Healthcare-associated infections

Pitfalls in conducting surveillance

Dubai, Oct. 2019

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Disclosures

Nothing to disclose

Pitfalls*

Merriam-Webster dictionary: a hidden or not easily recognized danger or difficulty

Global and regional challenges

HAI: The worldwide burden

- Estimates are hampered by **limited availability** of **reliable data**
- The burden of disease both outside and inside health-care facilities is **unknown** in many countries
- No health-care facility, no country, no health-care system in the world can claim to have solved the problem

Source : WHO

Never forget…

“The Book Is Always Better than the Movie”

Book: Report on patient safety

Movie: what is actually happening

What is written in documents/reports are always better than what is really happening- thus the need to always visit, audit and validate the data presented by the hospitals

Estimated rates of HAI worldwide

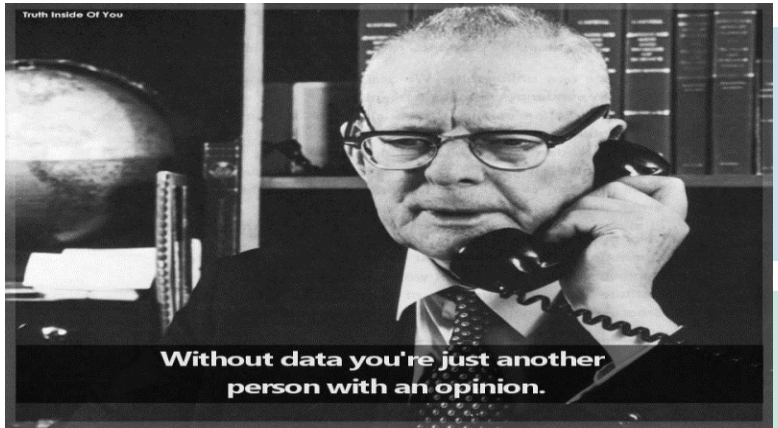
- At any time, **hundreds of millions** of people worldwide are suffering from infections acquired in health-care facilities
- In modern health-care facilities in the developed world: **5–10%** of patients acquire one or more infections
- In developing countries the risk of HAI is **2–20 times** higher than in developed countries and the proportion of patients affected by HAI can **exceed 25%**
- In intensive care units, HAI affects **about 30%** of patients and the attributable **mortality** may reach **44%**

Source : WHO

What about data from the Arab World?

*No national or regional system for collecting **reliable** and **validated** data. And if present, no unified methods, or validation of numbers or reports that enable benchmarking.*

Scattered efforts with fragmented data



Challenges in benchmarking local GCC data

Table 1 Comparisons of the characteristics of recognized benchmarks.

	NHSN	INICC	ECDC	WHO
Covered countries	US	36 countries in South America, Asia, Africa, and Europe in 2009	17 European countries Up to 13 reported SSIs 13 reported ICU-acquired HAIs	Systematic review of published data from 23 high- and 23 low-income countries
Covered years	2006—2010	2003—2009	2007—2009	1995—2010
Number of contributing hospitals	Approximately 2500 in last report	215 in last report	1156 reported SSIs 721 reported ICU-acquired HAIs	Not defined
Covered location for device-associated HAIs	ICU and non-ICU locations	ICU only	ICU only	ICU only
HAI types covered	SSI and device-associated HAIs	Device-associated HAIs	SSI and device-associated HAIs	SSI and device-associated HAIs
HAI definition used	US CDC	Similar to US CDC	European CDC	Mixed
Type of device-associated HAI data	Unit-based	Unit-based	Unit-based and patient-based	Mixed
Data entry & analysis	Individual data are entered locally in an internet-based surveillance system and then centrally analyzed	Aggregate data are received from enrolled hospitals and then centrally analyzed	Individual data are entered in standardized national networks, and then data from all networks are centrally analyzed	Systematic review and meta-analysis of published data
Advantages	• Large data set that allows multiple stratifications • Uses standardized definitions of HAIs • Reports device-associated HAIs from ICU and non-ICU locations • Electronic data entry	• Covers under-studied limited-resource countries • Uses standardized definitions of HAIs • Reports HAI-related mortality and length of stay as well as preventive bundles	• Large data set that allows stratifications and adjustments • Collects both unit-based and patient-based data • Provides some data adjusted for patient risk • Electronic data entry	• Good crude estimates for HAI incidence, prevalence, and impact • Covers both low- and high-income countries
Limitations	• Frequent changes in definitions and methods • Reports of dialysis infections and antimicrobial use are infrequently released • No adjustment for patient risk • Not a true cohort, which epidemiologically limits comparing data over time • Ignores non-device-associated HAIs such as non-ventilated pneumonia • Validity of reported data is not determined	• Analyzes aggregate rather than individual data • No standardized electronic data collection in enrolled hospitals • No single-year data to examine changes over time • Hospitals included may not reflect their respective countries • Lack of device-associated HAIs from non-ICU locations • Currently no SSI reports • No adjustment for patient risk • Validity of reported data is not determined	• Although standardized, definitions of HAIs are not followed by all member countries • ECDC definitions are not popular outside of European countries • Frequent changes in surveillance systems over the last 2 decades limits the frequency of reports • Lack of device-associated HAIs from non-ICU locations • Only 7 surgeries are covered in SSI reports Validity of reported data is not determined	• Includes studies with heterogonous case definitions of HAIs and methods • Data presented are neither risk-stratified nor risk-adjusted • Data from low-income countries are fragmented and may not represent low-income countries

A. El-Saed, H.Balkhy, D. Weber**. Benchmarking local healthcare-associated infections: Available benchmarks and interpretation challenges** *Gulf Journal of Infection and Public Health (2013)* ***6****, 323—330*

Variations!!!

Table 2 Device-associated HAIs and device utilization in adult medical-surgical ICUs in recognized benchmark reports.

	CA-BSI[a]	CLU	CA-UTI	UCU	VAP	VU
NHSN (2010)	1.1 (1.1–1.2)	0.45	1.5 (1.4–1.5)	0.68	1.3 (1.2–1.4)	0.32
INICC (2004–2009)	5.9 (5.7–6.2)	0.53	7.1 (6.9–7.3)	0.56	18.4 (17.9–18.8)	0.38
ECDC (2007)	3.2	0.69	6.5	0.77	13.4	0.54
WHO, High-resource countries (1995–2010)[b]	3.5 (2.8–4.1)	NA	4.1 (3.7–4.6)	NA	7.9 (5.7–10.1)	NA
WHO, Low-resource countries (1995–2010)[b]	12.2 (10.5–13.9)	NA	8.8 (7.4–10.3)	NA	23.9 (20.7–27.1)	NA

[a] Central line-associated, rather than catheter, in the NHSN and INICC reports. We excluded clinical sepsis from the INICC rate. ECDC rates included primary and secondary BSIs.

[b] WHO estimates were from all types of adult ICUs and included both catheter-related and -associated BSIs and UTIs.

