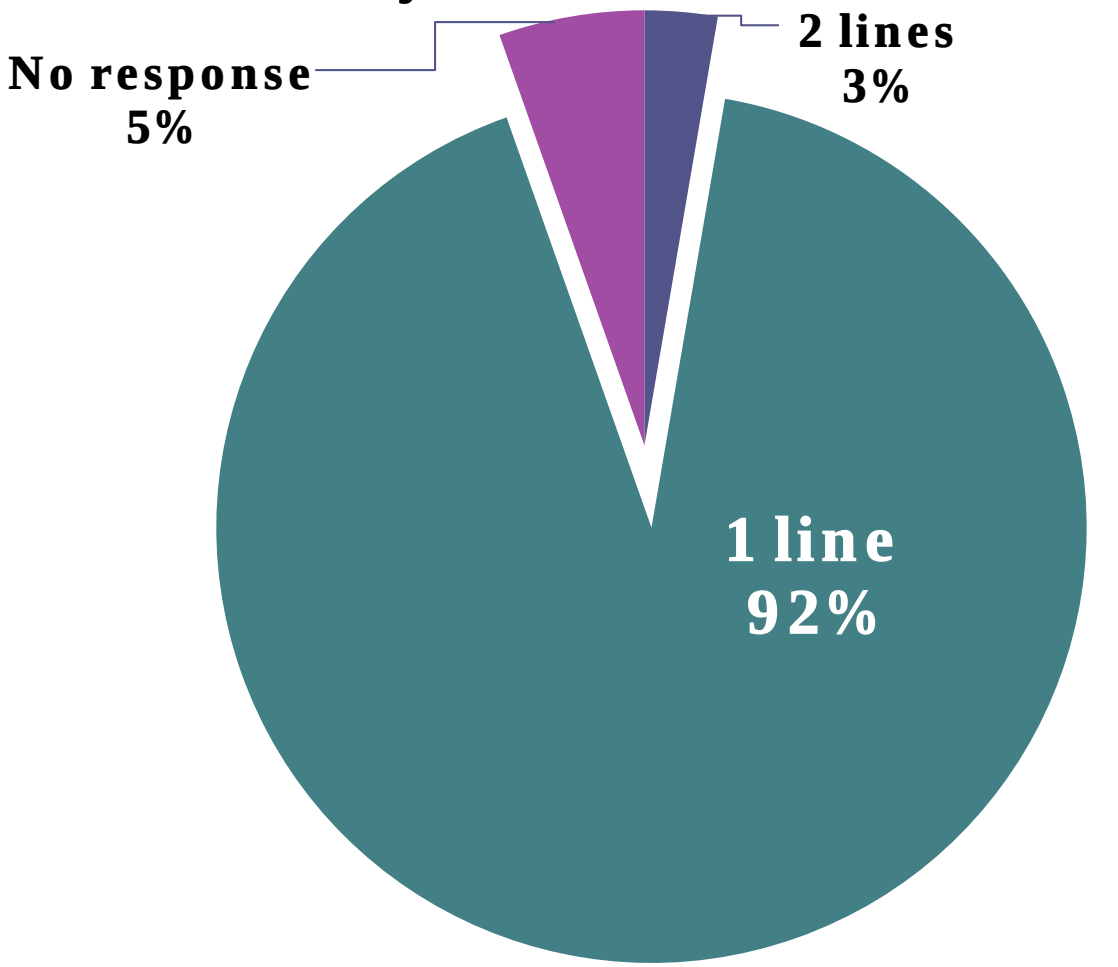


If a patient had 2 separate central lines, how many central line days are counted?

