Achieving sustainable and significant reduction in Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia rates over 5 years in a major acute general hospital: a multi-level strategic approach

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Oral Presentation (SPP 2.1)
Hospital Authority Convention 2013

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Introduction (1)

- MRSA bacteremia can cause high mortality (up to 30%) and morbidity and is associated with unduly increased patient care cost (with 2x longer hospital stay).

  Shurland S *et al.* Comparison of mortality risk associated with bacteremia due to methicillin-resistant and methicillin-susceptible *Staphylococcus aureus*. *Infect Control Hosp Epidemiol* 2007;28:273-9.

  Cosgrove SE *et al.* The impact of methicillin resistance in *Staphylococcus aureus* bacteremia on patient outcomes: mortality, length of stay, and hospital charges. *Infect Control Hosp Epidemiol* 2005;26:168-74.

- Yet most of the episodes, especially those acquired in the hospital, could have been preventable, especially those related to central venous catheters.

  Hidron A *et al.* Antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007. *Infect Control Hosp Epidemiol* 2008;29:996-1011.

  Klevens RM *et al.* Invasive Methicillin-resistant *Staphyloccus aureus* infections in the United States. *JAMA* 2007;298: 1763-71.

Introduction (2)

- Overseas recommendations:
  - USA (Society for Healthcare Epidemiology of America / Infectious Diseases Society of America):
    - Calfee DP *et al.* Strategies to prevent transmission of Methicillin-resistant *Staphylococcus aureus* in acute care hospitals. *Infect Control Hosp Epidemiol* 2008;29:S62-80.
  - UK (Department of Health):
    - Coia E *et al.* Guidelines for the control and prevention of methicillin-resistant *Staphylococcus aureus* (MRSA) in healthcare facilities. *J Hosp Infect* 2006;66(S1):1-44
- Successful examples:
  - England, from 2004-5 to 2009-10: 1.76→0.50 / 10,000 bed-days

    Mandatory surveillance of MRSA bacteraemia, Health Protection Agency

    http://www.hpa.org.uk/web/HPAweb&Page&HPAwebAutoListName/Page/1191942169773 (accessed on 18 Apr 2013)

Introduction (3)

- With the engagement of all stakeholders, tailor-made reduction programs for targeted departments have been designed and rolled out at PMH since 2008.

Objectives

- To reduce the number of MRSA bacteremia episodes per year, and hence MRSA bacteremia rates, especially those intravascular catheter-related bloodstream infections (CRBSI) and hospital-apportioned ones (i.e. detected after 48h of admission).

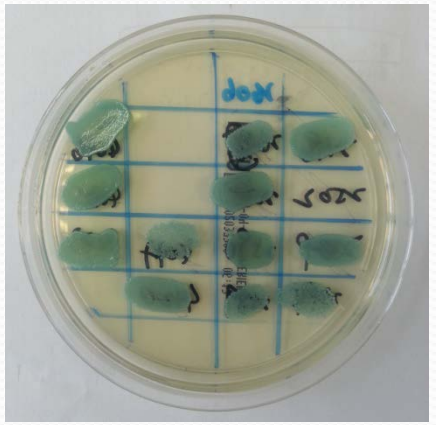
Methodology (1)

- 1. Laboratory testing and reporting:

  (a) Use of chromogenic agar for MRSA

  - to facilitate early detection cost-effectively

    Wassenberg MW *et al.* Rapid screening of methicillin-resistant *Staphylococcus aureus* using PCR and chromogenic agar: a prospective study to evaluate costs and effects. *Clin Microbiol Infect* 2010;16:1754-61.



  (b) Additional testing for vancomycin MIC for selective cases

  - to guide appropriate treatment to prevent bacteremic complication

Lewis II JS *et al.* Approaches to serious methicillin-resistant *Staphylococcus aureus* infections with decreased susceptibility to vancomycin: clinical significance and options for management. *Curr Opin Infect Dis* 2007;20:568–573.