Challenges in benchmarking local GCC data *cont'd*

INICC : Benchmarking to INICC seems legitimate due to:

1- Similar methodologies and challenges
2- Availability of unique data on mortality, length of stay, and prevention

But

Using aggregate data from enrolled hospitals does not account for the variability in surveillance adjudication between and within participating countries

Challenges in benchmarking local GCC data *cont'd*

WHO

- Estimates for high-resources countries are driven by NHSN and ECDC data
- Estimates for low-resources countries are largely fragmented and not derived from a clear source
- Failure to account for the wide variability in surveillance methods implemented in different parts of the world
- Failure to risk-stratify different metrics of HAI

Challenges in benchmarking local GCC data *cont'd*

ECDC

Maybe an alternative benchmark to GCC hospitals for SSIs and antimicrobial use and resistance.

But

The considerable differences in device-associated HAI **definitions** likely limit its use as a benchmark for that purpose.

Other National Surveillance Systems

- **Canada**
  Canadian Nosocomial Infection Surveillance Program (CNISP)
- **England**
  Nosocomial Infection National Surveillance Scheme (NINSS)
- **Germany**
  Krankenhaus Infektions Surveillance System (KISS)
- **Japan**
  Japanese Nosocomial Infection Surveillance System (JANIS)
- **Australia**
  Victorian Hospital Acquired Surveillance System (VICNISS)
- **France**
  Réseau d'alerte, d'investigation et de surveillance des infections nosocomiales (Raisin)

An experience from the Arab world: Egypt

91 *ICUs in* ***28*** *hospitals including* ***989*** *ICU beds (April 2012-August 2014)*

- *Developed a plan to implement a nationwide HAI surveillance program in ICUs.*
- *Supported by CDC, Global Disease Detection (GDD) Program in Egypt, the U.S. Naval Medical Research Unit (NAMRU-3), and the U.S. Agency for International Development*
- Guided by a panel of expert from the above authorities.

Characteristics of hospitals participating in intensive care unit surveillance (April 2012–August 2014)

	Bed size category			
Hospital type	51–200	201–500	>500	Total
Teaching hospitals				
Pediatrics	0	4	0	4
Obstetrics	1	2	0	3
Surgical	0	1	1	2
Medical	0	1	1	2
General	3	0	4	7
*Others	2	1	0	3
Public general hospitals	3	3	0	6
Private	0	1	0	1
Total	9	13	6	28

*Bone marrow and emergency hospitals.

Maha Talaat *et Al*. National surveillance of health care–associated infections in Egypt: Developing a sustainable program in a resource-limited country. American Journal of Infection Control 44 (2016) 1296-301

Findings

Incidence of DAIs by type of location, April 2012–August 2014

ICU type	No. of ICUs	Patient days	VAP				CLABSI			
			n	MV days	Rate	DUR	n	CL days	Rate	DUR
Burn	3	6,834	3	741	4.0	0.1	13	5,008	2.6	0.7
Medical cardiac	10	43,063	22	2,021	10.9	0.0	4	6,052	0.7	0.1
Medical critical care	10	62,065	64	17,019	3.8	0.3	76	34,403	2.2	0.6
Medical-surgical	13	69,900	104	29,330	3.5	0.4	58	44,888	1.3	0.6
Neurologic	2	6,654	0	230	0.0	0.0	5	1,954	2.6	0.3
Neurosurgical	8	29,382	76	12,328	6.2	0.4	33	19,576	1.7	0.7
Neonatal intensive care	11	135,193	115	25,029	4.6	0.2	198	26,958	7.3	0.2
Pediatric cardiothoracic	1	7,231	15	2,445	6.1	0.3	0	5,759	0.0	0.8
Pediatric medical	9	32,738	25	11,533	2.2	0.4	19	12,111	1.6	0.4
Pediatric surgical	3	5,220	0	1,032	0.0	0.2	7	1,513	4.6	0.3
Prenatal-surgical	2	7,955	1	793	1.3	0.1	25	2,800	8.9	0.4
Respiratory	4	16,097	16	6,145	2.6	0.4	13	6,747	1.9	0.4
Surgical cardiothoracic	5	13,827	6	2,078	2.9	0.2	5	9,023	0.6	0.7
Surgical critical care	7	35,190	61	10,851	5.6	0.3	39	19,888	2.0	0.6
~~Trauma~~	~~3~~	~~3,195~~	~~15~~	~~1,194~~	~~12.6~~	~~0.4~~	~~28~~	~~2,185~~	~~9.2~~	~~0.7~~
Total	91	474,544	523	122,769	4.3	0.3	515	198,865	2.6	0.4

These numbers were not similar to numbers reported by INICC, others (around the same period)

WE NEED TO HAVE OUR OWN BENCHMARKS

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journal homepage: www.ajicjournal.org

Major Article

Rates of catheter-associated urinary tract infection in tertiary care hospitals in 3 Arabian Gulf countries: A 6-year surveillance study

Wafa Al Nasser MD [a], Aiman El-Saed MD, PhD [b,c,d], Amina Al-Jardani MD [c,e], Abdulhakeem Althaqafi MD [f,g], Huda Alansari MD [h], Jameela Alsalman MD [c,h], Zaina Al Maskari MD, FRCPath [e], Ayman El Gammal MD [i], Seif S. Al-Abri MD, DTM&H [c,e], Hanan H. Balkhy MD [b,c,f,*]

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Key Words:
Urinary tract infection
Catheter
Health care
Surveillance
Infection control
Saudi Arabia
Oman
Bahrain

Background: T
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American Journal of Infection Control

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Major Article

Ventilator-associated pneumonia rates in critical care units in 3 Arabian Gulf countries: A 6-year surveillance study

Aiman El-Saed MD, PhD [a,b,c], Amina Al-Jardani MD [b,d], Abdulhakeem Althaqafi MD [e,f], Huda Alansari MD [g], Jameela Alsalman MD [b,g], Zaina Al Maskari MD [d], Ayman El Gammal MD [h], Wafa Al Nasser MD [i], Hanan H. Balkhy MD [a,b,e,*]

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Key Words:
Ventilator-associated pneumonia
health care
surveillance
infection control
Saudi Arabia
Oman
Bahrain
Benchmarking

Background: Da
Gulf Cooperation
rates in GCC hosp
Network (NHSN)
Methods: VAP ra
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American Journal of Infection Control

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Brief Report

Rates of central line–associated bloodstream infection in tertiary care hospitals in 3 Arabian gulf countries: 6-year surveillance study

Hanan H. Balkhy MD, MMed, FAAP [a,b,*], Aiman El-Saed MD, PhD [a,b,c], Seif S. Al-Abri MD, DTM&H [b,d], Jameela Alsalman MD [b,e], Huda Alansari MD [e], Zaina AL Maskari MD, DCH [d], Ayman El Gammal MD [f], Wafa Al Nasser MD [g], Amina AlJardani MD [d], Abdulhakeem Althaqafi MD, ArBIM [h]

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Key Words:
Bloodstream infection
Central line
Health care
Surveillance
Infection control
Saudi Arabia
Oman
Bahrain

