

CATHETER ASSOCIATED BLOOD STREAM INFECTION (CABSI) LOCAL PERSPECTIVES

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CABSI: LOCAL PERSPECTIVES

- The Local Project to Control CABSI
- Combined Data
- Further Thoughts as to whether we can do better



INFECTION CONTROL: LOCAL ICUS

•Joint Project of the Infection Control Task Force and COC (ICU)

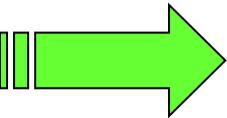
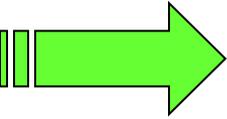
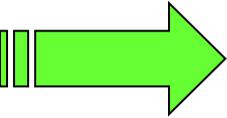
2007	2008	2009
<ul style="list-style-type: none">□ Mechanism of Data Collection□ Criteria of Blood Culture	<ul style="list-style-type: none">□ Phase in 2% Chlorhexidine□ Seminars on CABSIs: to ICU and ICN Staff	<ul style="list-style-type: none">□ Implementation of 5 Point Care Bundle: with Regular Daily review & Compliance Check□ On Going till Now
<ul style="list-style-type: none">□ Baseline Data: 3 months□ Defining Compliance Check & Daily Review	<ul style="list-style-type: none">□ Compulsory CABSIs Reporting: 3 months□ Standardized Hardware & Drapes	



CENTRAL LINE BUNDLE ELEMENTS AS THE INTERVENTION:

- Hand hygiene
- Maximal barrier precautions
 - One Piece Drape: Preliminary Evaluation
- Chlorhexidine skin antiseptis
 - 2% solution
 - Problem with Registration of Local Preparation
- Optimal catheter site selection,
 - with subclavian vein as the preferred site for insertion
- Daily review of line necessity with prompt removal of unnecessary lines

ALL 5



PUBLISHED GUIDELINES: PREVENTION OF CABSI

Clinical Infectious Diseases Advance Access published April 1, 2011

GUIDELINES

Guidelines for the Prevention of Intravascular Catheter-related Infections

Naomi P. O'Grady,¹ Mary Alexander,² Lillian A. Burns,³ E. Patchen Dellinger,⁴ Jeffrey Garland,⁵ Stephen O. Heard,⁶ Pamela A. Lipsett,⁷ Henry Masur,¹ Leonard A. Mermel,⁸ Michele L. Pearson,⁹ Issam I. Raad,¹⁰ Adrienne G. Randolph,¹¹ Mark E. Rupp,¹² Sanjay Saint,¹³ and the Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1)

CID 2011:52 (1 MAY) E1



POINTS TO NOTE IN GUIDELINES

Post Insertion Care

- Hand Hygiene before handling
- Proper care of and Minimal Use of Hubs
- Transparent Dressing
 - Keep intact for at least 96 hrs unless soiled
- Change IV Administration Set not longer than 96 Hrs
 - Except sets for Lipid Emulsion and Blood < 24 Hrs

Only care at insertion is not sufficient



PREVIOUS DEFINITION CABSI: NNIS

- Central Catheter > 48hrs
- NNIS (National Nosocomial Infection Surveillance)
Definition Of Lab Confirmed Blood Stream Infection

Criterion 1	Recognized pathogen cultured from one or more blood cultures
and	organism cultured from blood is not related to an infection at another site.
Criterion 2	One S/S of fever>38 , chills, or hypotension SBP<=90 mmHg
and	S/S and organism cultured from blood is not related to an infection at another site.
and	a) common skin contaminant is cultured from two or more blood cultures drawn on separate occasions, or
	b) common skin contaminant is cultured from at least one blood culture and physician institutes appropriate antimicrobial therapy.



NHSN DEFINITION (UPDATE JUN 2010)

Laboratory Confirmed Blood stream infection (Age >1 yr)

- Central Line in-situ
- Time not Relevant now
- Keep 48hrs Transfer Rule
- **Criteria 2b deleted (Jan 2008)**

Criteria 1	One or More Blood Culture of known Pathogen	AND	Not Related to Infection at other sites		
Criteria 2	At least one of: <ul style="list-style-type: none"> •Fever (>38°C) •Hypotension •Chills 	AND	Not Related to Infection at other sites	AND	Common Skin Contaminants cultures 2 or more times in Separate Occasions.



National Health Safety Network 2016



*Device-associated Module
BSI*

Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central line-associated Bloodstream Infection)

Central line-associated BSI (CLABSI): A laboratory-confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was **in place for >2 calendar days** on the date of event, with day of device placement being Day 1,

AND

the line was also **in place on the date of event or the day before**. If a CL or UC was in place for >2 calendar days and then removed, the date of event of the LCBI must be the day of



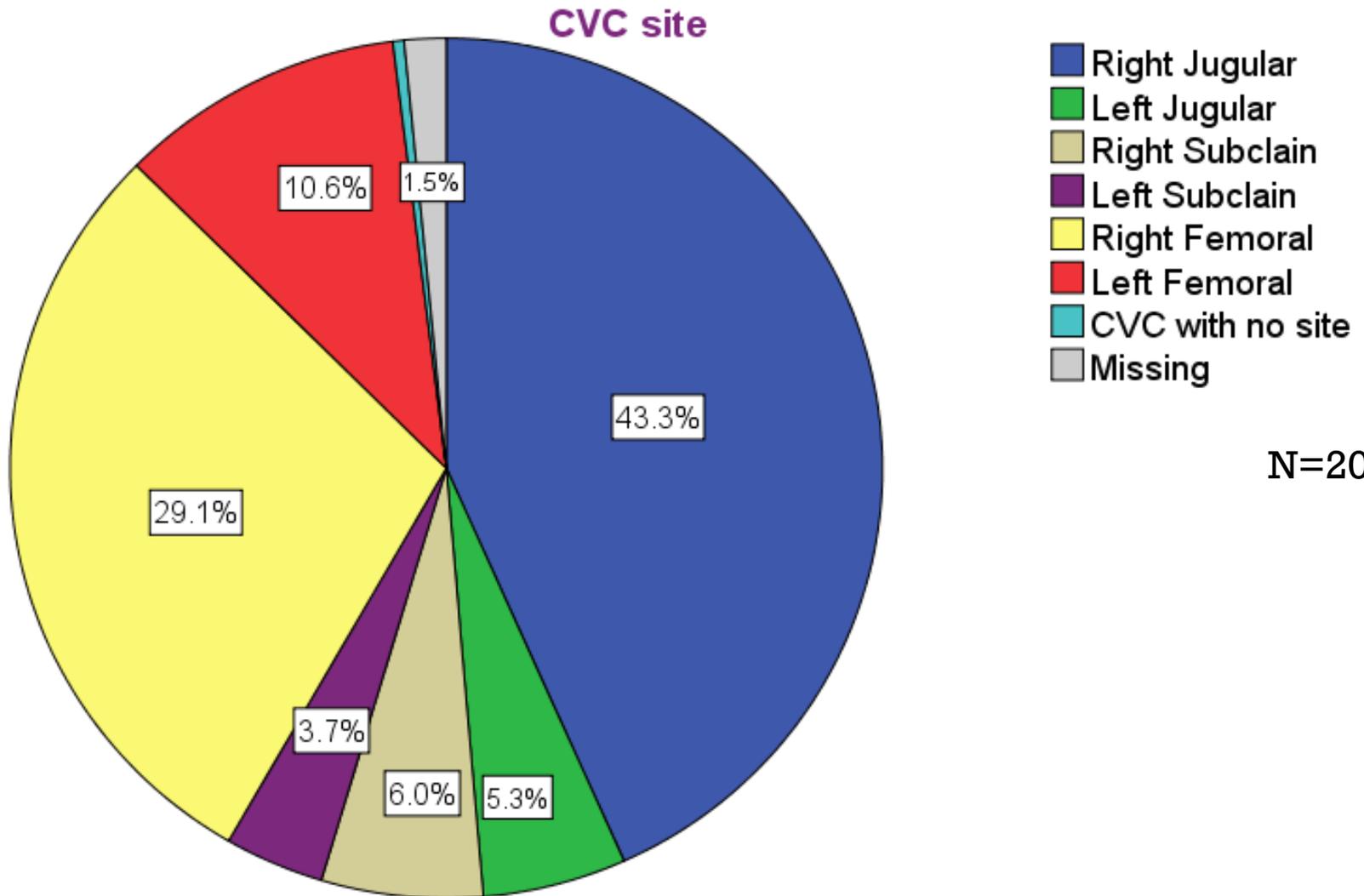
CENTRAL LINES ON DAILY REVIEW

		Freq	Percent	Valid Percent
Valid	QMH	234	10.9	10.9
	PYN	108	5.0	5.0
	RH	44	2.1	2.1
	CMC	51	2.4	2.4
	KWH	172	8.0	8.0
	PMH	195	9.1	9.1
	QEH	289	13.5	13.5
	UCH	214	10.0	10.0
	AHNH	14	.7	.7
	NDH	178	8.3	8.3
	PWH	290	13.6	13.6
	TKOH	74	3.5	3.5
	TMH	207	9.7	9.7
	YCH	70	3.3	3.3
Total		2140	100.0	100.0

- Preliminary Uncensored Data
- Jan-Mar 2009
- M:F=1192 (62%):732 (38%) :
 - Missing 216
- Age: 63.5± 16.4 years (n=1888)