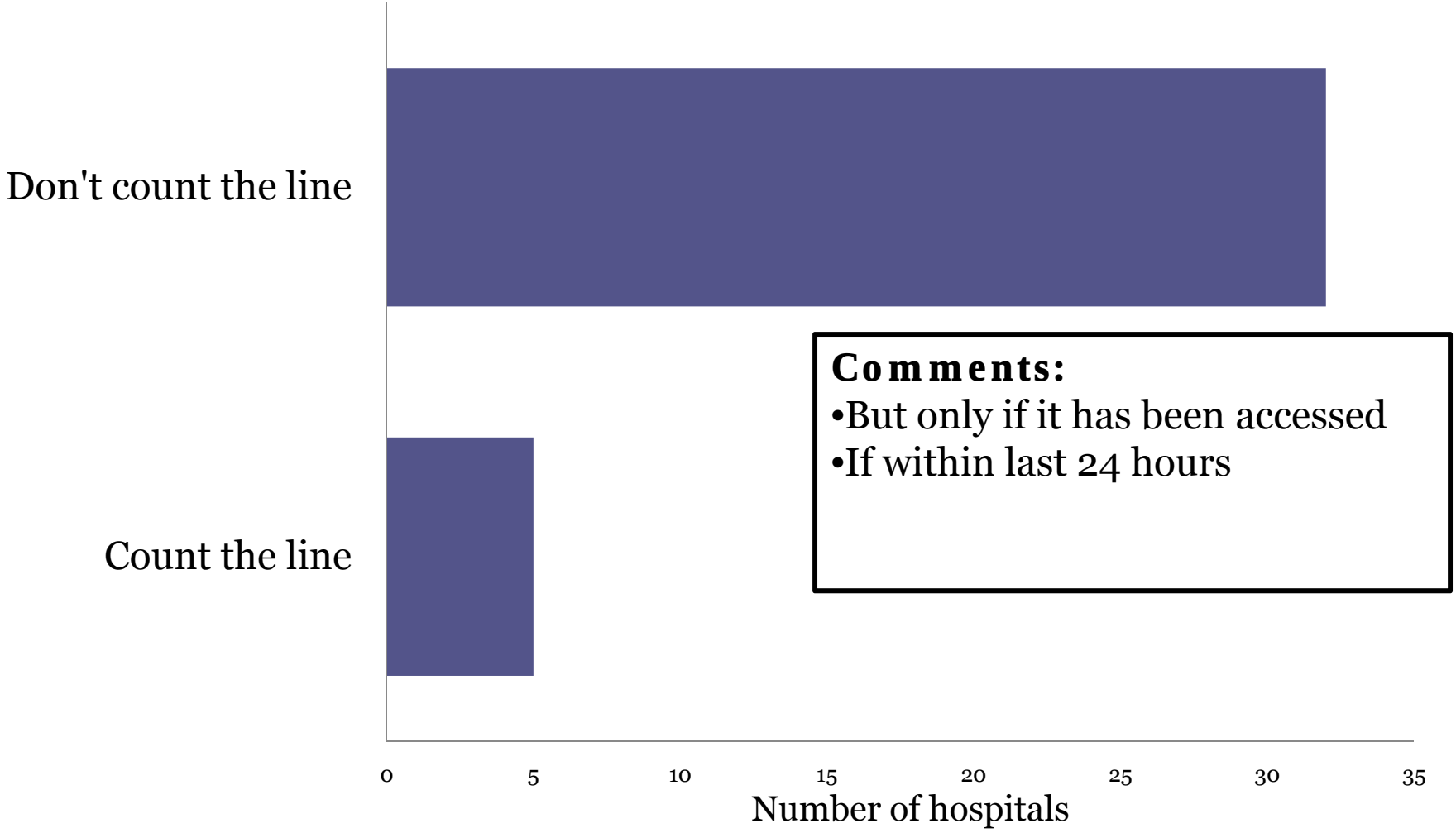


If a patient has more than one central line, only <u>one</u> central line per patient should be counted each day. Out of 37 ICUs, 3 (8%) are incorrectly counting these days.

If a patient had a temporary CL and a permanent CL, how many central line days are counted?



Will you count a central line that was removed earlier in the day?