The objective of this study was to compare central line–associated bloodstream infection (CLABSI) rates in Gulf Cooperation Council (GCC) states with those of the U.S. National Healthcare Safety Network (NHSN) and International Nosocomial Infection Control Consortium (INICC) using pooled data from 6 hospitals in 3 GCC countries. The overall CLABSI rate was 3.1 per 1,000 central line days. After adjusting for differences in intensive care unit types, the risk of CLABSI in GCC hospitals was 146% higher than NHSN hospitals but 33% lower than INICC hospitals.
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However…

Only 6 hospitals included:

- The National Guard Hospitals in Riyadh, Jeddah, Alhassa, and Dammam, KSA
- The Salmaniya Medical Complex, Manama, Kingdom of Bahrain
- The Royal Hospital, Muscat, Sultanate Oman

Papers published in 2016 to show data between 2008 and 2013

The ICU types included

- Medical/surgical
- Neurosurgical
- surgical
- trauma
- pediatric
- Pediatric cardiothoracic
- Neonatal critical care units

Can these findings be used as benchmark? Yes - taking into account differences in settings and difference in standards of care, and the **sample sizes**

Table 1
CLABSI rates and central line utilization ratios by hospital location in 3 GCC countries (2008-2013)

Hospital locations	Duration	Patient days	CL days	CLABSI events	Rate per 1,000 CL days	95% CI	CL utilization ratio	95% CI
Critical care units								
Medical-surgical	2008-2013	113,252	75,467	195	2.6	2.2-2.9	0.67	0.66-0.67
Trauma	2013	667	383	1	2.6	0.0-7.7	0.57	0.54-0.61
Burn	2013	645	234	0	0.0	—	0.36	0.33-0.40
Cardiothoracic	2011-2013	3,284	2,639	0	0.0	—	0.80	0.79-0.82
Medical cardiac	2013	625	332	0	0.0	—	0.53	0.49-0.57
Neurosurgical	2010 and 2013	2,222	1,374	0	0.0	—	0.62	0.60-0.64
Pediatric	2008-2013	29,975	13,145	41	3.1	2.2-4.1	0.44	0.43-0.44
Pediatric cardiothoracic	2010-2013	7,696	6,616	24	3.6	2.2-5.1	0.86	0.85-0.87
Neonatal	2008-2013	123,873	27,559	139	5.0	4.2-5.9	0.22	0.22-0.22
Step-down units								
Adult step-down	2012-2013	3,795	2,395	6	2.5	0.5-4.5	0.63	0.62-0.65
Wards								
Adult oncology	2011-2013	33,695	7,267	35	4.8	3.2-6.4	0.22	0.21-0.22
Pediatric oncology	2011-2013	17,121	13,081	20	1.5	0.9-2.2	0.76	0.76-0.77
Overall	2008-2013	336,850	150,492	461	3.1	2.8-3.3	0.45	0.45-0.45

CI, confidence interval; *CL*, central line; *CLABSI*, central line–associated bloodstream infection; *GCC*, Gulf Cooperation Council.

Table 2
CAUTI rates and catheter utilization ratios by hospital location in tertiary care hospitals in 3 GCC countries (2008-2013)

Hospital location	Duration	Patient days	Catheter days	CAUTI events	Rate per 1,000 catheter days	95% CI	Catheter utilization ratio	95% CI
Critical care units								
Medical-surgical	2008-2013	100,554	85,028	281	3.3	2.9-3.7	0.85	0.84-0.85
Neurosurgical	2013	652	627	0	0.0	—	0.96	0.95-0.98
Surgical	2013	754	684	1	1.5	0.0-4.3	0.91	0.89-0.93
Subtotal	2008-2013	101,960	86,339	282	3.3	2.9-3.6	0.85	0.84-0.85
Wards								
Medical	2010-2011	831	675	4	5.9	0.1-11.7	0.81	0.79-0.84
Medical-surgical	2012-2013	11,016	2,240	0	0.0	—	0.20	0.20-0.21
Subtotal	2008-2013	11,847	2,915	4	1.4	0.0-2.7	0.25	0.24-0.25
Overall	2008-2013	113,807	89,254	286	3.2	2.8-3.6	0.78	0.78-0.79

CAUTI, catheter-associated urinary tract infection; *CI*, confidence interval; *GCC*, Gulf Cooperation Council.

Table 1
VAP rates and ventilator utilization ratios by year and hospital name in tertiary care hospitals in 3 Gulf Cooperation Council countries (2008-2013)

Year	Patient days	Ventilator days	VAP events	Rate per 1,000 ventilator days	95% CI	Ventilator utilization ratio	95% CI
2008	17,336	8,140	60	7.4	5.5-9.2	0.47	0.46-0.48
2009	19,080	10,935	72	6.6	5.1-8.1	0.57	0.57-0.58
2010	31,311	18,116	85	4.7	3.7-5.7	0.58	0.57-0.58
2011	28,530	16,727	90	5.4	4.3-6.5	0.59	0.58-0.59
2012	25,652	16,217	48	3.0	2.1-3.8	0.63	0.63-0.64
2013	13,085	6,614	13	2	0.9-3.0	0.51	0.50-0.51
Overall	134,994	76,749	368	4.8	4.3-5.3	0.57	0.57-0.57

CI, confidence interval; *VAP*, ventilator-associated pneumonia.

Table 2
VAP rates and ventilator utilization ratios by type of critical care units in tertiary care hospitals in 3 Gulf Cooperation Council countries (2008-2013)

Critical care units	Duration	Patient days	Ventilator days	VAP events	Rate per 1,000 ventilator days	95% CI	Ventilator utilization ratio	95% CI
Medical-surgical	2008-2013	97,151	61,825	335	5.4	4.8-6.0	0.64	0.63-0.64
Neurosurgical	2010	1,570	935	4	4.3	0.1-8.5	0.60	0.57-0.62
Surgical	2013	1,362	617	1	1.6	0.0-4.8	0.45	0.43-0.48
Trauma	2010-2013	1,299	753	1	1.3	0.0-3.9	0.58	0.55-0.61
Pediatric	2008-2013	7,901	3,819	9	2.4	0.8-3.9	0.48	0.47-0.49
Pediatric cardiothoracic	2010	1,886	1,129	4	3.5	0.1-7.0	0.60	0.58-0.62
Neonatal	2008-2013	23,825	7,671	14	1.8	0.9-2.8	0.32	0.32-0.33
Overall	2008-2013	134,994	76,749	368	4.8	4.3-5.3	0.57	0.57-0.57

CI, confidence interval; *VAP*, ventilator-associated pneumonia.

challenge: Scattered efforts with fragmented data

Solutions

- **Use the GCC surveillance manual by all countries in the region**

- Make reporting mandatory **after**:
  - ✓ Forming a panel of experts to overcome challenges and decide on data collection methodologies
  - ✓ Training surveillance officers on data collection and entry-and ensure only those trained can submit data

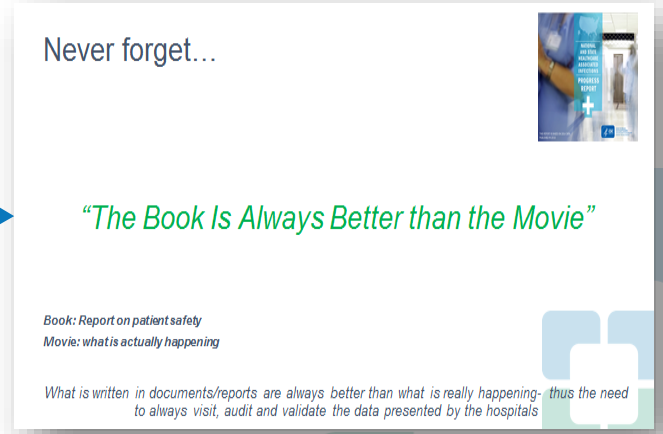
Options to ensure validity of data:

1. Third party surveillance of HAIs
2. Strong validation systems in place

Challenges

- How many other HAIs are there – that are not KPIs and/or are not caused by MDROs?
  - What is the real burden and impact of HAIs?