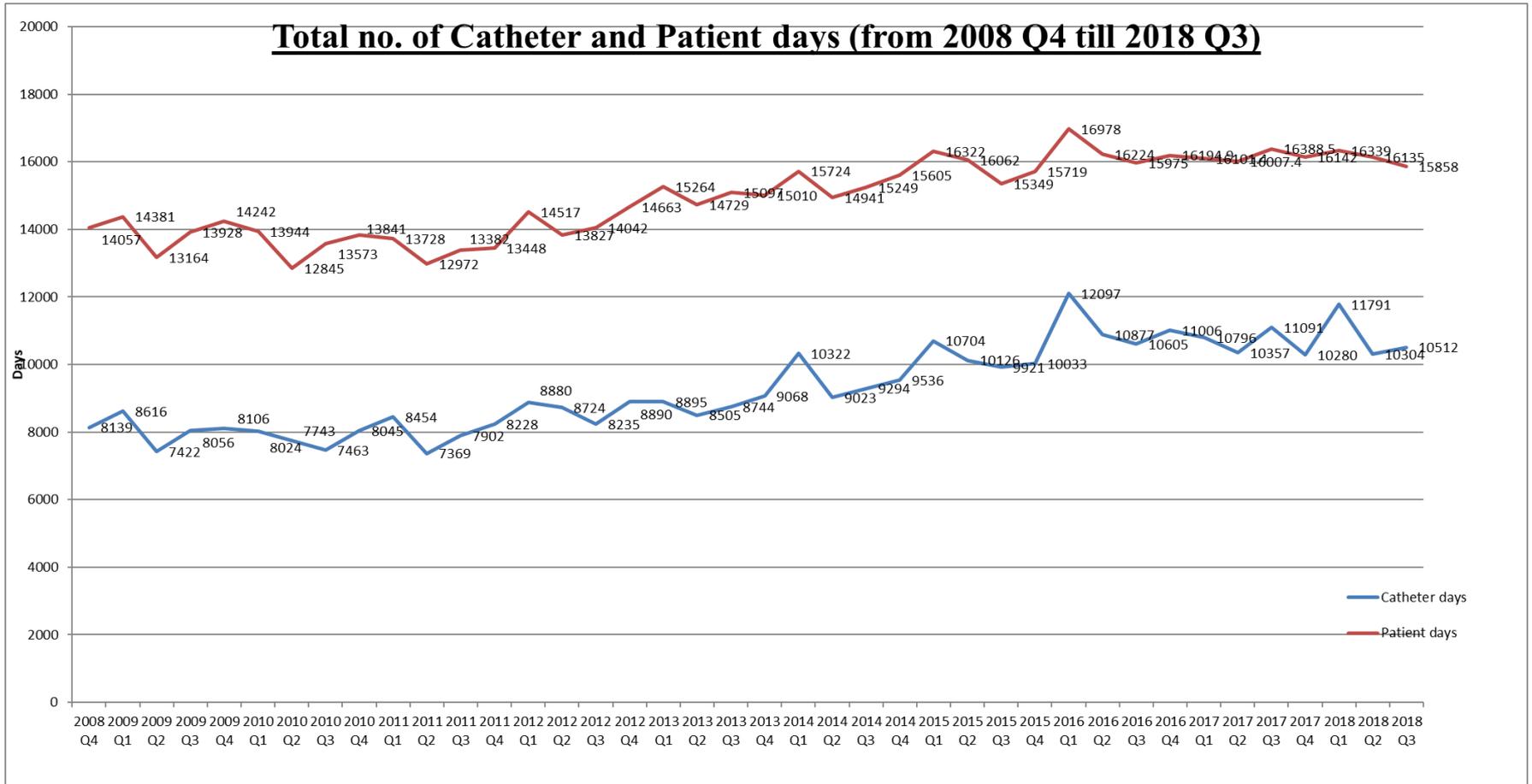
CVC BY SITE: 2009 SURVEY



N=2098

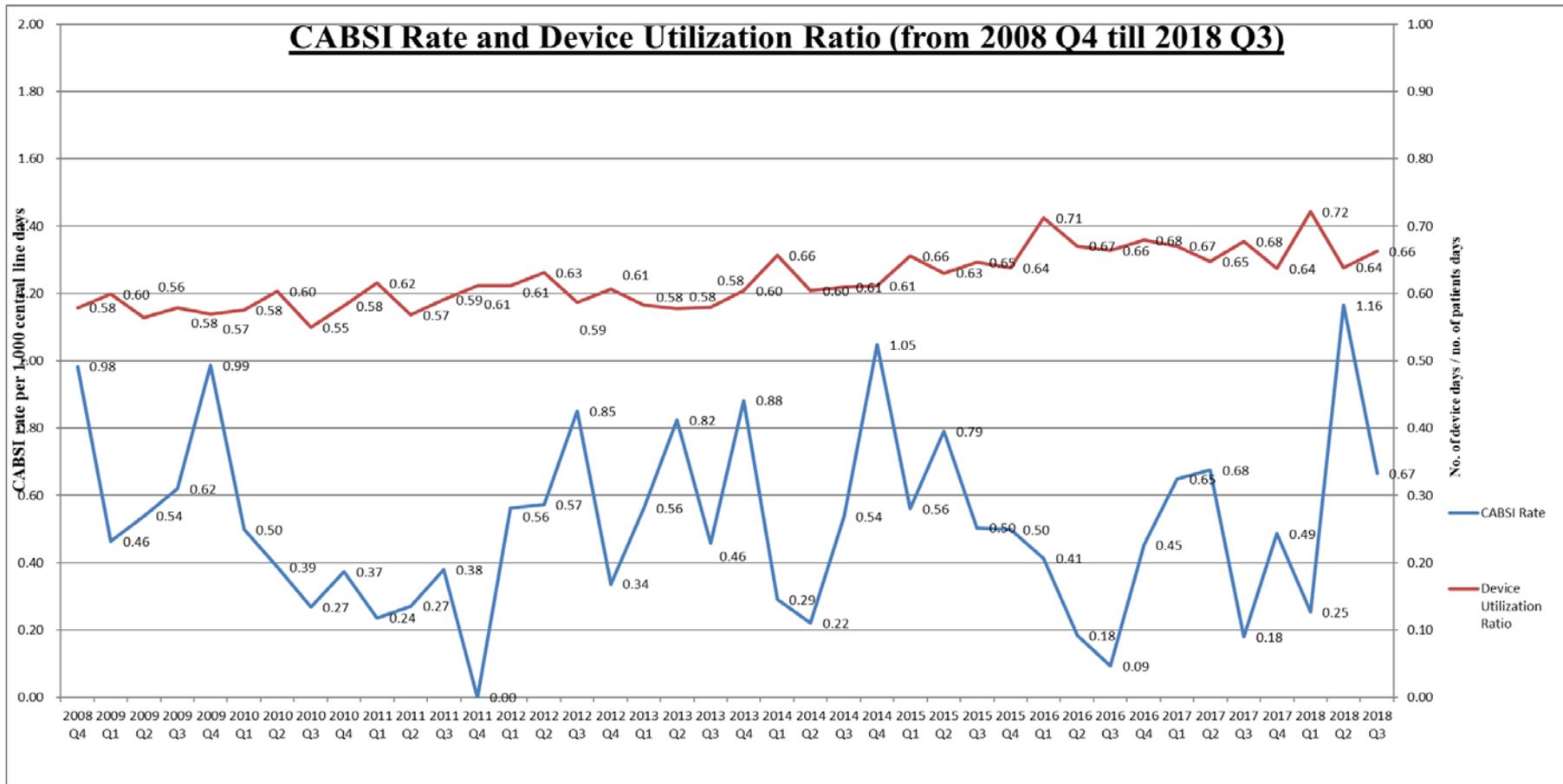


PATIENT DAYS AND CATHETER DAYS



INFECTED LINES ANALYSIS TILL Q3 2018

ON QUARTERLY BASIS



INFECTED CATHETERS BY SITES: Q1 2009 TO Q3 2018

		total	%	Utilization at Q1_2009
Site	Femoral	86	43.65%	40.4%
	Jugular	93	47.20%	49.4%
	Subclavian	17	8.63%	9.8%
	Axillary	1	0.51%	0%
	total	197	100%	100%

