

Proposed standard measures for public reporting of California hospital-specific central line associated bloodstream infections (CLABSI) data

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Agenda

- Background
 - Goals and mandates
 - Key considerations
 - CDC/NHSN risk adjustment
- CDPH Metrics Work Group
- Proposed standard measures for public reporting based on CDPH Metrics Work Group recommendations
- Managing expectations

Goals for public reporting

- Produce data that are valid, fair to hospitals, and useful to consumers
 - Inform the public
 - Improve hospital care
 - Provide incentive for collaboration between hospitals and prevention experts based on benchmarking

California statutory requirements

- Publicly post CLABSI rates, patient days [*sic, should be central line days*]acquired at each facility in California
- Follow a 'risk-adjustment process' for rates that is
 - consistent with CDC NHSN methods **or**
 - adopt by regulation, a fair and equitable process consistent with the recommendations of HAI Advisory Committee
- CDPH required hospitals report CLABSI using CDC NHSN as of April 1, 2010

Key constraints for the standard measures

- Must include denominator (central line days) and rate
- Must risk adjust - account for different patient care locations when comparing hospitals
 - rates of infection vary by type of patient care location
 - types of patient care locations vary by hospital
 - Using CDC/NHSN methods
- Acceptable to hospitals and public

Additional considerations – rate comparisons

- Rates may vary:
 - Random variation (imprecision)
 - Distortion (systematic errors)
 - Chance
 - Real differences
- Must disclose potential limitations for appropriate interpretation

Competing priorities make choice of a standard measure challenging

- Simplicity vs. validity?
- Complexity vs. ease of use/understandability?
- What are CDC NHSN methodologies, primary and secondary measures?

CDC primary standard measures for national publication – stratified rates

- Published by unit
- Period: 2006 – 2008, published Dec 2009
- Period 2009, published Spring 2011

Table 3. Pooled means and key percentiles of the distribution of laboratory-confirmed central line–associated BSI rates and central line utilization ratios, by type of location, DA module, 2006 through 2008

Type of location	Central line–associated BSI rate [†]								
	No. of locations*	No. of CLABSI	Central line-days	Pooled mean	Percentile				
					10%	25%	50% (median)	75%	90%
Critical care units									
Burn	35	390	70,932	5.5	0.0	1.2	3.1	7.5	11.8
Medical cardiac	228 (221)	876	436,409	2.0	0.0	0.0	1.3	2.5	4.6
Medical major teaching	125	1410	549,088	2.6	0.1	1.1	2.3	3.7	5.2
Medical all others	153 (147)	687	362,388	1.9	0.0	0.0	1.0	2.4	4.3
Medical/surgical major teaching	182 (181)	1474	699,300	2.1	0.0	0.6	1.7	2.9	4.6
Medical/surgical all others ≤15 beds	718 (650)	1130	755,437	1.5	0.0	0.0	0.0	1.8	3.7
Medical/surgical all others >15 beds	280 (277)	1449	986,982	1.5	0.0	0.0	1.1	2.0	3.6
Neurologic	24 (23)	61	45,153	1.4	0.0	0.0	1.0	1.9	3.2
Neurosurgical	72	396	160,879	2.5	0.0	0.0	1.9	3.2	5.3

CDC secondary measure Standard infection ratio (SIR)

- SIR= observed/expected
- Used to compare states; adjusted for national data
- Uses NHSN 2006-8 rates as the reference (to calculated expected infections)

Risk Group Stratifier	Observed CLABSI Rates in 2009			NHSN CLABSI Rates for 2006-2008 (Standard Population)		
Location Type	#CLABSI	#Central line-days	CLABSI rate*	#CLABSI	#Central line-days	CLABSI rate*
Medical ICU	170	100,000	1.7	1200	600,000	2.0
Surgical WARD	58	58,000	1.0	600	400,000	1.5

$$SIR = \frac{\text{observed}}{\text{expected}} = \frac{170 + 58}{100000 \times \left(\frac{2}{1000}\right) + 58,000 \times \left(\frac{1.5}{1000}\right)} = \frac{228}{200 + 87} = \frac{228}{287} = 0.79 \quad 95\%CI = (0.628, 0.989)$$

*defined as the number of CLABSIs per 1000 central line-days

SIR –easy to understand

Central Line-Associated Bloodstream Infections and Surgical Site Infections, January 2009 – June 2009.