Methodology (2)

- 2. Surveillance:

  (a) Set up hospital-based surveillance + corporate surveillance

  - to monitor MRSA case load, including carriage, infections with or without bacteremia, and CRBSI, of different wards and units.

  (b) Identify the source of every case of MRSA bacteremia and analyze the gaps by detailed case review

  (c) Feedback the trends regularly to stakeholders for necessary actions

Cumulative Newly Acquired MRSA cases by ward 2012

Dept	Acquired ward	Total in 2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A&E	H5EM	2				1									1
ICU	C2	17	3		1	2	2				1			2	11
	D2	8	1			1		3					1	1	7
	F4	0													0
	S6 (IDC)	0													0
IDC	S10 (MID)	2					2	1		1			1		5
	S11 (MID)	1	1	2		1		1	1						6
	S12 (MID)	3	1		1	1			2						5
	S15 (MED)	0			2			3							5
LKB	R4N	0								1		1		1	3
	R4S	35	4												
	R5N	18													
	R5S	17													
M&G	C3	6	1												
	D3	10	0												
	C6	2													
	D6	17	2												
	E1	5	0												
	E2	14	3												
	E3	7	2												
	ELG1/CCU	2													
	F1	7	1												
	F2	8													
	F3	5	2												

Case No.	
HN	13231
OAH	lived w
Sex/Age	F/58Y
specimen	Blood
organism	MRSA
Ward/ Bed	C6/14
Request Loc	C6/14
Collection date	25/3/2
Admission date	25/3/2
Last admission period	11/3/2
Contamination/HAI/HCAI/CAI	CAI
Manisfestations	. Admitted for fever and gum bleeding. T38C→37.9→36.8. WCC 25/3/2013.c/o neck pain for 2 days. XR showed C6 collapse. Pr hickman exit site : no discharge. USG Abd 25/3: only splenomeg RLZ hazziness on 25/3/2013.Repeated bld culture on 26/3: resu
Source of bacteraemia	Chest infection
Other body sites (infection/colonization)	25/1/2013 bld culture + 28/1/13 IV cath tip: MRSA
Date of discharge	not yet discharged
Underlying diseases	Ca Larynx, AML
Skin condition	intact
Device (type, site, insertion site)	peripheral 25/3: no S/S of phebitis; plan PICC 28/3
Invasive procedure before bacteraemia (type, date)	Not done
Treatment (date)	Augmentin, vancomycin

MRSA Bacteraemia cases in 2012

Case no.	Collection Date	Current Ward	Contamination / HAI / *HCAI / CAI	OAHR	Source	Type of Device	Cumulative # of Contamination
1	30/1/2012	D2 (Died on 01/02/2012)	CAI (CA-MRSA)	N	SST		
2	30/1/2012	R5SB	Contamination (>48hr)	Y			1
3	8/2/2012	P6	Contamination (<48hr)	N			2
4	19/2/2012	D3	Contamination (<48hr)	N			3
5	9/3/2012	ELG1	HAI (ELG1>48hr)	Y	CRBSI	Peripheral line (Rt hand)	1
6	17/3/2012	D3	HAI (R4S >48hr)	Y	UTI		
7	17/3/2012	D2	HAI (P2<48hr)	N	CRBSI	Split catheter (Rt subclavian)	2
8	29/3/2012	D3	HAI (D3>48hr)	N	PNEU		
9	11/4/2012	H4N	Contamination (<48hr)	N			4
10	28/4/2012	D3 (died on 5/5/2012)	Contamination (>48hr)	Y			5
11	2/5/2012	D3 (Died on 4/5/2012)	HAI (D3>48hr)	Y	SST		
12	10/5/2012	D6F	Contamination (<48hr)	Y			6
13	6/6/2012	P6	Contamination (>48hr)	Y			7
14	15/6/2012	C2	HAI (D2>48hr)	N	VAP		
15	20/6/2012	D3	Contamination (>48hr)	N			8
16	24/6/2012	EL1F	HAI	N	CRBSI	Peripheral line (Rt hand)	3
17	6/7/2012	D4	HAI (D4>48hr)	N	SSI		
18	19/7/2012	S15	Contamination (<48hr)	Y			9
19	30/7/2012	EL1F	Contamination (>48hr)	Y			10
20	5/8/2012	S6	HAI (S6 >48hr)	N	VAP		
21	8/8/2012	S15 (died on 8/8/2012)	HAI (E2>48hr)	N	Primary BSI		
22	17/8/2012	D3	HCAI	Y	SST		
23	8/9/2012	A5	CAI	N	BJ (septic spondylitis)		