Lack of Random Error (Precision)	Lack of Systematic Error (Validity)
Study Size and Statistical Power	Misclassification Bias
	Selection Bias
	Observation Bias
	Confounding



Answering questions by questions!!

Who is (are) driving these efforts?

What are you KPIs?

Answering questions by questions!!.

Who is (are) driving these efforts?

What are you KPIs?

What kind of IP in the institution?

Applicable for outcome surveillance and for process surveillance

1-

2-

This comparison is valid:

A- in one institutions between IPS

B- IPs in different hospitals

What's 2 + 2?

The mathematician says:

"I believe it's 4, but I'll have to prove it."

The engineer says:

"The answer is 4, but I'll have to add a safety factor so we'll call it 5."

The clinical microbiologist says:

"We don't deal with numbers that small."

The biostatistician says:

"The sample is too small to give a precise answer, but based on the data set, there is a high probability it is somewhere between 3 and 5."

Used with permission: Michael B. Edmond / chief quality /university of Iowa .

The infection preventionist says:

"I think it's 4, but I'll have to ask the hospital epidemiologist."

The hospital epidemiologists say:

"What do you want it to be?"

The ultimate goal is

To have everybody say

$$2+2=4$$

Answering questions by questions!!

Who is (are) driving these efforts?

What are you KPIs?

KPIs are very good indeed, they do target our efforts.

However, if they render Healthcare institutions administrators as monomaniacal thinkers, they become a curse.

Lack of Random Error (Precision)	Lack of Systematic Error (Validity)
Study Size and Statistical Power	Misclassification Bias
	Selection Bias
	Observation Bias
	Confounding

Evaluating IC programs should <u>not solely</u> be about meeting surveillance targets

Other infections

The race towards hospital positioning:
CLABSI-CAUTI
MDRO-DE-C Diff.
SSI- (Selected)

- How many other HAIs are there – that are not KPIs and/or are not caused by MDROs?

- What is the real burden and impact of HAIs?

HAI UTI vs CAUTI

Cohort study: All adult hospitalizations between 2013 and 2017

Hospital wide surveillance using NHSN definition and methodology to capture CAUTI and UTIs

Results: 163,386 hospitalizations (97,485 unique patients),

1,273 UTIs

715 Non device associated UTIs

558 CAUTIs

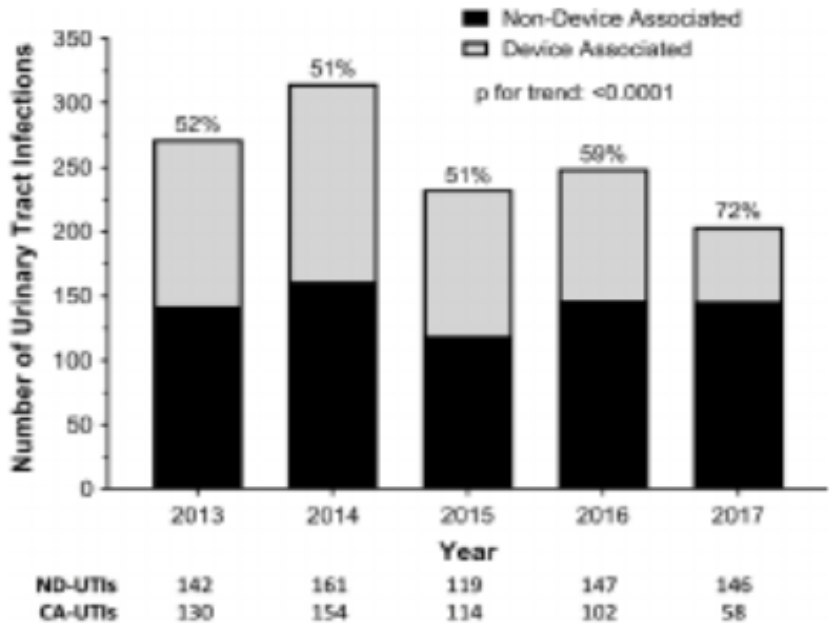


Fig. 1. Proportion of urinary tract infections (UTIs) that are device and non–device associated, stratified by year.

Noted that non-device associated increased from 52% to 72%
(P<0.0001) between the beginning and the end of the surveillance study

P. Strassle, E. Sickbert-Bennett, M. Klompas *et al.*, **Incidence and risk factors of non–device-associated urinary tract infections in an acute-care hospital**. *Infection Control & Hospital Epidemiology 1-6. Published online 02 September 2019*

Singapore Med J 2012; 53(4) : 255

External ventricular drain infections: successful implementation of strategies to reduce infection rate

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INTRODUCTION External ventricular drain (EVD) infections can cause serious complications. We performed an audit of EVD infections within our neurosurgical unit. Through this study, we aimed to reduce the incidence of external ventricular drain-related infection, including ventriculities in neurosurgical patients.

METHODS We conducted an audit of the EVD infections in our institution observed over a one-and-a-half year period. This was conducted in three phases. A baseline EVD infection rate was determined for Phase I, from January to June 2007. We introduced the following measures to reduce EVD infection rate in Phase II, from July to December 2007: (1) For Neurosurgery doctors: performing proper surgical techniques to minimise intra-operative infections; educating junior doctors on proper CSF sampling from the EVD; and minimising the number of days the EVD is maintained *in situ*; (2) For Neurosurgery nurse clinicians: developing Standard Operating Procedures on nursing management of EVDs; conducting EVD care workshops for nurses working in neurosurgical wards; and competency skill checks on the management of EVDs for nurses working in the neurosurgical wards. Silver-coated EVDs were introduced in Phase III of the study from January to June 2008.

RESULTS The EVD infection rate decreased from a baseline of 6.1% to 3.8% in Phase II; a further reduction from 3.8% to 0% was achieved during Phase III.

CONCLUSION Good teamwork among doctors and nurses is essential for reducing EVD infection rate. We managed to reduce EVD infections substantially and would continue to strive to remain infection-free in the future.