*** Subclavian lines are not exempted from CABSI.**



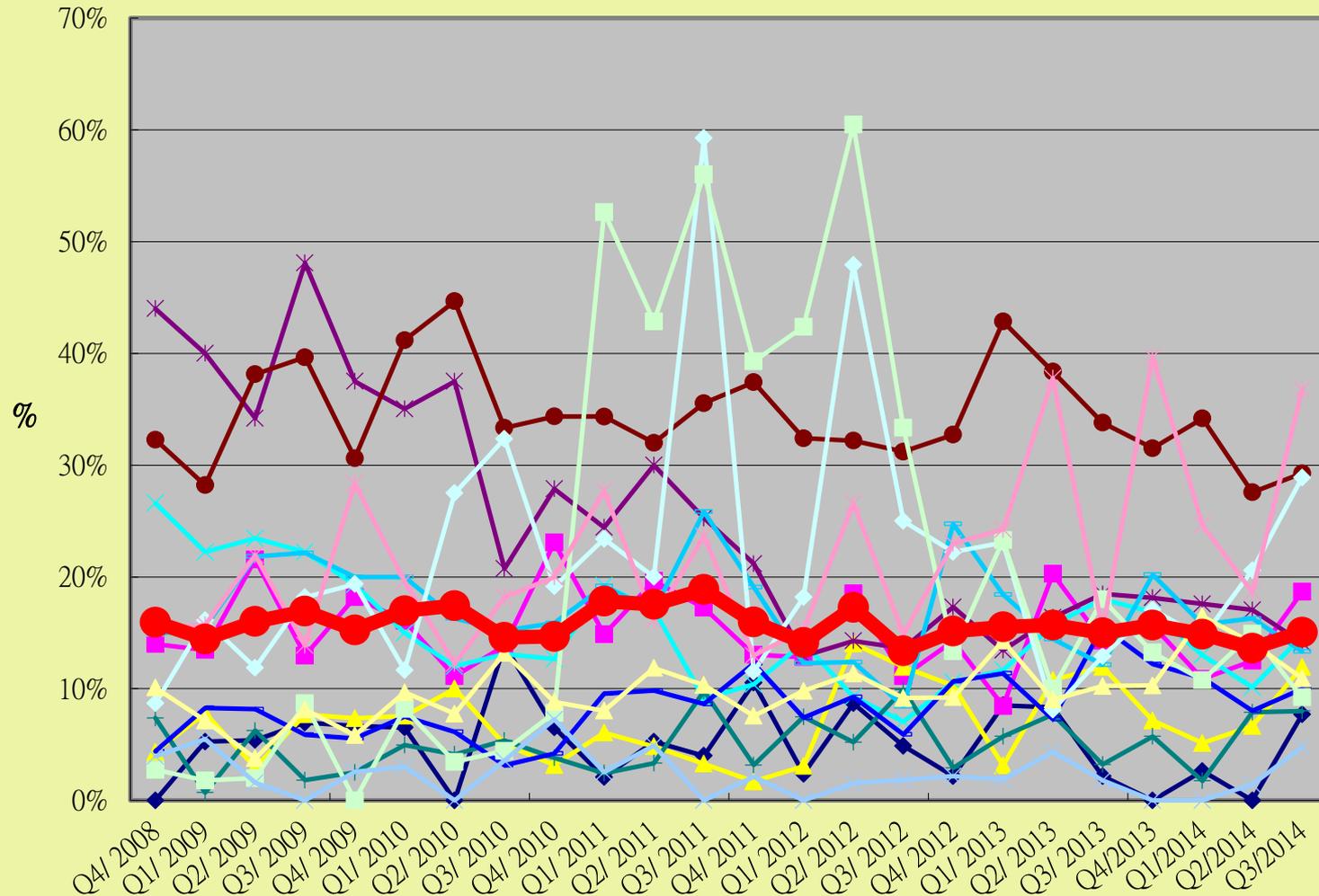
HOW ABOUT IF WE CORRELATE YEAR BY YEAR?

- The average rate of Paired culture for an ICU might be habitual and might not change over a long time
- But we cannot identify a standard rate of Blood Culture to Benchmark!



PRACTICE OF PAIRED BLOOD CULTURE

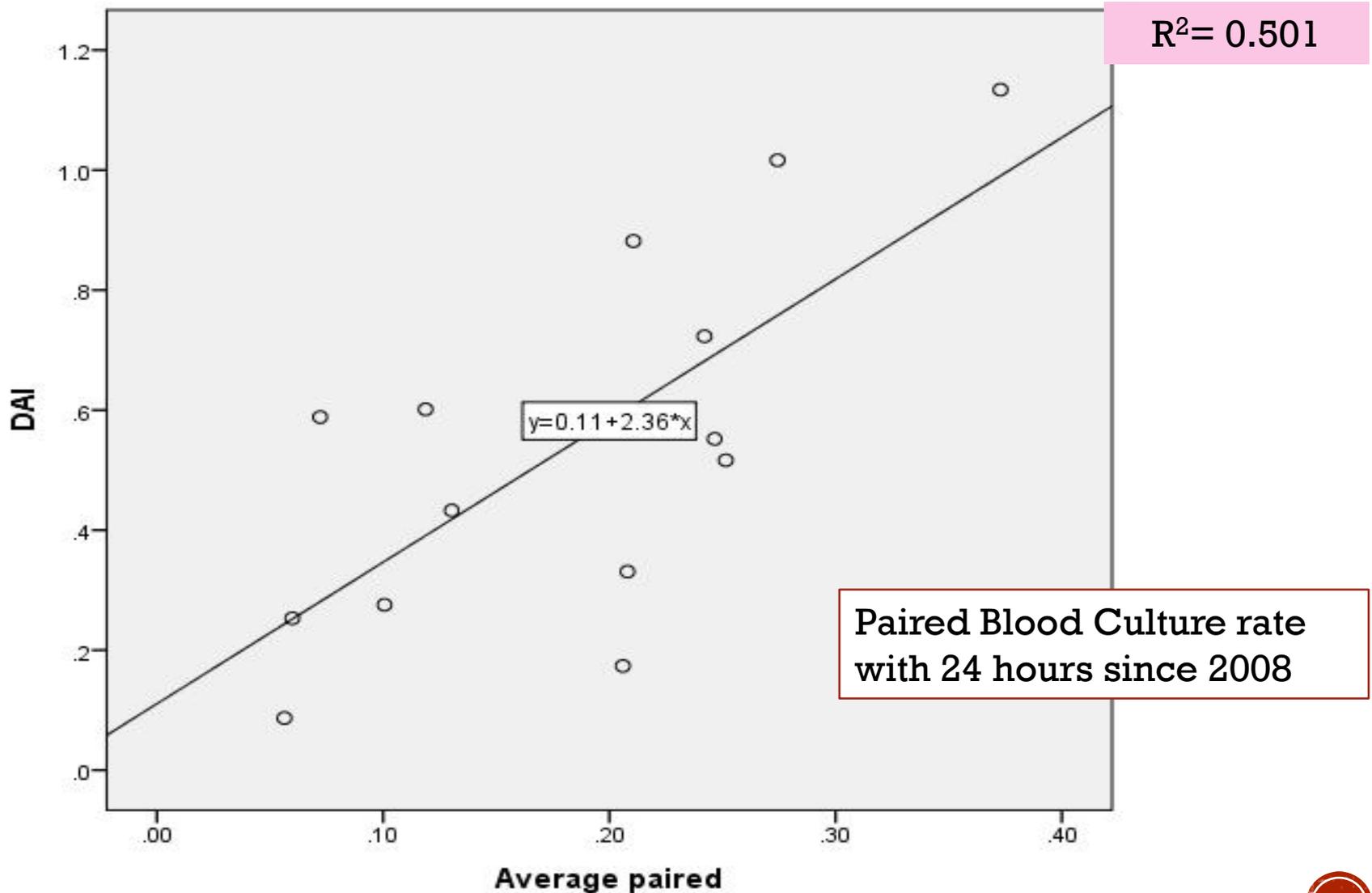
% of Sending Paired Blood Culture Within 24 Hours Among Hospitals (since Q4/ 2008)



19.
Ave



OVERALL: PAIRED BLOOD CULTURE RATE VS CABSII RATE



CORRELATION: CABSI VS BLOOD CULTURE PRACTICE

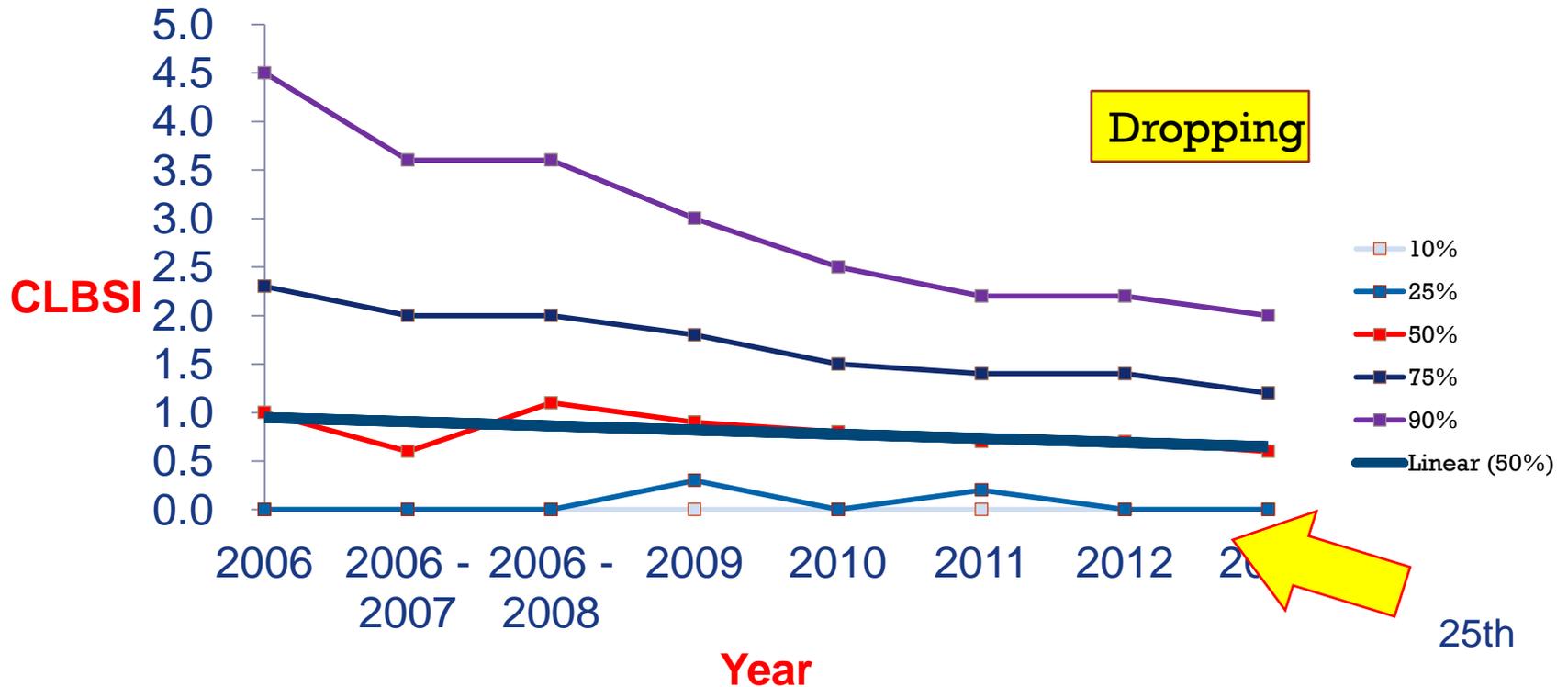
Correlations				
		Average paired	DAI	culture/pt
Average paired	Pearson Correlation	1	.708**	.659*
	Sig. (2-tailed)		.005	.010
	N	14	14	14
CABSI	Pearson Correlation	.708**	1	.640*
	Sig. (2-tailed)	.005		.014
	N	14	14	14
culture/pt	Pearson Correlation	.659*	.640*	1
	Sig. (2-tailed)	.010	.014	
	N	14	14	14