Central Line-Associated Bloodstream Infections

State	No. of Facilities Reporting	Observed	Predicted	SIR	95% CI for SIR		Graphic Representation of SIR**		
					Lower	Upper	0	1.0	2.0
	48	59	118.95	0.50	0.38	0.64	◆		
	37	50	82.21	0.61	0.45	0.80	◆		
	204	818	1176.83	0.70	0.65	0.74	◆		
	63	183	158.11	1.16	1.00	1.34		○	
	72	282	245.99	1.15	1.02	1.29		*	
	8	3	10.99	0.27	0.07	0.71	◆		
	76	161	193.81	0.83	0.71	0.97		◆	
	62	86	148.07	0.58	0.47	0.72	◆		
California	118	432	521.13	0.83	0.75	0.91	◆		
	50	64	94.25	0.68	0.52	0.87	◆		
	30	65	69.46	0.94	0.72	1.19		○	
	8	20	33.84	0.59	0.36	0.91	◆		
	140	301	333.46	0.90	0.80	1.01		○	
	48	234	179.95	1.30	1.14	1.48		*	
	70	124	211.44	0.59	0.49	0.70	◆		
	24	13	22.93	0.57	0.34	0.90	◆		
	72	183	222.97	0.82	0.71	0.95		◆	
	182	604	610.22	0.99	0.91	1.07		○	
US	1538	4615	5618.75	0.82	0.80	0.85	◆		

SIR – may be misleading

Advantages

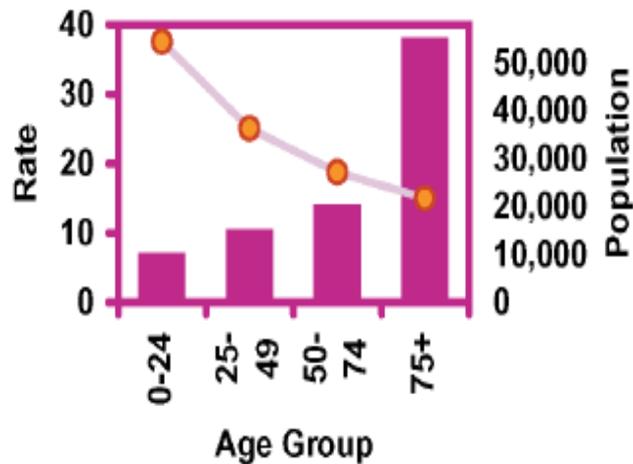
- **Provides a single summary measure**
- Is more stable than direct method as it minimizes the variance, giving a smaller standard error and narrower confidence intervals. It may be more appropriate when dealing with statistical significance of small populations

Disadvantages

- **May not preserve consistency between populations being compared. Will be biased in extreme situations**
- **Hospitals may be directly compared to the standard population but not each other (unless they have same distribution of units)**
- Can only compare over time if the reference population is 'frozen' at a fixed point in time.

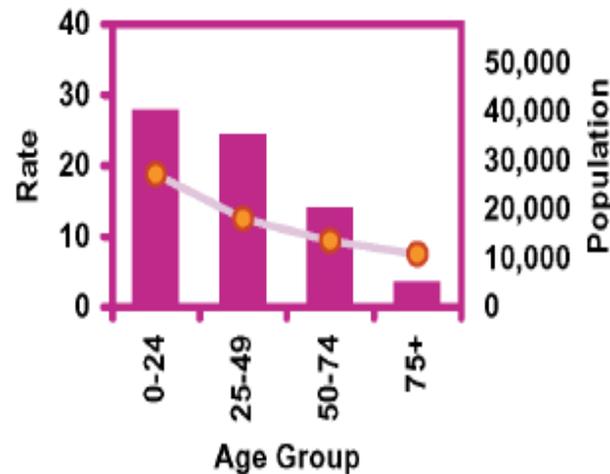
SIR – may be misleading

Population A: SMR = 81



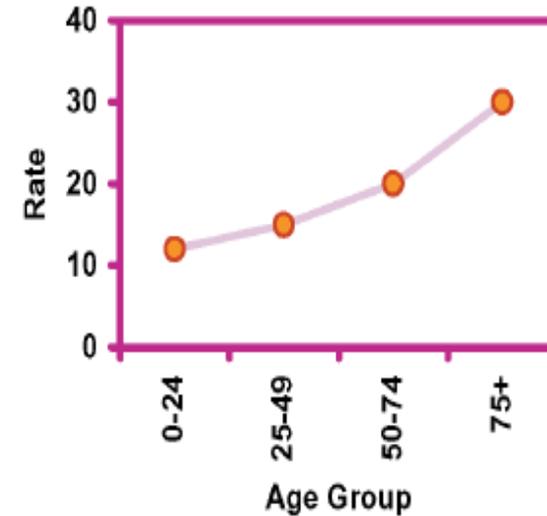
Population Age-specific rate

Population B: SMR = 91



Population Age-specific rate

Reference Rates



Age-specific rate

CDPH Metrics Work Group

- While HAI AC on hiatus, CDPH convened a panel of experienced leaders in hospital epidemiology to make recommendations for public reporting of HAIs including CLABSIs
- Provided detailed recommendations