Methodology (3)

- 3. Patient care:
  (a) Different tailor-made active screening programs with or without decolonization protocols, in ICU, Renal, Respiratory, Hematology units, Neurosurgery, Rehabilitation Block.
  (b) 2% chlorhexidine bathing for MRSA carriers or old age homes patients in medical and oncology departments.
  (c) Hospital-wide CRBSI prevention program adopting standardized central line insertion and care bundle since 2010.

  BHS Lam, CK Tong, WM Lee, SS Lam, TK Ng. Towards zero tolerance for catheter-related bloodstream infection: combining hospital-wide and targeted strategies.

  HA Convention 2013, Speed Presentation (Session 4: 16 May, 3:45-4:15pm, Rm 224-225) and Poster Display (SPP-P2.15).

  (d) Hand hygiene campaigns to improve staff compliance.
  (e) Use of chlorhexidine antiseptic kits for blood culture taking to minimize contamination.

Decolonisation procedure for carriers of MRSA
對帶有抗藥性金黃葡萄球菌人仕之除菌步驟

How to use the Chlorhexidine (4%) preparation for skin decolonization and Mupirocin (Bactroban
for nasal decolonization?
怎樣使用**氯己定** Chlorhexidine(4%)達致皮膚除菌成效及使用莫匹羅星 Mupirocin 達致鼻孔除

The purpose of this treatment is to try to rid the body of the germ (bacteria) that has caused boils or infections. In order for the treatment to be effective, however, it is important that the preparations a according to the following instructions.
這個步驟的目的是除去身體表面導致腫疱及感染的細菌。爲了令治療有較大的成效，我們需列的準備工作。

General notes on skin treatment:皮膚治療一般注意事項

As with all treatment to be applied to the skin, avoid contact with the eyes. Those who are pregnant eczema, or are under one year old should be screened first to see if they are carrying the bacteria (t or nurse who is arranging your treatment will explain how this is done) - the doctor will then decid treatment is appropriate.
所有治療都是應用在皮膚上，請避免觸及眼睛。孕婦、患有濕疹人士，以及一歲以下的幼兒帶菌者，應先尋找醫護人員協助。(醫生和護士會解釋有關治療程序及方法) — 因應不同需會爲病人提供最有效的處方。

This treatment should not be used if there are any boils or skin lesions that are still leaking. Wait until boils or lesions are dry.
用該療程。應先等腫疱變乾或皮膚完全癒合才

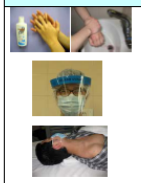
help reduce spread of the bacteria within the

每日更換.
oms. 定期打掃房間及吸塵
l. 避免使用塊狀肥皂，可使用唧裝肥皂液
與他人共用一條毛巾
nt, and then rinse clean. 使用即棄潔布及去污

CRBSI Prevention Program in PMH 2010 to 2011 App 3

Central Line Insertion Photo Guide

Before the procedure



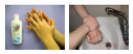
1a. Prepare the Staff
- Apply hand rub / wash hands
- Wear cap and mask +/- face shield (Doctor)
- Wear mask (Nurse)

1b. Prepare the Patient
- Put on mask if indicated

2a. Prepare the Trolley
- Disinfect trolley with 70% alcohol

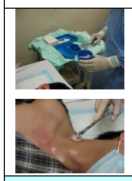
2b. Prepare the Equipment
- 2% Chlorhexidine in 70% Alcohol
- Suture set
- Sterile disposable drape (150 x 100 cm)
- Sterile towel
- Suitable central venous catheter + 1 more stand by