ROOM FOR FURTHER IMPROVEMENT?

- Problem of Benchmarking against NHSN database
 - NHSN Database is not real time
 - Thus, not useful for immediate feedback or audit purpose
- Change over to Standardized infection ratio
- Data on Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)

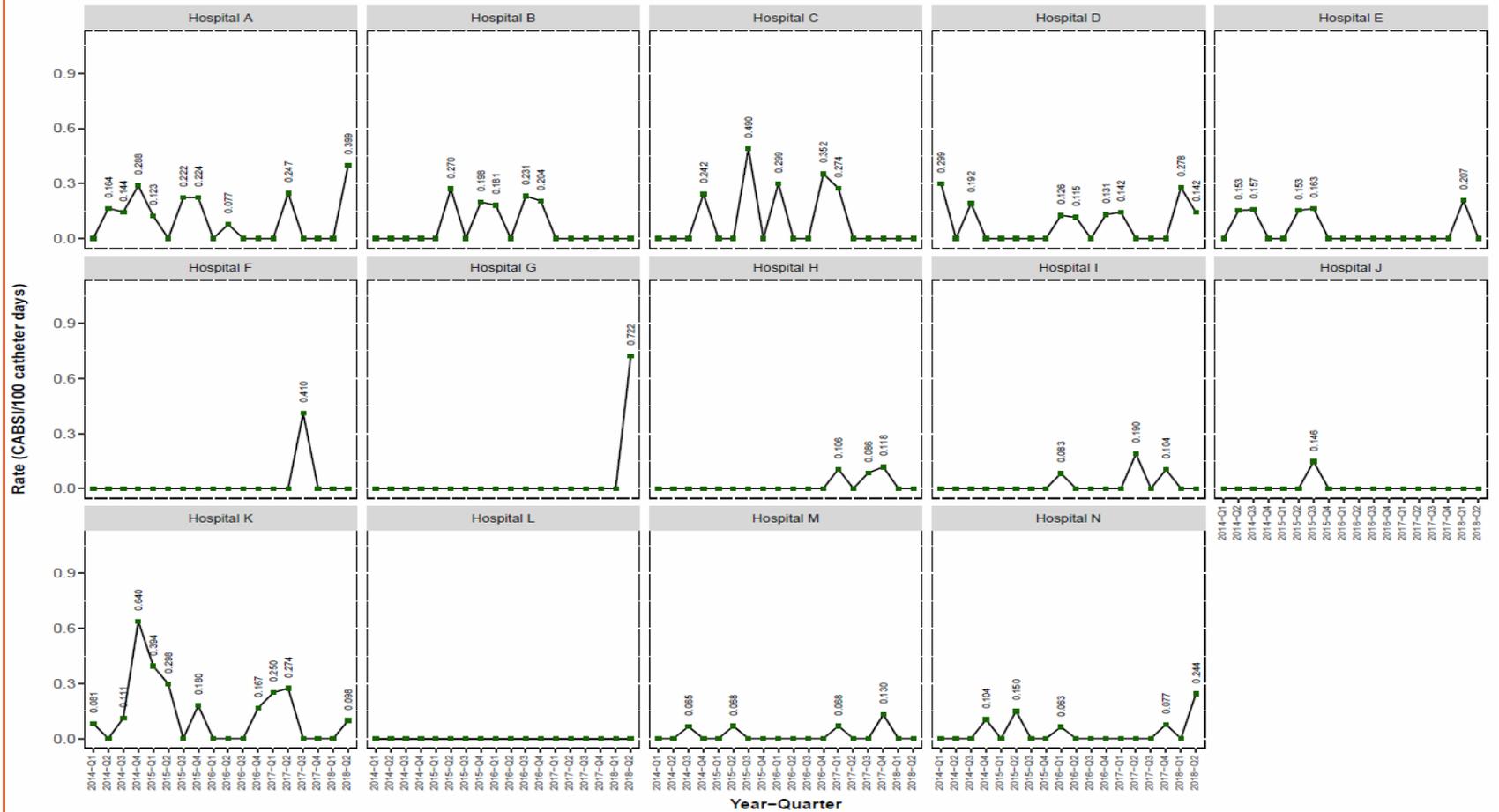
THE NHSN CABSİ BENCHMARK CHANGED WITH TIME

Medical/surgical - All others/ > 15 beds



VARIATION ACROSS HA ICU INDIVIDUAL RATE IN EACH ICU

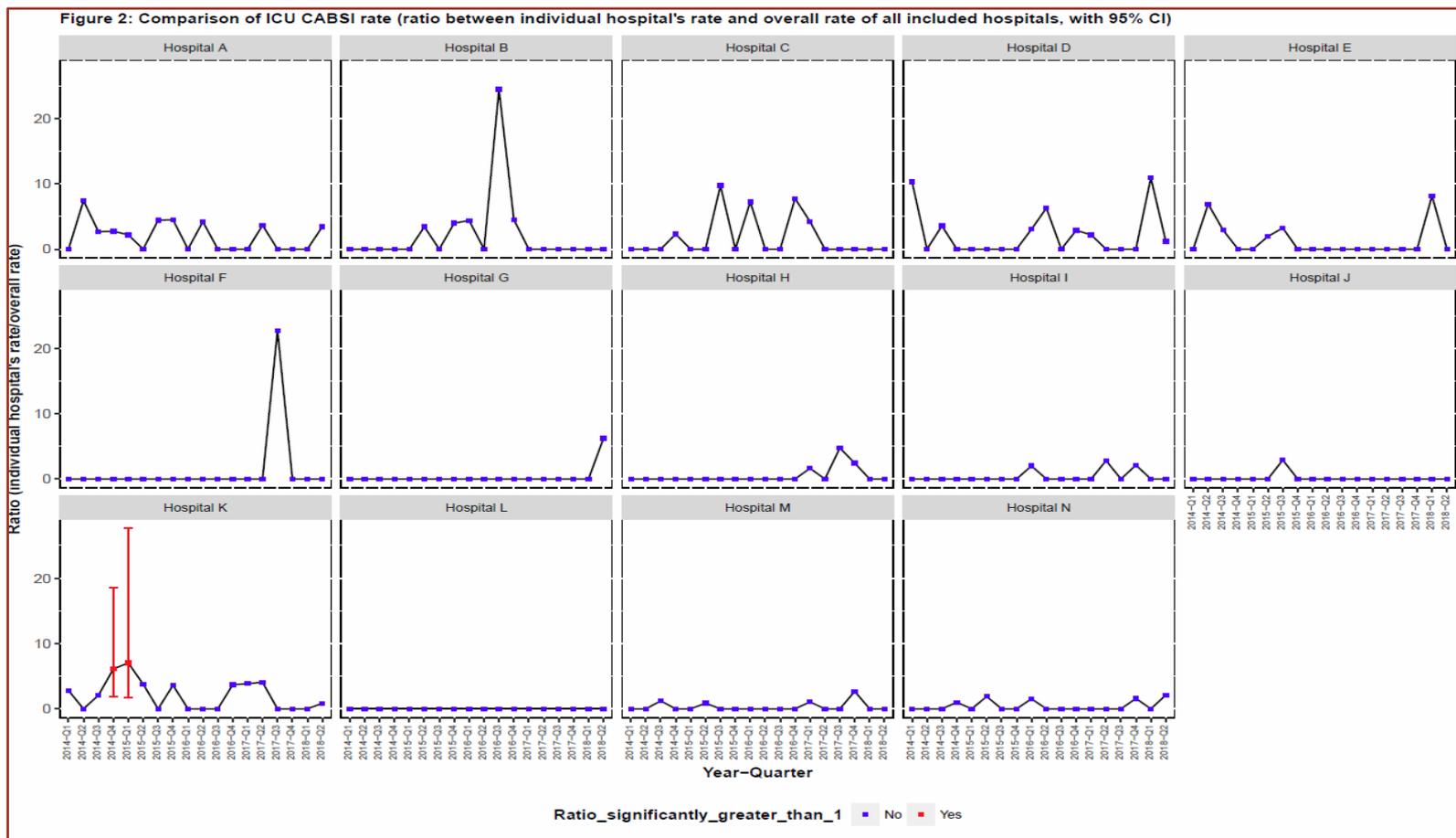
Figure 1: HA ICU CABSIs rate (CABSIs/100 catheter days) breakdown by hospital