Comments:

- But only if it has been accessed
- If within last 24 hours

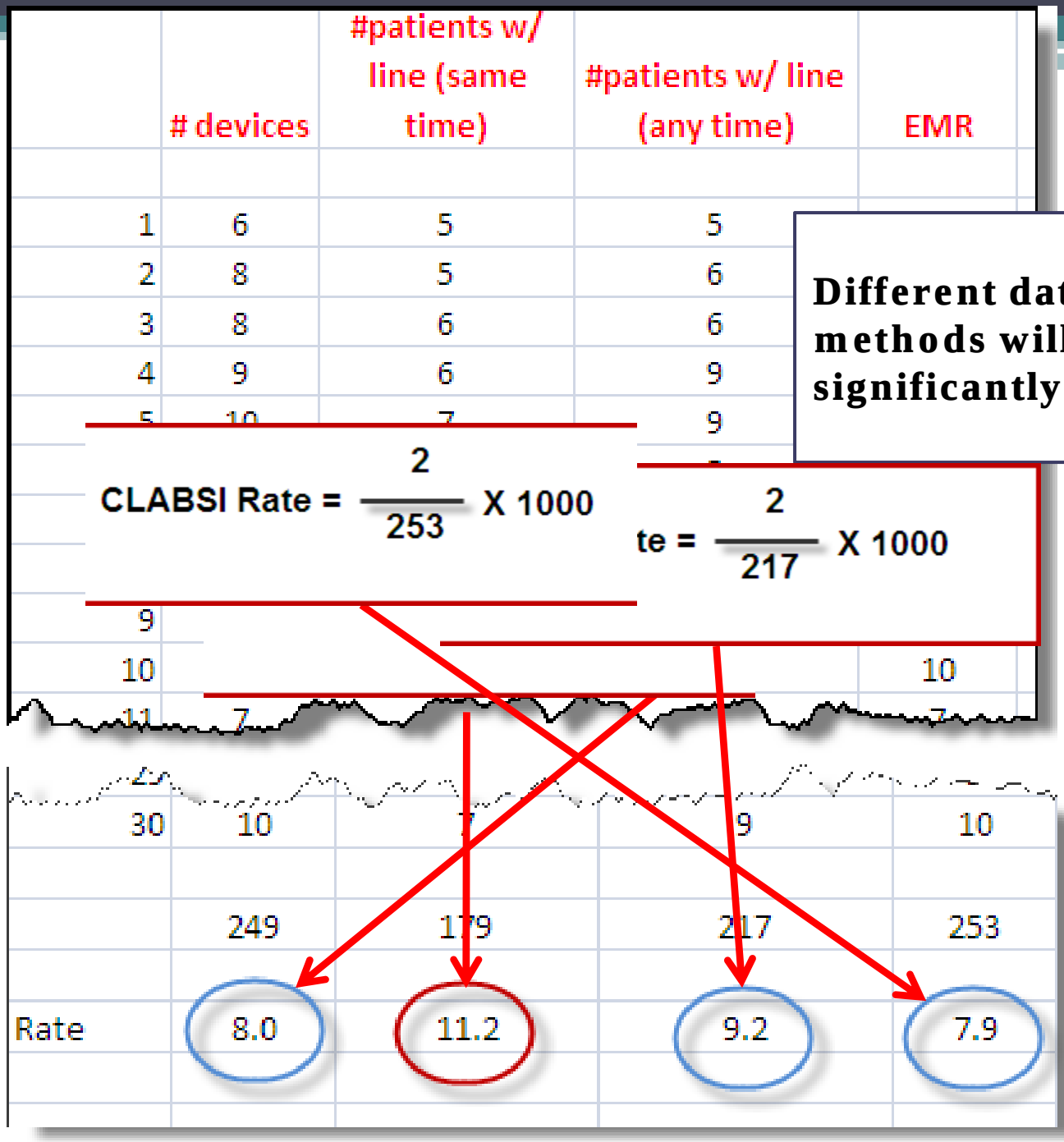
$$\text{Device-associated HAI rate}^{*} = \frac{\#\ \text{Device-associated infections}^{*}}{\#\ \text{Device days}^{*}} \times 1000$$