Keywords: cerebrospinal fluid, external ventricular drain, infection
Singapore Med J 2012; 53(4): 255–259

"EVD infections are not in our surveillance plan"

"Because EVD Infections are not always caused by an MDRO"

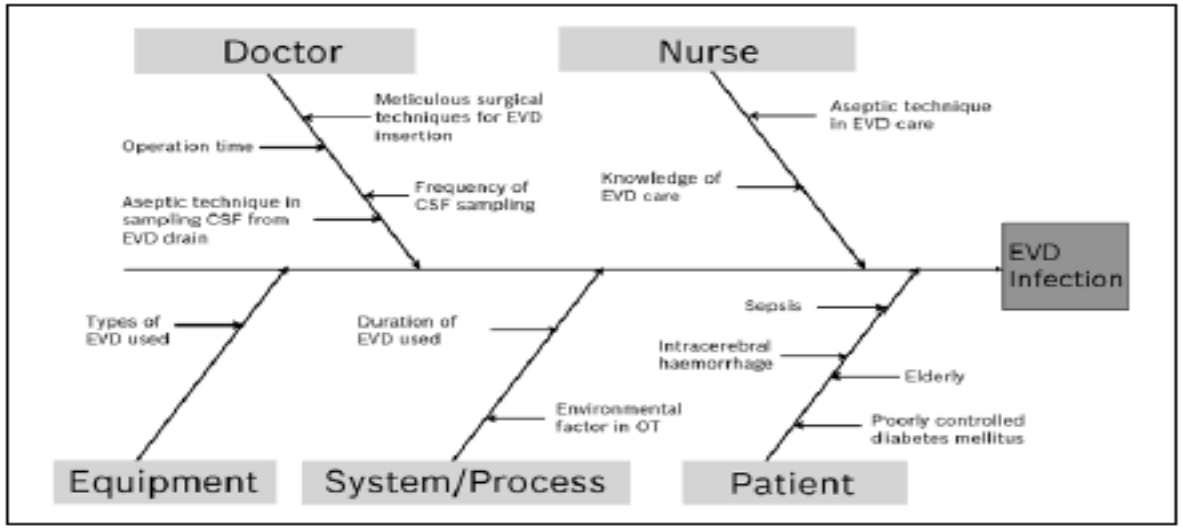


Fig. 1 Cause and effect diagram for external ventricular drain infection.

Table 2S. Outline of measures of the EVD infection control "bundle"

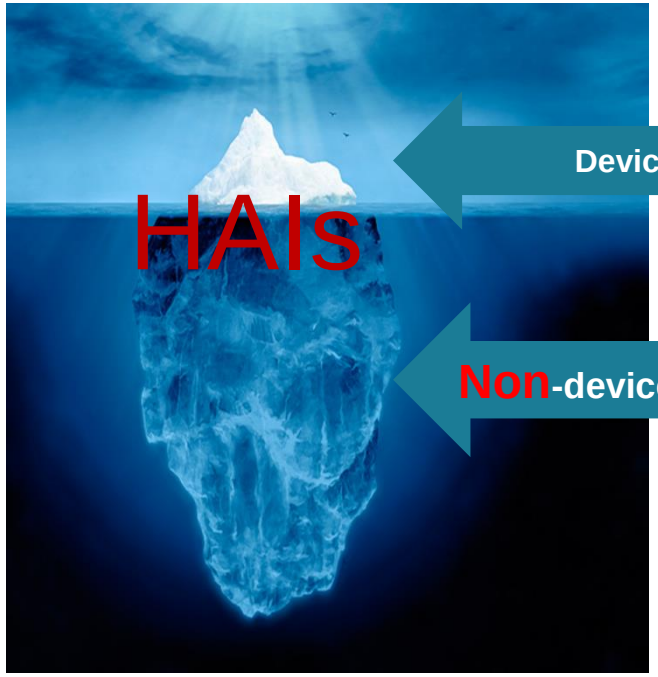
	Procedures	Schedule	Health personnel involved
A. **Re-education of ICU personnel on infection control**	*Oral presentations on:* *a) CNS and EVD infection in ICU* *b) MDR bacterial infections – local patterns* *c) Hand hygiene - special focus on trainees* *d) Barrier precautions in patients with MDR bacteria* *e) EVD handling* *f) CSF sampling*	Twice monthly over three months (each presentation was repeated twice) The programme was repeated twice	ICU nurses -trainees ICU doctors Physiotherapists
	Doctor-nurses "update and feedback agenda" *a) Update on bacterial epidemiology of ICU* *b) EVD handling* *c) Discussion on program evolution* *d) Practical problems*	Once weekly meeting	ICU nurses-trainees ICU doctors Physiotherapists
B. Handling of EVD	1. Aseptic drape for EVD covering at all time 2. Aseptic dressing for wound exit site 3. Hand hygiene, national C.C.P.D. protocol 4. Hand hygiene, sterile gloves plus barrier precautions (mask, cap, gowns) whenever opening the connecting 3-way valve 5. Flushing EVD for unblocking is strongly discouraged (oral-verbal communication) - if absolutely necessary in intracranial hypertension cases, it should be performed only in the distal part of the circuit -"confirm procedure in chart" at end of procedure	Permanent reminders in the ICU	ICU nurses ICU doctors
Cleaning standards	a. Wound site: povidone iodine 10% followed by alcohol (70%) and sterile gauze; procedure repeated once per day - "confirm procedure in control chart" at end of procedure b. EVD 3-way connector disinfection: povidone iodine 10% followed by alcohol (70%) and sterile gauze - "confirm procedures in control chart" at end of cleaning procedure c. Medical equipment disinfection: benzalkonium chloride, dodecylbispropylenetriamine; procedures repeated at least once per day and in each handling- "confirm procedure in control chart" at end of cleaning procedure Home equipment disinfection: quartenary ammonium and 70% alcohol solution or hypochlorite solution 30%; procedures repeated at least once per day and in each handling - "confirm procedure in control chart" at end of cleaning procedure d. head – mouth - body wash: (7.5% aquous povidone iodine surgical scrub, hexetidine and polychloro phenoxy phenol, respectively; procedures repeated at least once per day- "confirm procedure in control chart" at end of cleaning procedure	Permanent reminders in the ICU	Neurosurgeons ICU nurses, assistants
C. **CSF sampling via EVD**	a) Sampling only when unexplained fever ± worsening mental status or clouding of CSF – record procedure CT b) Routine sampling is strongly discouraged (oral and written communication) aiming at sampling less than twice weekly	Daily screening	ICU doctors
D. **EVD catheter replacement or removal**	a) Evaluate the necessity to keep the EVD every day b) If the patient is stable and ICP measurement for 24hours<20mmHg, increase the cut-off level for drainage by incremental steps up to 20mmHg c) Replace the catheter at the seventh drainage day if the catheter is still necessary (based on volume of drainage, clinical and radiologic data)	Daily screening	Neurosurgeons ICU doctors

EVD=External Ventricular Drain, ICU=Intensive Care Unit, MDR=Multi-drug Resistant, CSF=Cerebrospinal Fluid, C.C.P.D=Center of Control and Prevention of Diseases

Challenge

We are mostly identifying device-associated and procedures related infections

What we know is probably a very small fraction of what is really there



Device-associated and procedures related infections (high risk/high volume)

Non-device-associated and procedures related infections (high risk/high volume)