INTERNAL BENCHMARKING ACROSS ICU IN HK

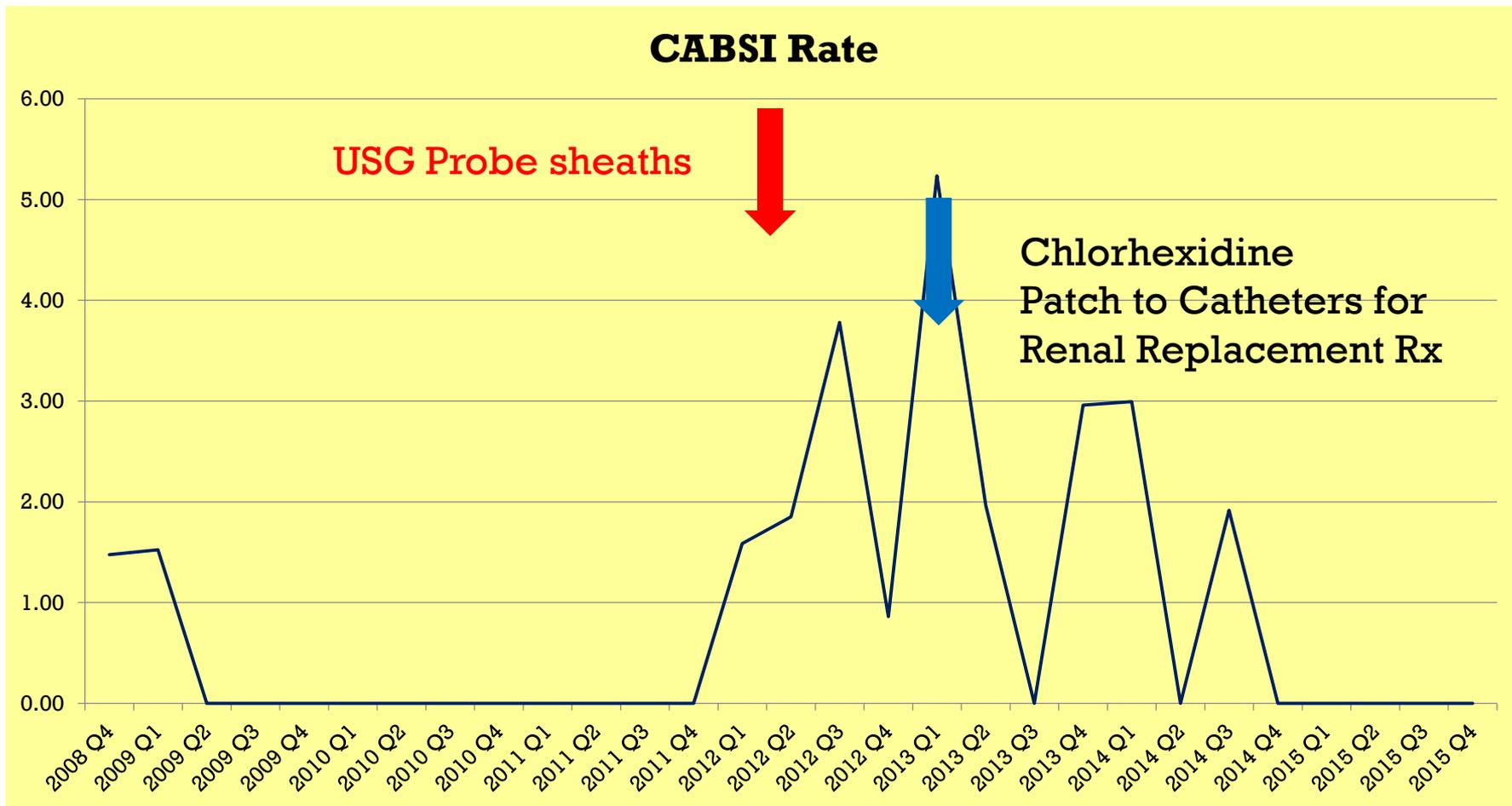
(2014 TILL Q2 2018)

= HOSPITAL RATE TO AVERAGE HA RATE OF CABS I



SURVEILLANCE COULD LEAD TO TIMELY INTERVENTION

- Case of Hospital X: Has something gone wrong?

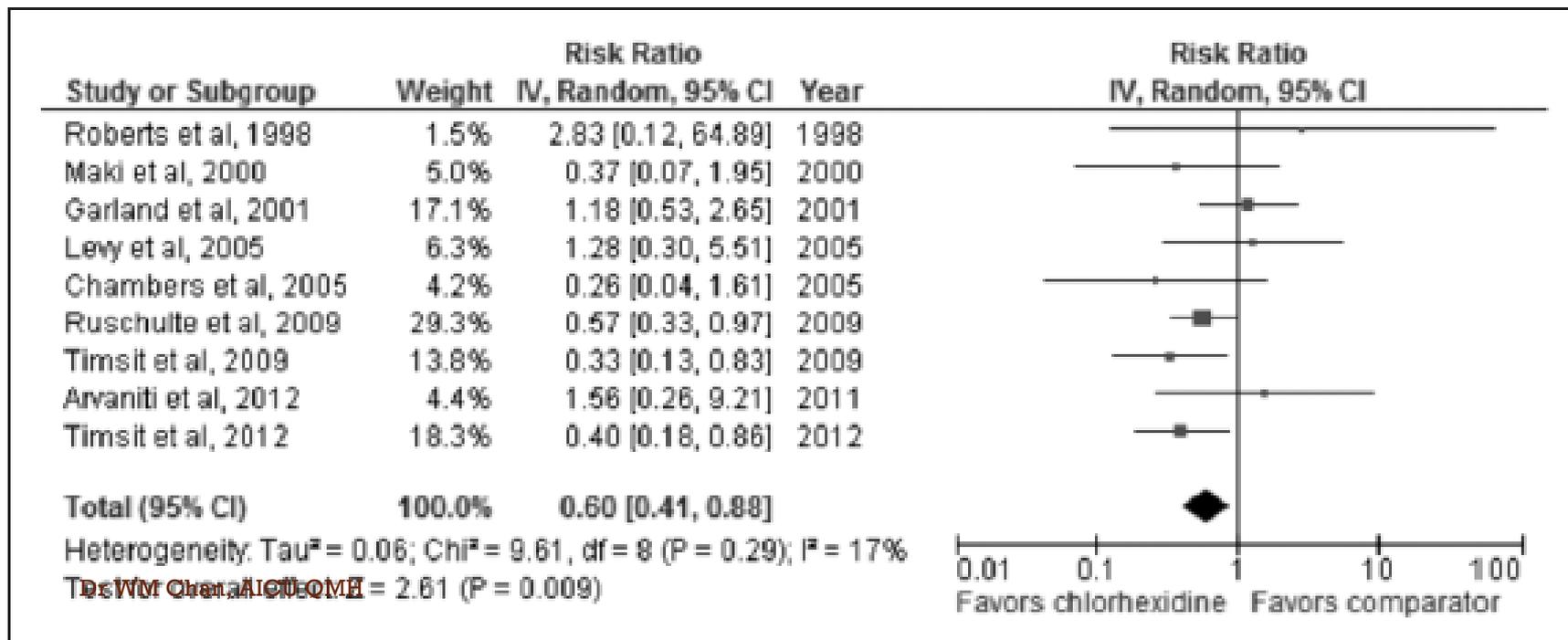


CHLORHEXIDINE IMPREGNATED DRESSING AS POSSIBLE INTERVENTION

SAFDAR *ET AL CRIT CARE MED 2014*

- Meta-Analysis of 9 studies,
- Year 1998-2012, 5586 Study Catheters

Effect	RR	95CI	P
CABSI	0.60	0.41-0.88	0.009
Colonization	0.52	0.43-0.64	<0.001



STANDARDIZED INFECTION RATIO (SIR)

- For Database Reported after 2016
- Ratio of Observed Infections over Predicted Infection
- Correct for Difference in Risk factors, including type of ICU

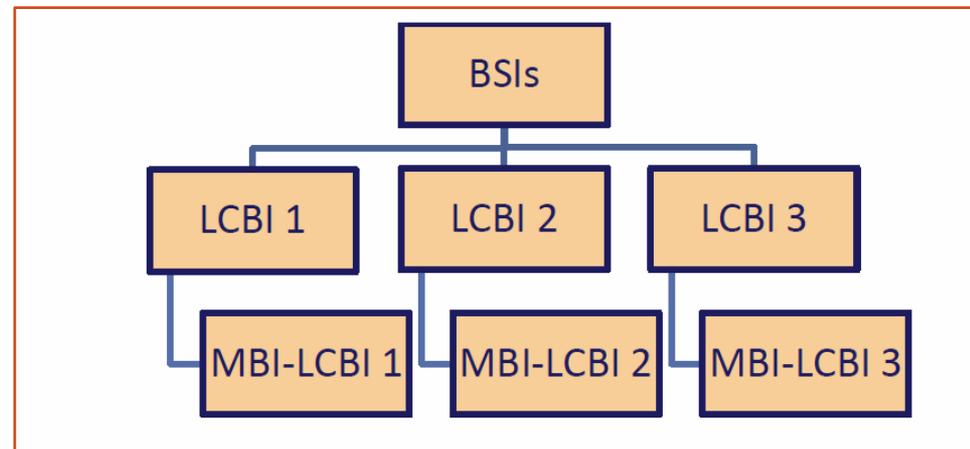
$$SIR = \frac{\text{Observed (O) HAIs}}{\text{Predicted (P) HAIs}}$$

VARIATION IN LOCAL PRACTICES IN HONG KONG

- Lack of Standardized use of:
 - Use of Chlorhexidine Impregnated Patched over catheters
 - Recommended if high rate of CABSIs in spite of adequate adjunctive measures to control CABSIs
 - Use of Chlorhexidine body bath
 - Use of Antibiotics Impregnated catheters
 - Use of PICC (Peripherally Inserted Central Catheters)
 - Meta-Analysis Chopra *et al* *ICHE* 2015: 13 studies included
 - [95% CI], 0.91 [0.46-1.79].