*stratified by device/infection type

$$\text{Device Utilization Ratio}^{*} = \frac{\#\ \text{Device days}^{*}}{\#\ \text{Patient days}^{*}}$$

*stratified by device type

Device-associated Rates/Ratios

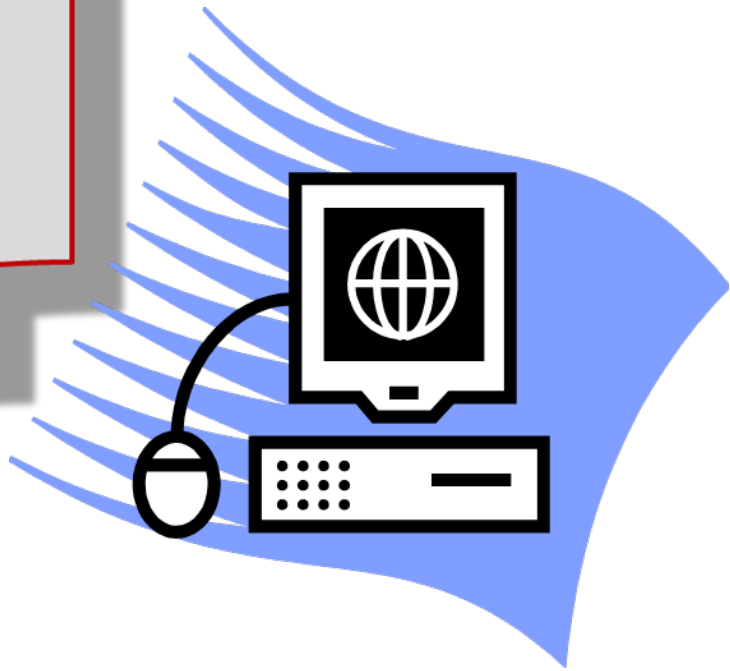


Different data collection methods will produce significantly <u>different rates</u>!