Solution

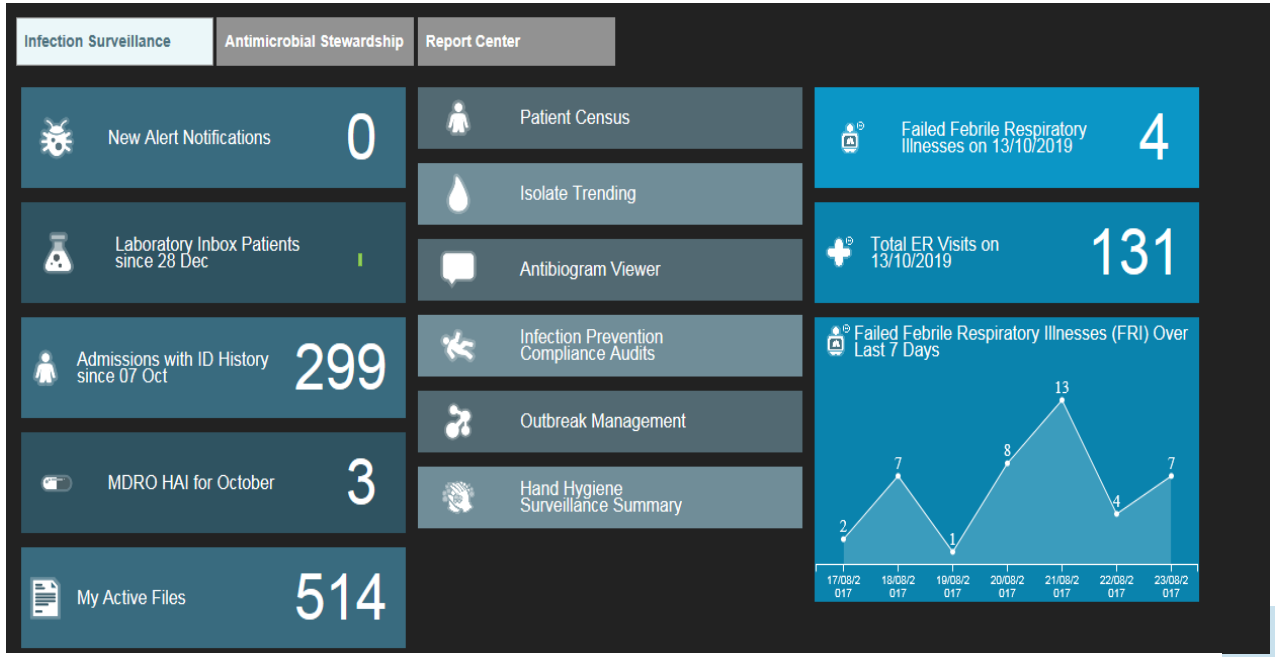
"Standard precautions for all patients"

Standard surveillance for all patients

Solutions

- **To have an electronic surveillance system that can pull data on HAI for the IP. This can ease “full house” surveillance of HAI.**

- **To include *<u>all</u>* HAIs as KPIs-**
  - ✓Device and non device related
  - ✓Procedures and non procedures related
  - ✓MDRO and non- MDRO



Challenge: Not wearing the correct hat

The Correct Conceptual Model for Surveillance

Clinician

Researcher

CRBSI is not CLABSI

CRBSI criteria require one of the following:

- A positive semi quantitative (>15 colony-forming units [CFU]/catheter segment) or quantitative (>103 CFU/catheter segment) cultures whereby the same organism (species and antibiogram) is isolated from the catheter segment and peripheral blood
- Simultaneous quantitative blood cultures with a ≥5:1 ratio CVC versus peripheral
- Differential period of CVC culture versus peripheral blood culture positivity of >2 hours

CRBSI is a clinical definition, used when diagnosing and treating patients, that requires specific laboratory testing that more thoroughly identifies the catheter as the source of the BSI. It is not typically used for surveillance purposes.

CLABSI as defined by NHSN/CDC possess

These two should be used as written if data is to be compared

- Protocols: i.e. RIT, DOE,IWP, denominator collection
- Definitions: i.e. LCBI1, LCBI2

Must meet **one** of the following LCBI criteria:

Criterion	*Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Once an LCBI determination is made, proceed to the MBI-LCBI definitions and determine if the corresponding MBI-LCBI criteria are also met (for example, after meeting LCBI 2, investigate for potential MBI-LCBI 2)
LCBI 1 If LCBI 1 criteria is met, consider MBI-LCBI 1	Patient of any age has a recognized bacterial or fungal pathogen not included on the NHSN common commensal list, identified from one or more blood specimens obtained by a culture or non-culture based microbiologic testing methods **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix B: Secondary BSI Guide). **Notes:** 1. If a patient meets both LCBI 1 and LCBI 2 criteria, report LCBI 1 with the recognized pathogen entered as pathogen #1 and the common commensal as pathogen #2. 2. No additional elements (in other words, no sign or symptom such as fever) are needed to meet LCBI 1 criteria; therefore, the LCBI 1 DOE will always be the collection date of the first positive blood specimen used to set the BSI IWP.

Infection Window Period (IWP)

The 7-day period: in which all site-specific infection criterion must be met. It includes the date of collection of the first blood specimen which identifies an organism in the blood, 3 calendar days before and 3 calendar days after

Date of Event (DOE)

LCBI 1:DOE will always be the date of the blood specimen collection which identifies an organism in the blood (will always be a recognized pathogen) No symptom required

LCBI 2 or 3: DOE will always be the first date an element that is used to meet the LCBI 2 or 3 criteria (symptom or the first of 2 cultures with matching CC) occurs within the BSI IWP Symptom required

Device-associated Rates/Ratios

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

*stratified by device/infection type

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

*stratified by device type

Denominators (Summary Data)

At the same time each day, count:

- the number of patients on the unit
- the number of patients with one or more of the devices you're collecting

Symptomatic UTI (SUTI)	
SUTI 1a Catheter-associated Urinary Tract Infection (CAUTI)---Any Age	
Patient must meet 1, 2, and 3 below:	
Element	**Element Met**
1. Patient had an indwelling urinary catheter (IUC) that had been in place for more than 2 consecutive days in an inpatient location on the date of event **AND** was either:	
• Present for any portion of the calendar day on the date of event[†] **OR**	☑
• Removed the day before the date of event[‡]	☐
2. Patient has at least ***one*** of the following signs or symptoms:	
• Fever (>38°C): Reminder: To use fever in a patient > 65 years of age, the IUC needs to be in place for more than 2 consecutive days in an inpatient location on date of event and is either still in place OR was removed the day before the date of event.	☑
• Suprapubic tenderness*	☐
• Costovertebral angle pain or tenderness*	☐
• Urinary urgency^	☐
• Urinary frequency^	☑
• Dysuria^	☑
3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml. All elements of the SUTI criterion must occur during the IWP (See IWP Definition Chapter 2 Identifying HAIs in NHSN).	☑

Example one : variation in **protocol** interpretation

John Doe had fever and dysuria on June 1.

On June 5 urine culture was positive:
E. coli 100 000 cfu.

IP Jane Doe classified this as **CAUTI** since John did have a foley catheter for more than 2 calendar days.