Procedure steps



3. Perform Hand Hygiene
- Apply hand rub / wash hands

4. Apply Maximal Barrier Precaution for the Staff
- Wear sterile gown
- Wear sterile gloves

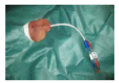


5. Perform Skin Preparation
- Prepare skin with 2% Chlorhexidine in 70% Alcohol
- Use back and forth friction scrub for at least 30 seconds
- Allow antiseptic solution to dry completely before puncturing the site (Do not wipe or blot)

* Holding or clamping the tail end of the guidewire during the procedure.

6. Designate Sterile Field
- Place sterile towel around the puncture site first
- Use sterile disposable drape to cover patient with a small opening for the designated puncture site
- Maintain aseptic technique at all times
- Change sterile gloves if contaminated

After the procedure



7. Perform Site Dressing
- Clean up insertion site with sterile gauze
- Apply transparent dressing or gauze with aseptic technique
- Mark date on dressing

8. De-gown in a Proper Way
- Follow the photo guide to de-gown

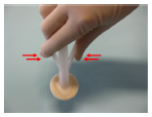
Remarks:
1. Take post X-Ray if indicated.

ipment and environment.

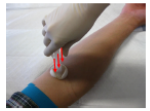
g, i.e. blades, needles,

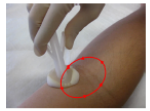
Photo Guide on Using of ChloraPrep in Blood Culture Procedure

- Prepare all the equipments
  1. ChloraPrep
  2. 70% alcohol prep (Disinfect stopper of the culture bottles)
  3. Sterile gloves
  4. Blood culture bottles
  5. VACUETTE blood collection system
- Identify the vein
- Perform hand hygiene
- Open ChloraPrep under aseptic technique



- Wear sterile gloves
- Disinfect the site by ChloraPrep
- **Pinch** wings once to activate applicator and release antiseptic



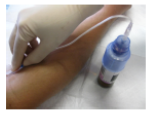


- **Press**: Allow solution to partially load in sponge
- Gently press applicator against treatment area(4in x 5in)

Remarks:

Use repeated back-and-forth strokes for 30 seconds.

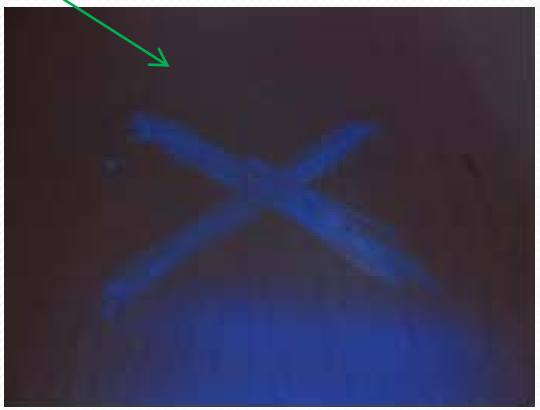
Allow area to air dry for approximately 30 seconds