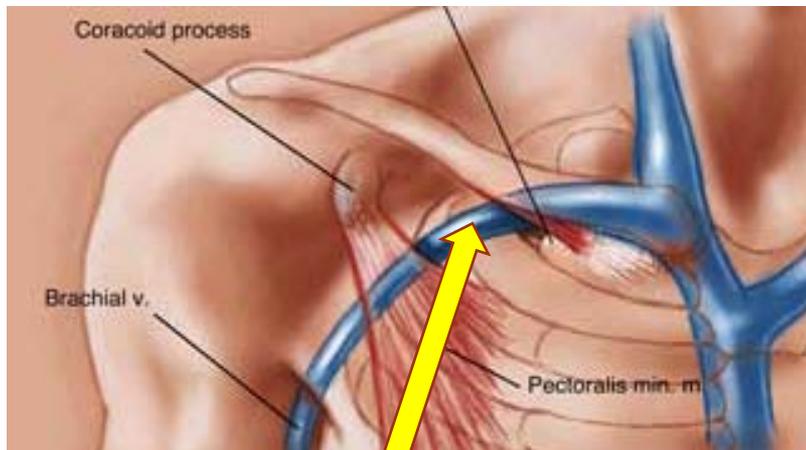
MBI-LCBI

- Mucosal Barrier Injury - Laboratory-Confirmed Bloodstream Infection
- BSI in patients
 - after BMT with Graft vs Host Disease
 - Severely Neutropenic Patients ($ANC < 500/mm^3$)
- **No Local Data**



IMPACT OF ULTRASOUND GUIDED CENTRAL LINE INSERTION

- Ultrasound Guided Central Lines Insertion is becoming more and more common in ICU
- Our Experience: Safe with Short Learning Curve
- Other Alternative Sites:
 - Axillary Vein,
 - Peripherally Inserted Central Catheters (PICC)



Axillary Vein



ULTRASOUND GUIDED CENTRAL LINE INSERTION

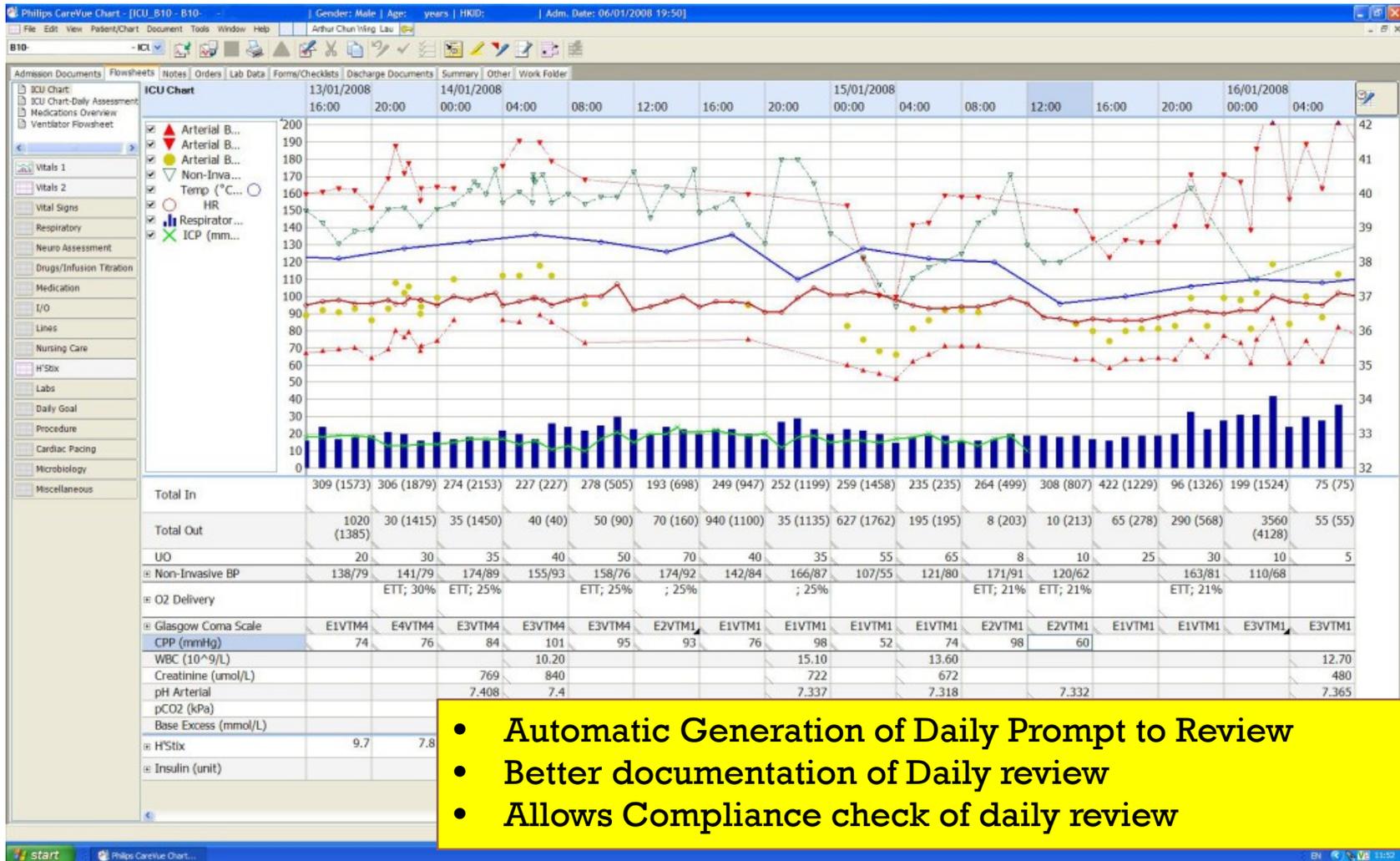
Hind *et al BMJ* 2003

- **Meta-Analysis 18 Trials 1646 Subjects**
- Much Lower mechanical complications
 - Feasible for high risk patients: Bleeding risk, Risk of Pneumothorax
- Higher Success Rate at first attempt for Jugular Lines

	OR	95% CI	OR	95% CI	OR	95% CI
	Jugular		Subclavian		Femoral	
Failure of Placement	0.14	0.04-0.33	0.14	0.04-0.57	0.29	0.07-1.21
Failure at First Attempt	0.59	0.39-0.88				
Complications	0.43	0.22-0.87	0.10	0.01-0.71		



WE ARE NOW MOVING TOWARDS DIGITALIZED CLINICAL INFORMATION SYSTEMS IN ICUS



- Automatic Generation of Daily Prompt to Review
- Better documentation of Daily review
- Allows Compliance check of daily review

SUMMARY

- **A territory wide project to survey and control CABSIs is feasible**
 - The Result so far is better than average
 - May need more stringent control measures to achieve a zero rate of infection.
- **The current surveillance system allows pickup of warning trend of change of CABSIs rate.**
- **Benchmarking of Practice across ICUs in Hong Kong could be difficult**