Infection Window Period
(first positive diagnostic test, 3 days before and 3 days after)

Repeat Infection Timeframe (RIT)
(date of event = day 1)

Date of Event
(date the first element occurs for the first time within the infection window period)

Lack of Random Error (Precision)	Lack of Systematic Error (Validity)
Study Size and Statistical Power	Misclassification Bias
	Selection Bias
	Observation Bias
	Confounding

HOSPITAL DAY	RIT	INFECTION WINDOW PERIOD
1		
2		
3		
4	1	**Urine culture:** >100,000 cfu/ml *E. coli*
5	2	Fever > 38.0 C
6	3	Fever > 38.0 C
7	4	
8	5	
9	6	Urine culture: No growth
10	7	
11	8	
12	9	Urine culture: > 100,000 cfu/ml *S. aureus*
13	10	
14	11	
15	12	
16	13	
17	14	
18		
19		
		SUTI-HAI **Date of Event = 4** **Pathogens = *E. coli, S. aureus***

One day counts of:

- Patient days
- Device days

MSICU - Wednesday, November 28, 2007 10:00 am

Room #	Name	IV line
201	Mrs. Jones	CVC – Jugular
202	Miss Scarlett	CVC – Femoral
203	Mr. Green	Swan ganz
		PICC
204	Mrs. White	PIV X 2
205	Col. Mustard	PIV right
		CVC Jugular
206	Mrs. Doubtfire	
207	Mr. Jackson	PIV right
208	Mr. Blue	CVC – Subclavian
209	Mrs. Smith – transferred out to MS Ward at 11 am	PICC
210	Miss Brown – transferred in from CVICU @ 9 am	PICC

Patient days 10

Central line days _____

MSICU - Wednesday, November 28, 2007 10:00 am

Room #	Name	IV line
201	Mrs. Jones	CVC – Jugular
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203	Mr. Green	Swan ganz
		PICC
204	Mrs. White	PIV X 2
205	Col. Mustard	PIV right
		CVC Jugular
206	Mrs. Doubtfire	
207	Mr. Jackson	PIV right
208	Mr. Blue	CVC – Subclavian
209	Mrs. Smith – transferred to MS Ward at 11 am	PICC
210	Miss Brown – transferred from CVICU @ 9 am	PICC

Patient days 10

Central line days 7

Example 2: CLABSI denominator- variation in collection methods

- *What if, manual collection of denominator is in use?* Nurse collecting the denominator form does not understand what constitutes a central line, is not recording numbers appropriately or is recording numbers at different times

	# devices	#patients w/ line (same time)	#patients w/ line (any time)
1	6	5	5
2	8	5	6
3	8	6	6
4	9	6	9
5	10	7	9
6	6	5	5
7	9	5	6
8	10	6	8
9	9	8	9
	150	240	290
	13.3	8.3	6.8

We have identified 2 infections during that period.

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

*stratified by device/infection type

NHSN CAUTI definition **does not always** reflect clinician or ID consultant diagnosis

Total pts **387**

METHODS:

- All adult inpatients hospitalized between July 2010 and June 2011
- Looked for data on patients' signs, symptoms, and diagnostic tests; clinician's diagnosis; and the impression of the infectious diseases (ID) consultant.

The clinician's practice was compared with the NHSN definition and the ID consultant's impression.

Clinicians treated CAUTI **216** of 387 (55.8%)
Fitting the NHSN CAUTI definition **119** of 387 (30.7%)
Considered by ID to have a CAUTI **63** of 211 (29.9%) (ID didn't review all)

Al-Qas Hanna et al. Clinician practice and the National Healthcare Safety Network definition for the diagnosis of catheter-associated urinary tract infection. Am J Infect Control. 2013 Dec;41(12):1173-7

Possible solution????

ICD10Data.com

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ICD-10-CM Codes › S00-T88 Injury, poisoning and certain other consequences of external causes › T80-T88 Complications of surgical and medical care, not elsewhere classified › T80- Complications following infusion, transfusion and therapeutic injection ›

2017/18 ICD-10-CM Diagnosis Code T80.211A

Bloodstream infection due to central venous catheter, initial encounter

2016 2017 2018 Billable/Specific Code

- T80.211A is a billable/specific ICD-10-CM code that can be used to indicate a diagnosis for reimbursement purposes.
- Short description: Bloodstream infection due to central venous catheter, init
- The 2018 edition of ICD-10-CM T80.211A became effective on October 1, 2017.
- This is the American ICD-10-CM version of T80.211A - other international versions of ICD-10 T80.211A may differ.

The following code(s) above T80.211A contain annotation back-references that may be applicable to T80.211A:

- S00-T88 Injury, poisoning and certain other consequences of external causes
- T80-T88 Complications of surgical and medical care, not elsewhere classified
- T80 Complications following infusion, transfusion and therapeutic injection
- T80.2 Infections following infusion, transfusion and therapeutic injection
- T80.21 Infection due to central venous catheter
- T80.211 Bloodstream infection due to central venous catheter

Approximate Synonyms

- Candidemia associated with intravascular line
- Candidemia, line related
- Sepsis due to infected central venous catheter
- Sepsis related to central venous catheter

ICD-10-CM T80.211A is grouped within Diagnostic Related Group(s) (MS-DRG v35.0):

The use of administrative data: CLABSI

Methods

- Performed a retrospective comparative analysis on **1,505 cases**.
- Period: October 1, 2007, through December 31, 2009.
- Settings: 3 hospitals within the Duke Health System: (a 950-bed academic tertiary care hospital and 2 community hospitals with 200 and 350 beds each).

Results:

844 identified by *International Classification of Diseases, Ninth Revision* (*ICD-9*),

798 identified by IC personnel- using NHSN-defined CLABSI.

Only 112 cases (13%) were concordant

Conflicting results when these 2 measures are used as hospital quality metrics.

Rebekah W. Moehring et al., Central Line–Associated Infections as Defined by the Centers for Medicare and Medicaid Services' Hospital-Acquired Condition versus Standard Infection Control Surveillance: Why Hospital Compare Seems ConflictedInfect Control Hosp Epidemiol. 2013 Mar; 34(3): 238–244.

Solution:

Researcher

- ✓ Wear the correct hat during surveillance
- ✓ Don’t try to make the patient or situation fit the definition
- ✓ Don’t try to make the definition fit the situation
- ✓ Do not “bend” the protocol to make data look more favorable
- ✓ Use only the facts of the case and the details of the situation and apply the criteria as it’s written!

It is a must that leaders in healthcare don’t put pressure on the IP to do any of the above

Zero tolerance can go wrong

- *Organizational behaviour is somehow similar to human behaviour*

- Especially with highly competitive institutions where market positioning is very crucial for their survival

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Published: May 11, 2010

ZERO TOLERANCE INEFFECTIVE IN SCHOOLS

Contact(s): Andy Henion, Laura McNeal

EAST LANSING, Mich. — Zero tolerance in schools is failing to make students feel safe, two Michigan State researchers argue in a new study.

The policy, established in the mid-1990s to address gun violence in schools, has become plagued by inconsistent enforcement and inadequate security, according to the study, which appears in the May issue of the journal Urban Education.