COLLECTION OF CLABSI DENOMINATORS

Electronic Collection of Denominators

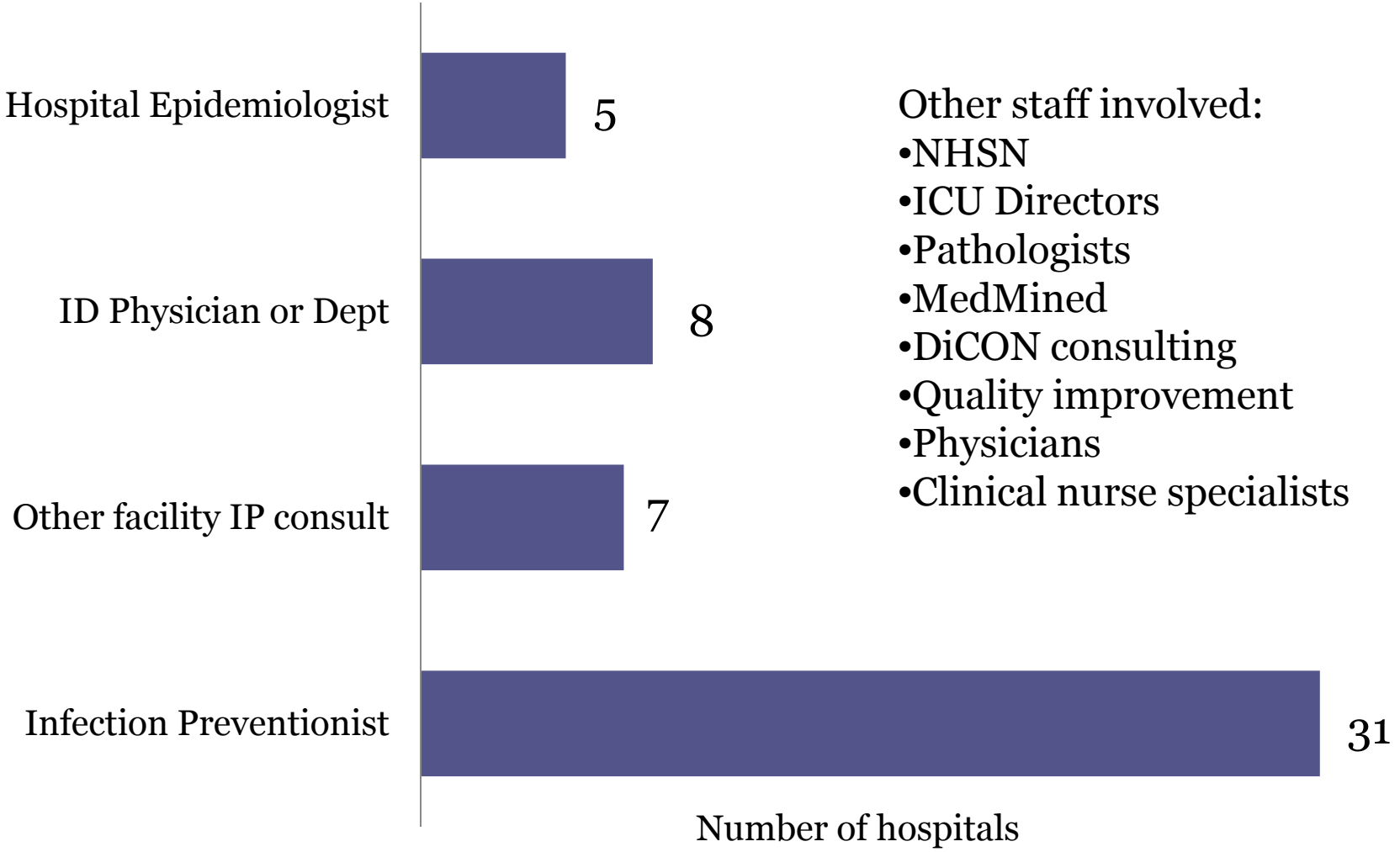
When denominator data are available from electronic databases (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually collected counts.



Are peripheral IVs counted as central lines?