Metrics Work Group members

VOTING

- Susan Huang, MD MPH
(Chair)
- David Birnbaum, PhD MPH
- Raymond Chinn, MD*
- Loren Miller, MD MPH
- Frank Myers, MA CIC*
- Andrew Noymer, PhD MSc
- Kathleen Quan, RN, CIC
- Francesca Torriani, MD*

NON-VOTING CDPH REPS

- Kate Cummings, MPH
- Kavita Trivedi, MD
- Lynn Janssen, MS, CIC
- Jon Rosenberg, MD

*Member of the CA HAI Advisory Committee

Proposed standard measures
based on
CDPH Metrics Work Group
recommendations

Time window for reporting

- Annual rates as recommended

Primary standard measures

- Unadjusted rates stratified by subgroups of units or 'strata' (details on strata to follow)
 - Alphabetically list hospitals, numbers of infections, line days and patient days
 - Hospital strata ≥ 100 central line days: report rate and indicate (by symbol) if statistically lower than, normative to, or higher than the state average
 - Hospital strata < 100 central line days: do not report rate or statistical testing results
- Central line utilization ratio

Proposed reporting strata

- Adult ICU (7 distinct strata)
- Adult non-ICU (5 distinct strata)
- Pediatric ICU (2 distinct strata)
- Pediatric non-ICU (1 strata)
- Adult specialty care (3 distinct strata)
- Pediatric specialty care (3 distinct strata)
- LTACS

Reporting strata – additional details

- **Adult ICU**

- Medical – Major Teaching
- Medical – Other
- Med/Surg – Major Teaching
- Med/Surg – Other
- Surgical
- Burn
- Trauma

- **Adult non-ICU**

- Medical
- Med/Surg
- Surgical
- Stepdown
- Rehabilitation

- **Adult specialty care areas**

with perm and temporary lines listed separately

- Oncology
- Bone marrow transplant
- Transplant
- Long term acute care

Reporting strata details - continued

- **Pediatric ICU**
 - Neonatal (NICU)
 - Stratify by birth weight; combine central line and umbilical catheter BSIs and line days
 - General pediatric (PICU)
- **Pediatric non-ICU (all units combined)**
- **Pediatric specialty care areas with permanent and temporary lines reported separately**
 - Oncology
 - Bone marrow transplant
 - Transplant

Example of proposed data flow

Reports: CLABSI reports by locations

Inpatient critical care units for adults (including mixed adult/pediatric)

Table 1: Adult ICU: Medical Units, Major Teaching Hospitals

Table 2: Adult ICU: Medical Units, Others Hospitals

Table 3: Adult ICU: Medical/Surgical Units, Major Teaching Hospitals

Table 4: Adult ICU: Medical/Surgical Units, Others Hospitals

Table 5: Adult ICU: Surgical Units

Table 6: Adult ICU: Burn Units

Table 7: Adult ICU: Trauma Units

Inpatient wards (non critical care) for adults (including mixed adult/pediatric):

Table 8: Adult Medical Wards

Table 9: Adult Medical/Surgical Wards

Table 10: Adult Surgical Wards

Table 11: Adult Stepdown Wards

Table 12: Adult Rehabilitation Wards

Example of unadjusted rates by strata (in this case, Adult Med ICU)

Table X. Adult or mixed adult/pediatric Medical Intensive Care Locations (Major Teaching Hospitals)

Hospital	Infections	Line days	Patient days	Device Utilization Ratio	Rate per 1000	95% Confidence Interval	Statistical Interpretation
Hospital A	2	3483	19463	17.9	0.6	0.1 - 2.1	⊙
Hospital B	10	4489	6930	64.7	2.2	1.1 - 4.1	⊙
Hospital C	3	5467	11654	46.9	0.5	0.1 - 1.6	⊙
Hospital D	2	2284	6420	44.9	0.7	0.1 - 2.5	⊙
Hospital E	35	11685	20052	58.3	3.0	2.1 - 4.2	●
Hospital F	1	70	3887				
Hospital G	1	1477	3388	43.6	0.7	0.0 - 3.8	⊙
....							
Hospital Z							
	○	Statistical interpretation: hospital rate was lower than the state average					
	⊙	Statistical interpretation: hospital rate was no different than the state average					
	●	Statistical interpretation: hospital rate was higher than the state average					
		Blank cells represent hospitals reporting fewer than 100 central line days;					