As a result, the very students zero tolerance was designed to protect overwhelmingly say the policy is ineffective, said Laura McNeal, assistant professor of teacher education and lead researcher on the project.

"Zero tolerance policy represents what happens when there is a disconnect between law on the books and law in action," said McNeal, who has a law degree. "We need to reform existing policies such as zero tolerance to ensure every child receives a high-quality education in a safe and supportive learning environment."

McNeal and Christopher Dunbar Jr., associate professor of educational administration, interviewed and collected data from above-average students at 15 urban high schools in the Midwest. While much has been

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EDUCATION

Zero-Tolerance Policies in Schools are Often Destructive, Fueling a School to Prison Pipeline

States are realizing that when it comes to student behavior, positive reinforcement may deliver better results than punitive measures.

By ***s.e. smith*** */* ***AlterNet*** | *December 6, 2013, 1:00 PM GMT*

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81 COMMENTS

In 2011, a 13-year-old student in Albuquerque, New Mexico burped audibly in class (perhaps the school lunch didn't agree with him). His instructor summoned the school resource officer, one of a new generation of police officers and

Reflections on punishment

The traditional school of consequences

If we teach young people that the consequence of wrongdoing is a sanction or punishment then we encourage them to think only of themselves and to become self centred

... and the threat of 'punishment consequences' encourages deviousness, dishonesty and a conspiracy of silence amongst other students for fear of retaliation

The restorative school of consequences

If we teach young people that the consequence of their wrongdoing is the impact their actions have on others regardless of *whether they are caught or not* we encourage empathy

... and the invitation to become accountable, to take responsibility for their actions and to put things right teaches children that it's OK to make mistakes but it's even better to put things right afterwards.

On one hand: Little attention was given to HAI rates given lack of consequences

On the other hand: financial penalties without assessment of internal processes and a good validation process can also be very destructive

……”Even if it's true, what can one bee do?

Sting them where it really hurts”.

In the face! The eye!

- That would hurt.
- No.

Up the nose? That's a killer.

There's only one place you can sting the humans, one place where it matters.

Their pocket

Adherence to the Centers for Disease Control and Prevention's (CDC's) Infection Definitions and Criteria is Needed to Ensure Accuracy, Completeness, and Comparability of Infection Information

Issue: Ensuring data accuracy is critically important to both the Centers for Disease Control and Prevention (CDC) and the Centers for Medicare and Medicaid Services (CMS) for guiding preve
protecting patients. CDC and CMS require that all infections that meet the specified N
CMS requires for incentive payment or public reporting purposes be reported to NHS
issuing this communication to remind all hospitals of the importance of complete and
purposes of quality of care measurement and improvement.

Background: The CDC's NHSN is the nation's most comprehensive medical event t
more than 16,000 U.S. healthcare facilities in all 50 states, Washington, D.C., and Puer
NHSN is used for tracking of healthcare-associated infections and guides infection pre
protect patients. CMS and other payers use these data to determine incentives for perf

For questions or concerns about the protocols, specifications, or criteria specified for any of the NHSN measures, please contact:

NHSN Helpdesk nhsn@cdc.gov

For more information about the OIG go to: https://oig.hhs.gov/. Suspected healthcare fraud and abuse can be reported to the OIG Hotline:

Phone: 1-800-HHS-TIPS (1-800-447-8477) Fax: 1-800-223-8164
E-mail: HHSTips@oig.hhs.gov
TTY: 1-800-377-4950 or
https://oig.hhs.gov/fraud/

Mail: US Department of Health and Human Services
Office of Inspector General Attn:
OIG Hotline Operations P.O. Box
23489
Washington, DC 20026

Beth P. Bell, MD, MPH
Director, National Center for Emerging and Zoonotic Infectious Diseases
Centers for Disease Control and Prevention (CDC)

Patrick Conway, M.D.
Deputy Administrator for Innovation & Quality, CMS Chief Medical Officer
Centers for Medicare & Medicaid Services (CMS)

CDC has received reports from NHSN users indicating that in some healthcare facilities, some of the decisions about what infections should be reported to NHSN are made by individuals who may choose to disregard CDC's protocol, definitions, and criteria or who are not thoroughly familiar with the NHSN specifications. While there is no evidence of a widespread problem, CDC and CMS take any deviation from NHSN protocols seriously.

In some instances, these decisions may be made through a review process that overrules the decision of an infection preventionist or hospital epidemiologist to report an infection to NHSN, or clinicians may have departed from standard diagnostic practices to avoid reporting infections to NHSN, for example:

- Ordering diagnostic tests in absence of clinical symptoms. It has been reported that in some instances, when patients are admitted to a hospital, diagnostic microbiology tests are ordered even in the absence of clinical indications for testing, such as obtaining urine specimens for culture and sensitivity testing from patients who have no symptoms of a urinary tract infection. Many negative culture results are generated by this practice subjecting the patient to potentially unnecessary tests. On the occasion that a culture result is positive, the results are then used to assert that infections that first manifested themselves clinically many days later during hospitalization were present on admission and hence not reportable to NHSN.

- Discouraging the ordering of diagnostic tests in the presence of clinical symptoms. It has been reported that in some instances clinicians responsible for inpatient care in some hospitals may be discouraged from ordering diagnostic microbiology tests recommended by best medical practices (or

In either case, systematic underuse or overuse of diagnostic microbiology testing puts patients at risk. These practices can lead to use of antibiotics that is not necessary, such as treatment for bacterial colonization rather than infection, or antibiotic treatment that is not informed by culture results. When diagnostic tests are used inappropriately, clinicians lose the opportunity to modify antibiotic choice in response to antibiotic susceptibility testing results and make better informed decisions for patients. These practices could result in an increase in antibiotic resistant infections and adverse reactions among patients

Other potential "bad medical tactics" in response to the punitive decision:

- Using TTP for CLABSI
- Changing devices more often – or not even using them at all
- Changing patients location
- Not including discharged patients

Putting pressure on staff performing surveillance

In conclusion

Realistic:

- Achievable
- True (real)

Efficient:

- Maximum productivity
- Minimum effort

Surveillance of Healthcare-Associated Infections
Elements & Challenges

Establish endemic rates of HAIs
Identify outbreaks
Allow prioritization of problems
Develop interventions to reduce infections
Determine the impact of interventions
Reporting requirements

Assess the population
Identify outcomes and processes
Determine observation time period
Choose the methodology
Monitor the outcome or process using standardized definitions
Collect appropriate denominator data
Analyze surveillance data
Report

Active vs passive
Patient-based vs laboratory-based
Prospective vs retrospective
Priority-directed vs comprehensive
Risk-adjusted rates and crude rates
Incidence and prevalence

Required data to be collected
Sources of data
Plan to collect

Specificity and Sensitivity of the definitions
Validity and reliability of data
Time constraints
Logistics
Bias and confounding factors
Representativeness of the samples
Analysis challenges
Reporting challenges
Pressure: internal and external
Transparency

References:
Edmond MB, Eickhoff T. Clin Infect Dis 2008;46:1746-50.
https://www.cdc.gov/nhsn/pdfs/outlineforhaisurveillance.pdf

Elias Tannous,2017.

Thank you