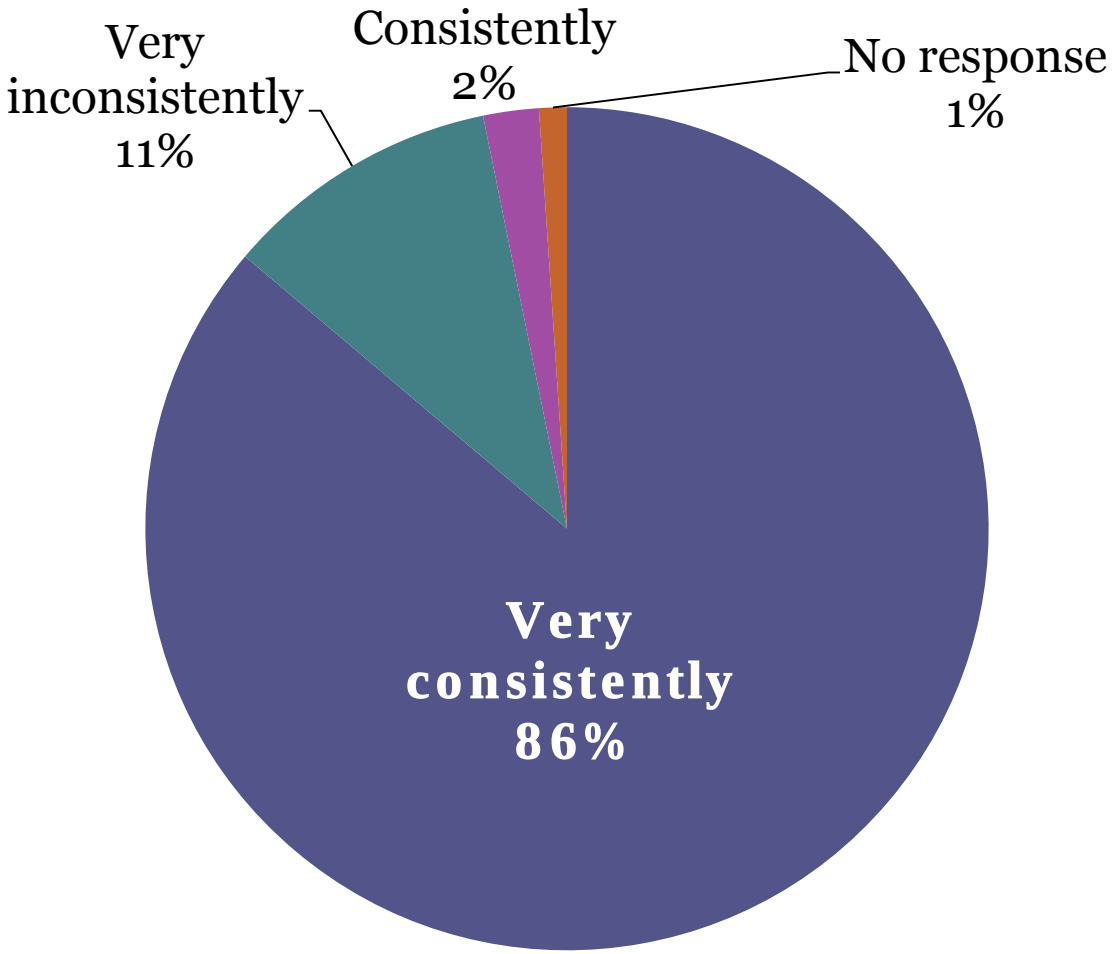
No – 100% answered correctly

Resolution of ambiguous cases - Who makes the final decision?