Proposed standard measures, continued

- **Secondary measures**
 - Recommend against secondary adjusted metrics, **including the SIR**, pending further evaluation
 - Convene experts to explore value of additional adjusted measures
 - In 2012, CDPH proposes a tabular summary of strata-specific statistical testing results (similar to Consumer Reports Rating Tables)

Statistical interpretation of CLABSI rates by hospital and patient care location

Hospital	Special Care Areas																														
	Intensive Care Areas						Wards				Temporary Lines				Permanent Lines																
	Adult Medical Surgical - Teaching	Adult Medical Surgical - non-Teaching	Adult Surgical	Burn	Trauma	Neonatal - < 750 g	Neonatal 751 - 1000 g	Neonatal - 1001-1500 g	Neonatal - 1501-2500 g	Neonatal - >2500 g	Pediatric	Adult Medical Surgical	Adult Surgical	Adult stepdown	Adult Rehabilitation	General Pediatric	Adult oncology	Adult Solid Organ Transplant	Adult Bone marrow transplant	Pediatric Oncology	Pediatric Transplant	Pediatric Bone Marrow Transplant	Long term acute care	Adult oncology	Adult Solid Organ Transplant	Adult Bone marrow transplant	Pediatric Oncology	Pediatric Transplant	Pediatric Bone Marrow Transplant	Long term acute care	
Hospital A	⊙	⊙	⊙								⊙	⊙	⊙	⊙			●							⊙	⊙						
Hospital B	⊙		⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙					⊙	⊙						⊙	⊙						
Hospital C		⊙									⊙					⊙							⊙								
Hospital D	⊙	⊙	⊙	⊙	⊙		⊙				⊙	⊙	⊙	⊙	⊙	⊙															
Hospital E	⊙	⊙	⊙	●	⊙	⊙	⊙			●	⊙	●	●	●	●	●		⊙												⊙	
Hospital F	⊙	⊙	⊙								⊙	⊙	⊙			⊙	⊙	⊙							⊙						
Hospital G	⊙		⊙	⊙	⊙						⊙	⊙	⊙				⊙	⊙							⊙						
Hospital H	⊙		⊙								⊙		⊙																		
Hospital I	⊙	⊙									⊙	⊙																			

- ⊙ Statistical interpretation: hospital rate was lower than the state average
 - ⊕ Statistical interpretation: hospital rate was no different than the state average
 - Statistical interpretation: hospital rate was higher than the state average
- Blank cells indicated that the hospital did not report use of any central lines in this unit type

Recommendations, continued

- Other recommendations
 - Ensure clear communication about changing surveillance criteria
 - Prior to publication, give each institution an opportunity to review reported data

Managing expectations about the standard measures and the 2012 report

- CDPH and California hospitals have adopted CDC/NHSN surveillance, reporting, and risk-adjustment protocols for CLABSI which will make rate comparisons published in 2012 **much more informative to all stakeholders, most especially the public**
- CDPH continues to expect that hospitals are complying with NHSN reporting protocols and continues to assist hospitals in identifying systematic data errors, However, **hospitals remain solely responsible for their data**

Managing expectations about the standard measures and the 2012 report

- Protocols cannot completely eliminate distortion from information or confounding errors (validation is yet to come)
- CDPH must continue to provide the appropriate context for interpreting rates
 - A high rate may reflect
 - Weak infection control
 - Strong surveillance methods that favor more complete identification of infections
 - *Non standard or inappropriate definitions*
 - *More medically complex patients*
 - A low rate may reflect
 - Strong infection control
 - Weak surveillance methods that favor non-detection of infections (missed cases)
 - *Non standard or inappropriate definitions*
 - *Less medically complex patients*

Managing expectations about the metric and the 2012 report

- Therefore, rates published in 2012 are best thought of as a **starting point** for asking questions about the quality of care in California hospitals

Summary – 2012 report

- Report period – 12 months (annual rates)
- Primary standard measures
 - Unadjusted stratified rates using unit-based strata
 - Central line utilization ratio
- Display hospitals alphabetically by strata
 - Infections, line days, patient days, - ALL
 - Rate, 95% CI, symbol for stat testing based on line days – Strata with at least 100 line days
- Display all hospitals in a table that graphically summarizes strata-specific testing results

Wrap up

- Feedback from HAI AC Committee:
 - Comments on proposed standard measures
 - partnership on expectations