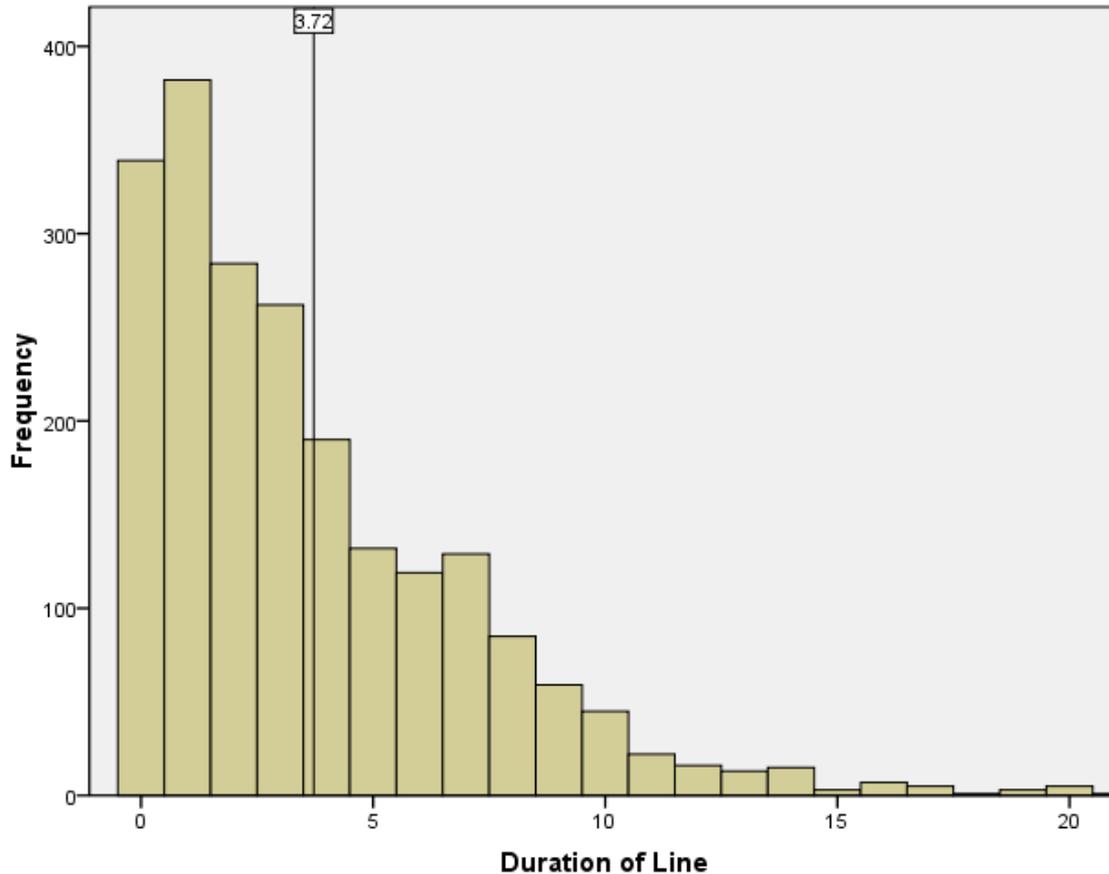
ACKNOWLEDGMENT

- Office of Chief Infection Control Officer
- All Participating ICUs
 - Infection Control Nurses:
 - ICU Doctors and Nurses
- HA Head Office
 - Members, COC ICU
- All Infection Control Officers
- Research Nurses AICU QMH

THANK YOU!

DURATION OF INSERTION IN 2009 SURVEY

Duration of Inserted Central Lines

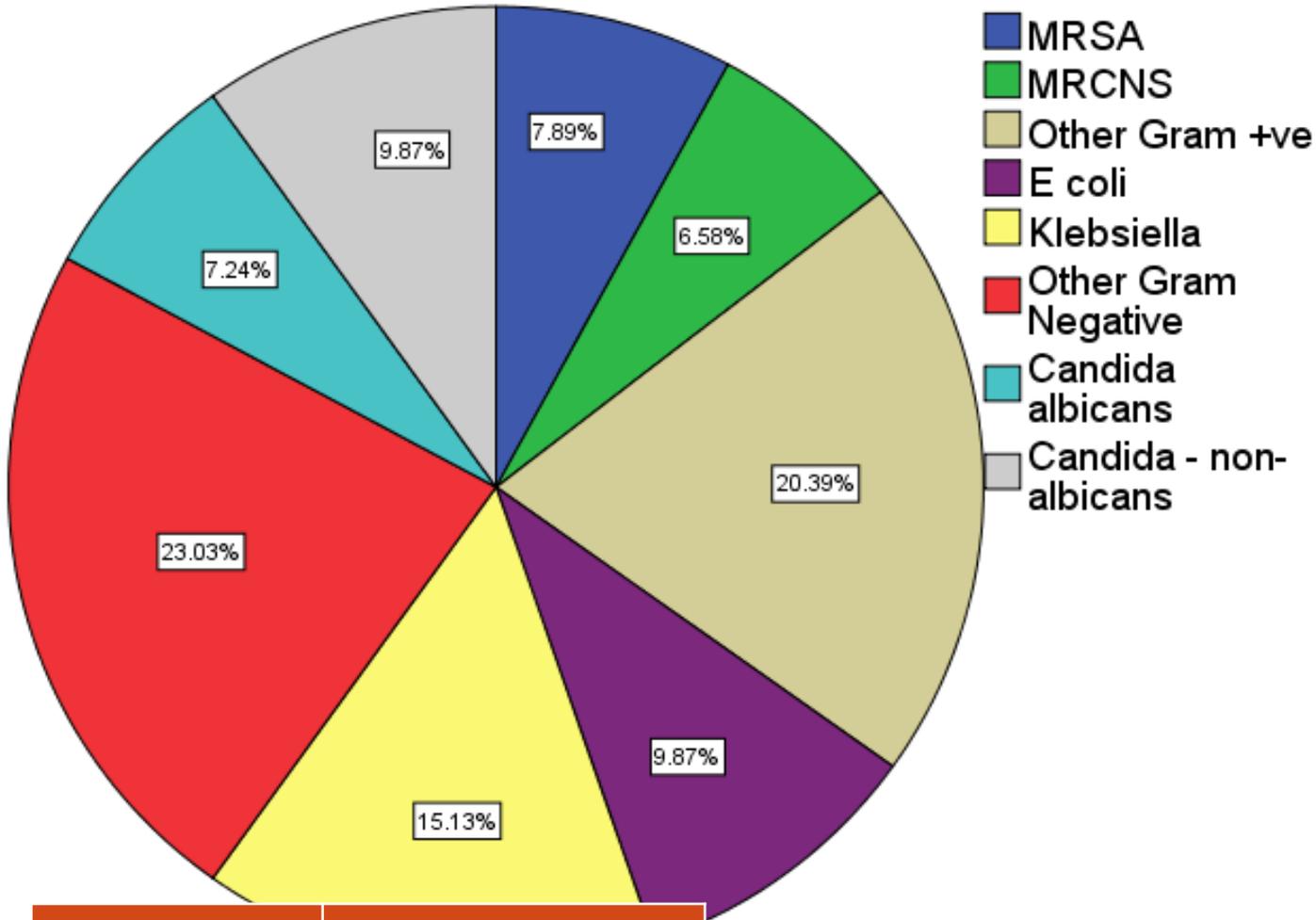


Mean =3.72
Std. Dev. =3.809
N =2,125

Duration of Line		
N	Valid	2125
	Missing	15
Mean		3.72
Median		3.00
Std. Deviation		3.809



Organism Group



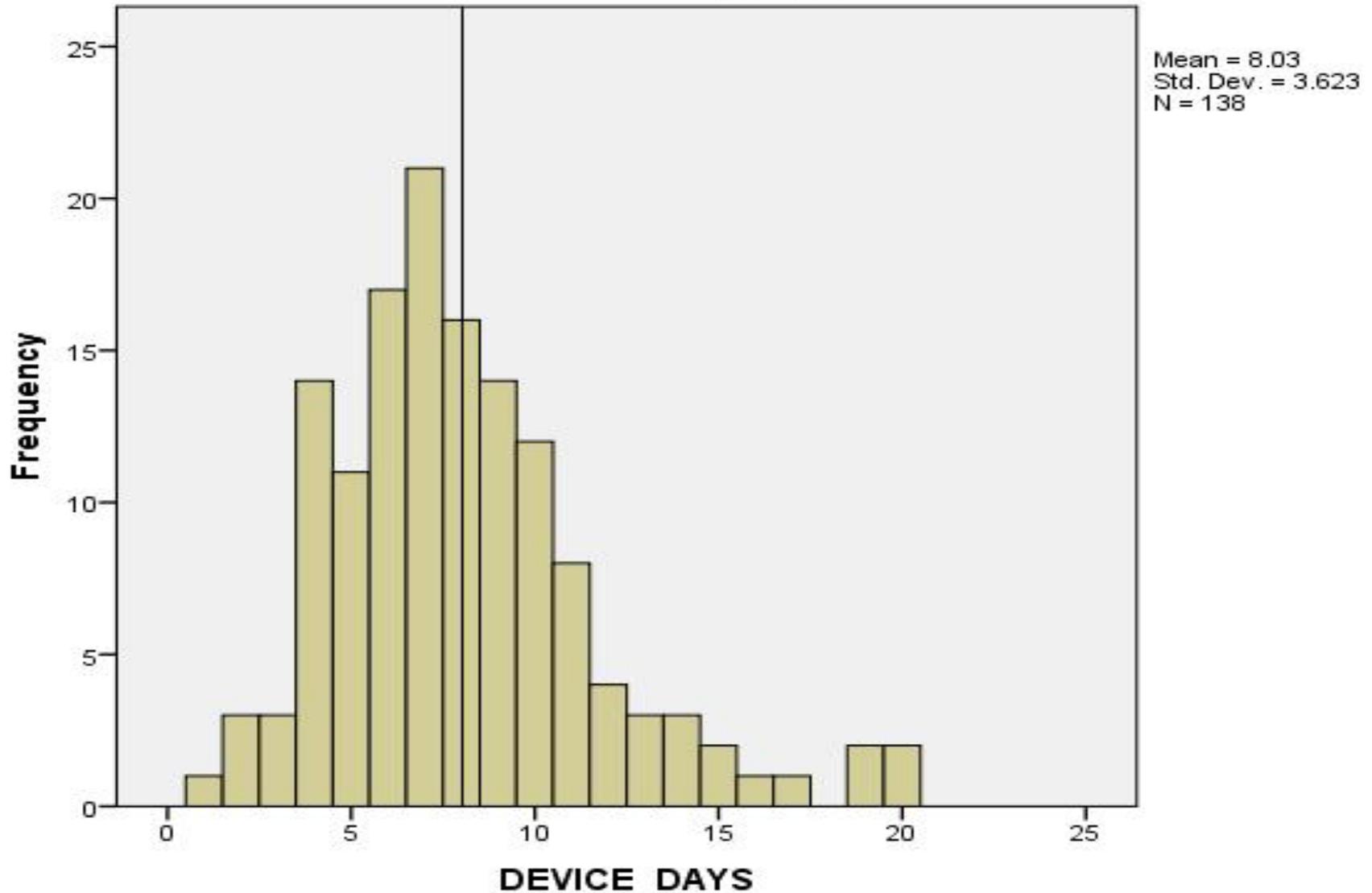
- MRSA
- MRCNS
- Other Gram +ve
- E coli
- Klebsiella
- Other Gram Negative
- Candida albicans
- Candida - non-albicans