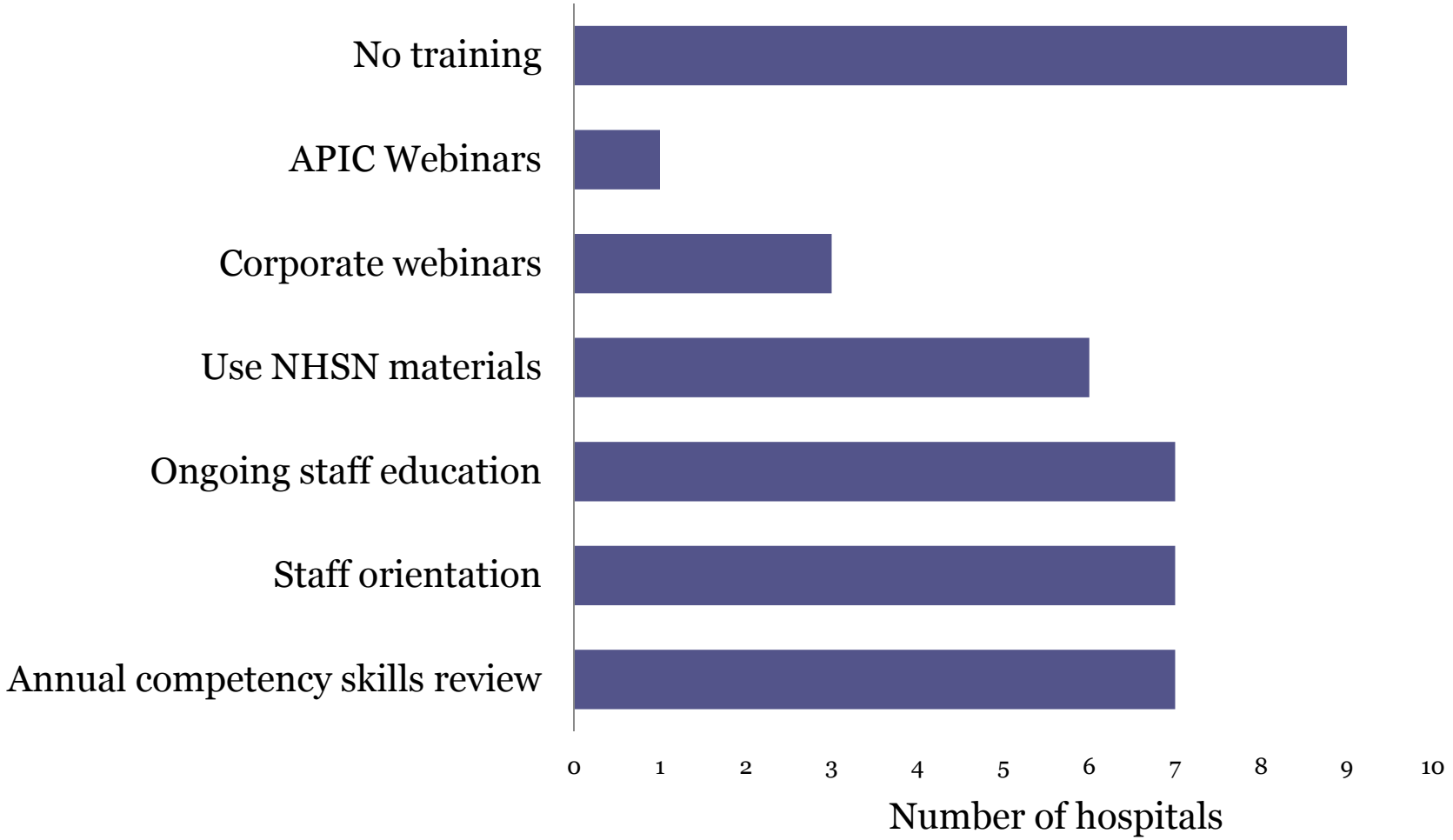


Other staff involved:
- NHSN
- ICU Directors
- Pathologists
- MedMined
- DiCON consulting
- Quality improvement
- Physicians
- Clinical nurse specialists