- Perform venipuncture with VACUETTE Safety Blood Collection Set

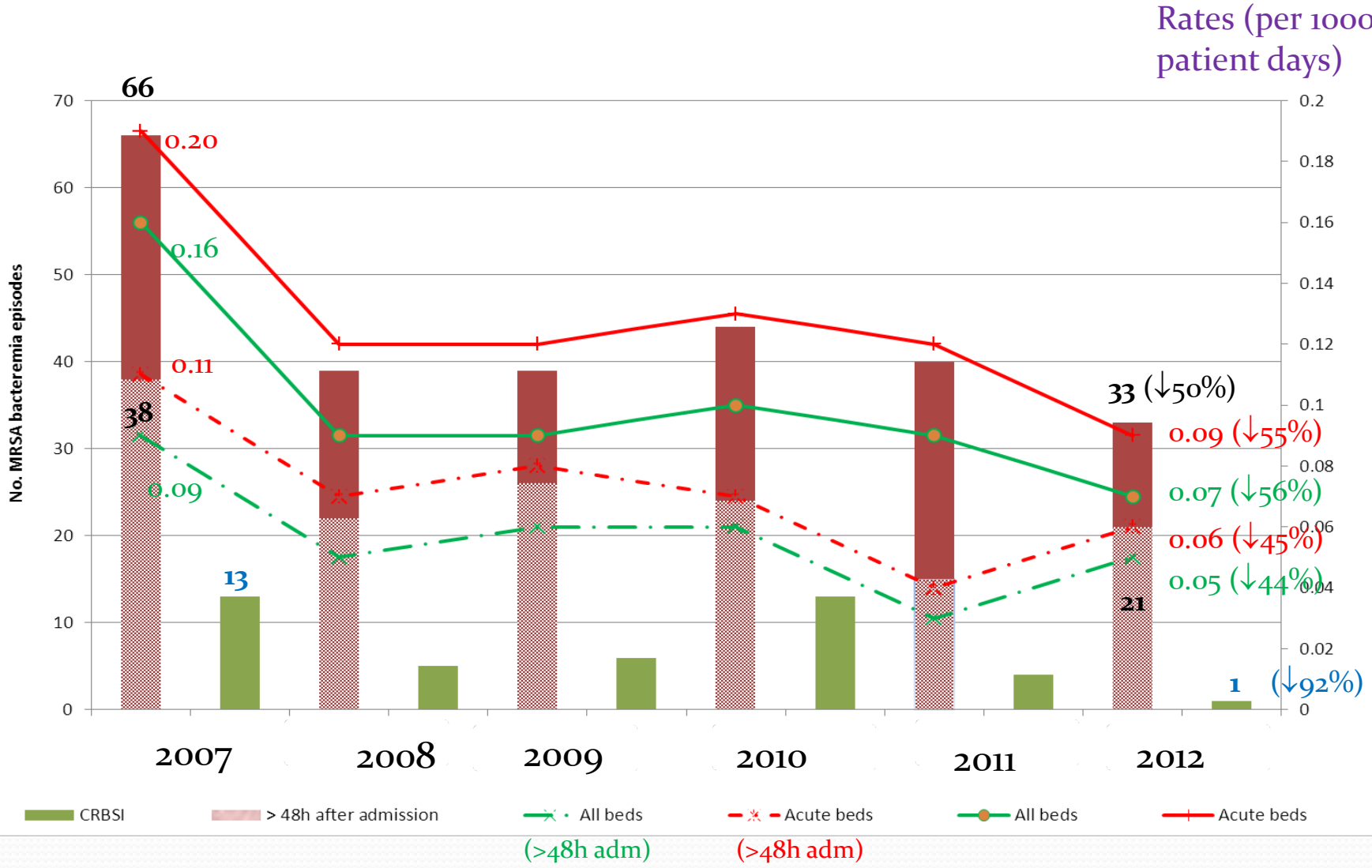
Methodology (4)

- 4. Isolation precautions and environmental hygiene:
  (a) Monitor compliance of contact isolation
  (b) Ad hoc spot check on environmental cleanliness by adenosine triphosphate (ATP) bioluminescence and fluorescent markers



Lam BHS, Tang WC, Ng TK. Evaluation and application of ATP detection as an effective audit tool for determining cleanliness of hospital environment surfaces and establishing appropriate benchmarks. *HA Convention 2010, poster display.*

Results


Rates (per 1000 patient days)
66
0.20
0.16
0.11
38
0.09
13
33 (↓50%)
0.09 (↓55%)
0.07 (↓56%)
0.06 (↓45%)
0.05 (↓44%)
21
1
(↓92%)
No. MRSA bacteremia episodes
2007
2008
2009
2010
2011
2012
CRBSI
> 48h after admission
All beds
Acute beds
All beds
Acute beds
(>48h adm)
(>48h adm)

Conclusion

- The multi-level strategic approach with engagement of all stakeholders, robust surveillance system and laboratory support, was highly effective in achieving sustainable reduction in MRSA bacteremia rates.

Thank you!