	Percentage
Gram +ve	34.86
Gram -ve	48.03
Fungi	17.11

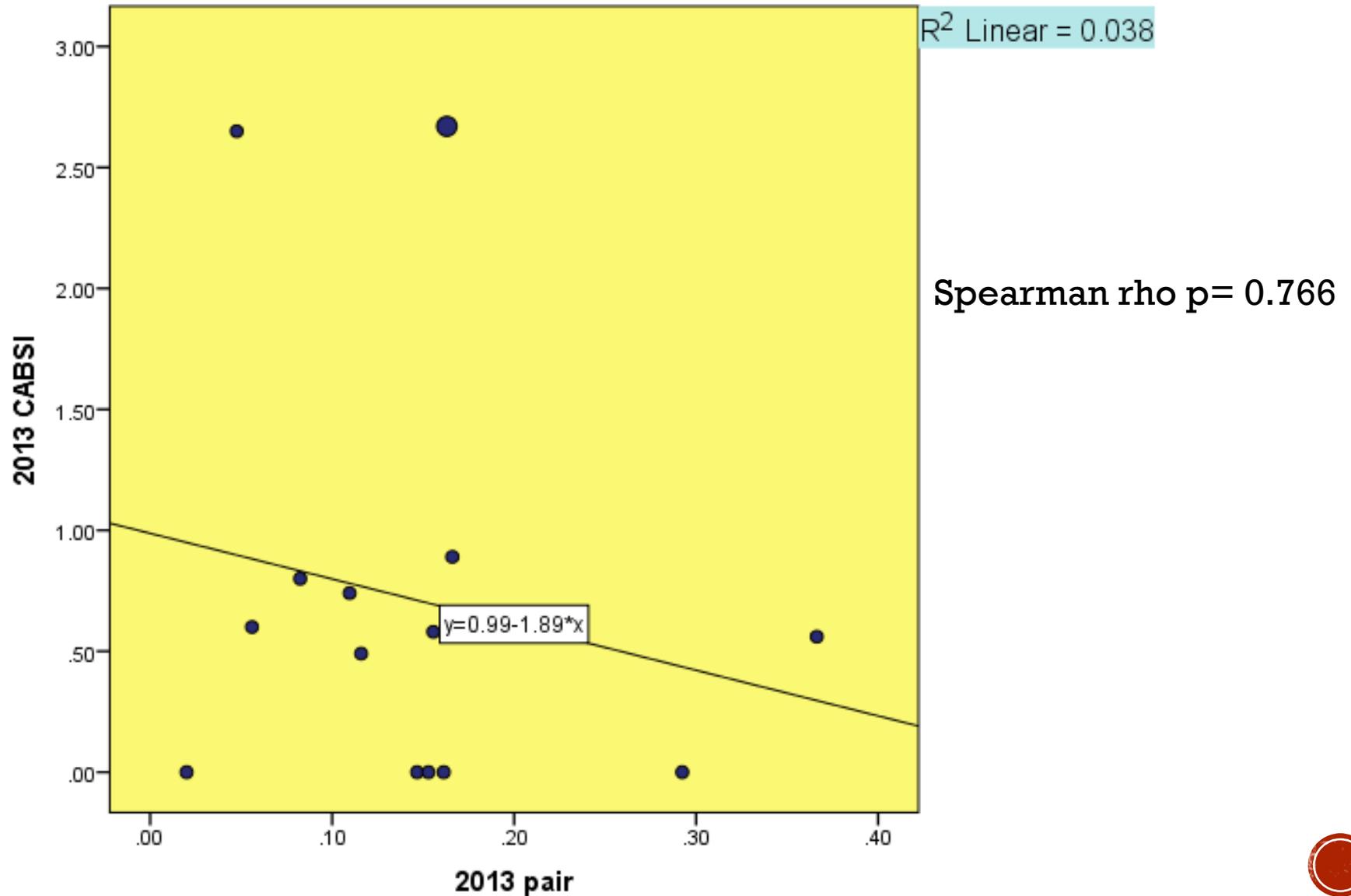
INFECTING ORGANISMS TILL Q4 2015

TIMING OF INFECTION

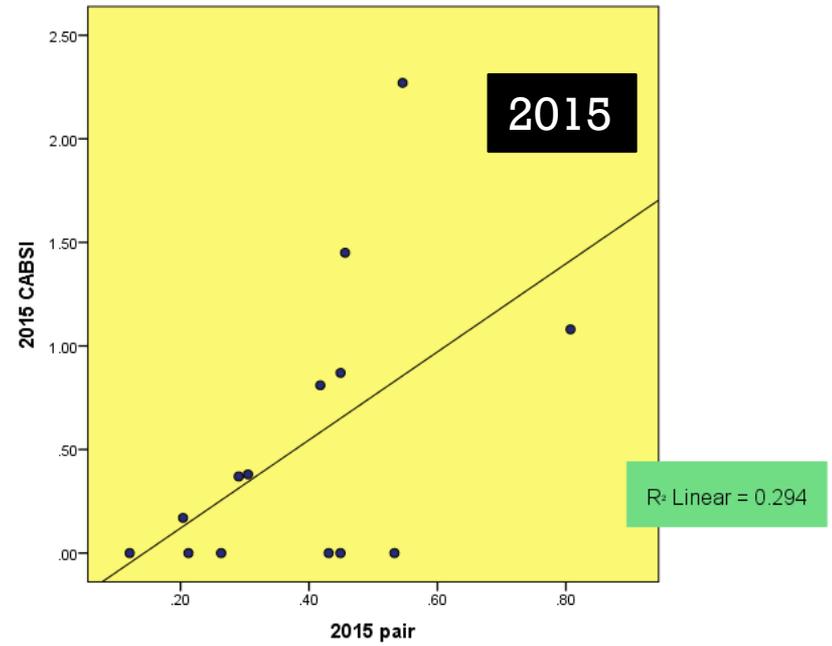
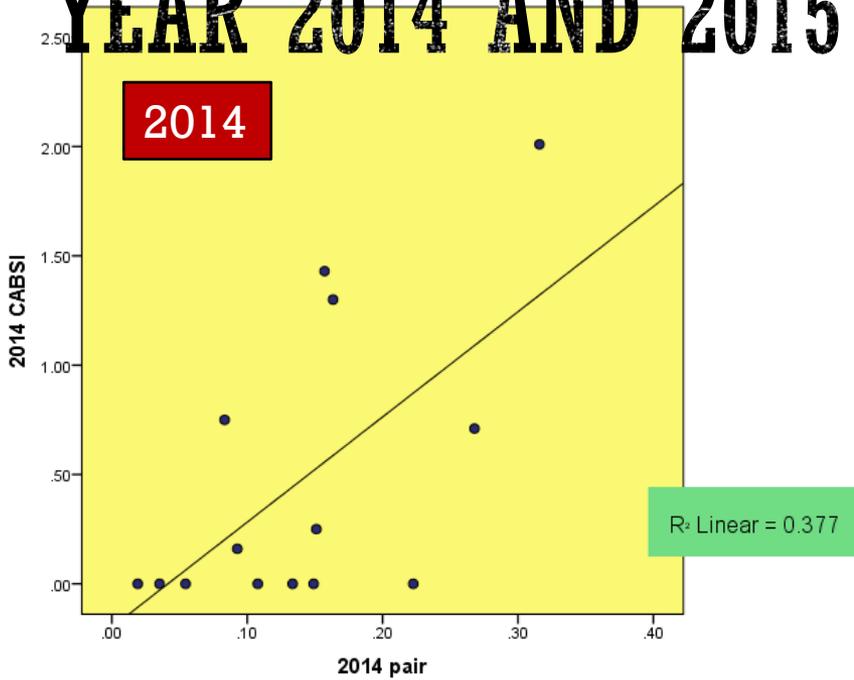
Histogram



PAIRED BLOOD CULTURE RATE VS CABSII RATE 2013



YEAR 2014 AND 2015



	2014	2015
Spearman rho	P=0.033	P=0.036

INFECTED LINES ANALYSIS TILL Q4 2015

- 136 episodes of CABSIs till Q4 2015
 - 18 episodes had 2 organisms isolated
- Age: Mean 59.6 Median 60 SD 15.6
- Time to Infection in Days

DEVICE DAYS		
N	Valid	136
Mean		8.03
Median		7.00
Std. Deviation		3.6