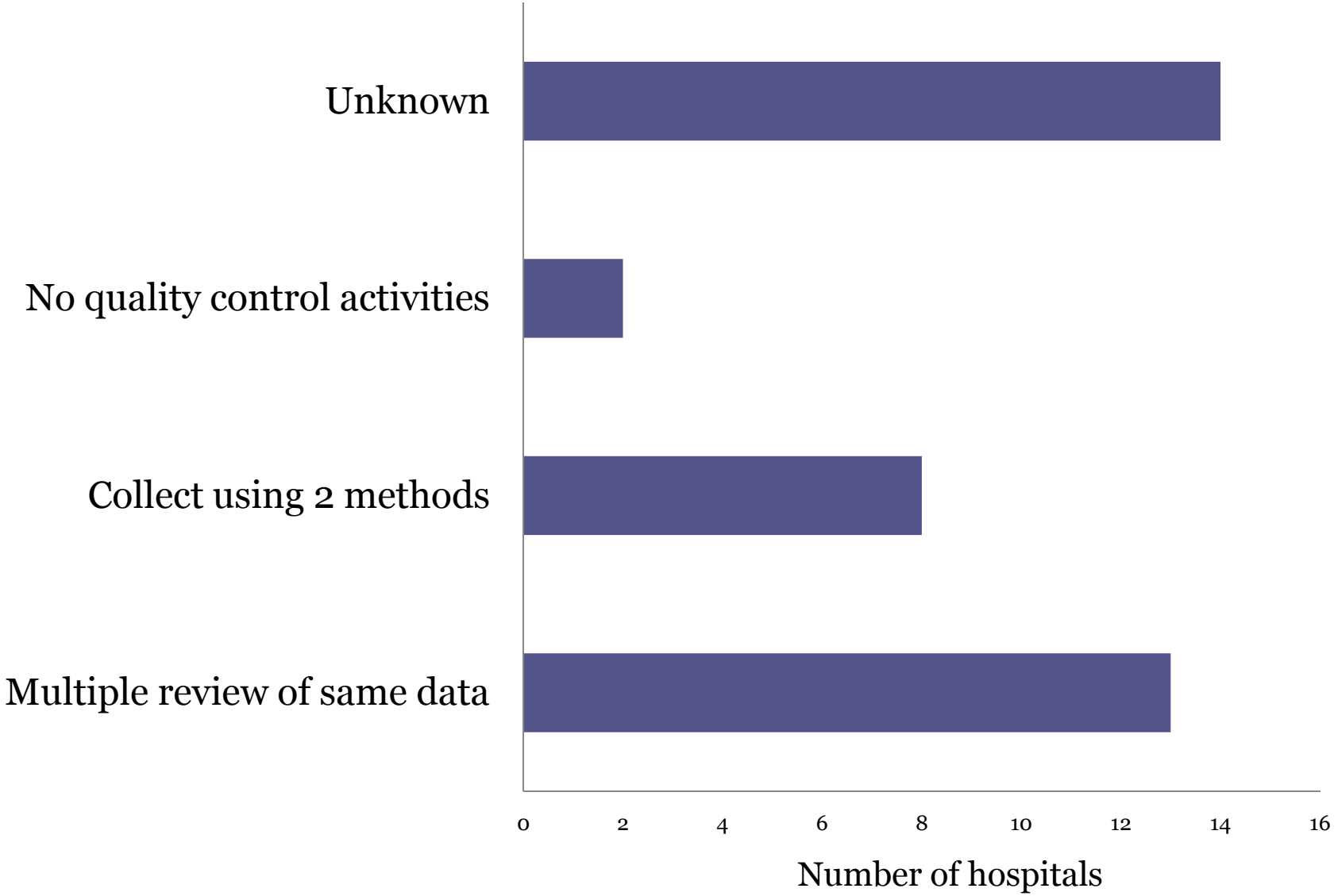
Application of CDC/NHSN Definition of CLABSI



Methods for Training for Data Collectors



Quality Control of Data



Discussion

- Great job applying the surveillance definitions!
  - Celebrate and promote your success
- Areas for improvement
  - Denominator data collection
  - Quality assurance
  - Continued education
- Quarterly reporting reminders
  - Monthly reporting plan essential!
  - Update NHSN (and VDH) about changes to unit composition
  - www.vdh.virginia.gov/Epidemiology/Surveillance/HAI/haireport.htm

Discussion (cont'd)

- Limitations of project
  - Audited ½ hospitals, took sample of blood cultures
    - Unable to quantify total number of CLABSIs in the entire state
    - May have missed some under-reporting issues
- How has this project impacted you?
  - Increased confidence in standardization and quality of data?
  - Changes to data collection, quality assurance methods, or educational strategies?

Next Steps

- Public reporting
  - Proposed additions to state reporting regulations
  - CMS – CLABSI in NICU, PICU
- Publish VDH report on CLABSI audit project
- Presentation of CLABSI data in quarterly reports?
  - More analyses by unit?
  - Transition to use of SIR?
- VDH/APIC conference 11/10/11 (Richmond)
  - More about quality assurance using NHSN, data analysis, and presentation
- NHSN denominator simplification project

Thank You!

- Participating facilities
- VHHA
  - Barbara Brown, PhD
- Data validation specialists
  - Jeanette Daniel, RN, CIC
  - Bonnie Harris, RN, CIC
  - Carol Jamerson, RN, BSN, CIC
  - Loretta Reardon, RN, CIC
- APIC-VA

Questions?

Contact the VDH HAI Program

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