


**Strategies to Improve Hand Hygiene Compliance in the ICU**  
**Dr. Alexandre Marra, Hospital Israelita Albert Einstein, Sao Paulo, Brazil**  
**Teleclass sponsored by Deb Ltd. (www.debgroup.com)**

**Strategies for Improving Hand Hygiene Compliance in the ICU**

**Alexandre R. Marra**  
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 Sao Paulo, Brazil

Hosted by  
**Dr. Jon Lloyd, MD**  
 Plexus Institute, Washington, DC

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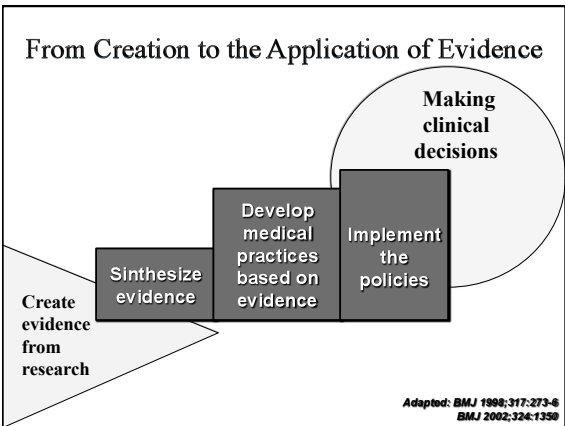
www.webbertraining.com      December 1, 2011

**Disclosure of Conflicts of Interest**

- Nothing to declare

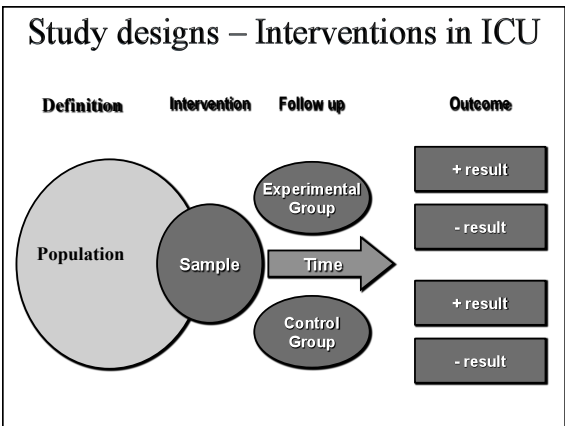
**My Outlines Are:**

- The intersection of ICU and Hospital Epidemiology
- Discussing about hand hygiene (HH) considering study designs
- Strategies for improving HH compliance
- Positive Deviance
- From lab to clinic battle



**The evidence does not make decisions, people do**

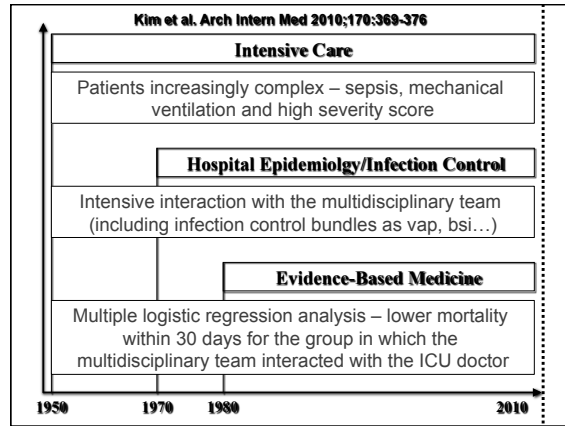
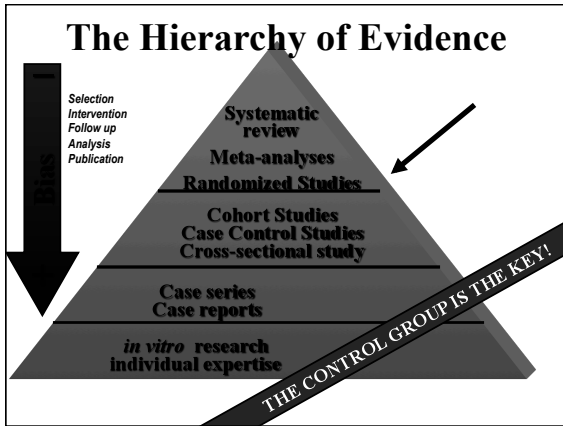
Haynes RB, Devereaux PJ, Goput GH  
 BMJ 2002;324:1350



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**Scientific evidence - CDC**

Category	Recommendation	Study design
IA <b>HAND HYGIENE!</b>	Strongly recommended for implementation	Well-designed randomized studies
IB	Strongly recommended for implementation	Well-designed non-randomized studies
IC <b>HAND HYGIENE COMPLIANCE!</b>	Required for implementation	Cohort or case-control studies
II	Suggested for implementation	Historical cohort
No recommendation; unresolved issue	Practices for which insufficient evidence or consensus regarding efficacy exists	Individual expertise



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## Dr. Alexandre Marra, Hospital Israelita Albert Einstein, Sao Paulo, Brazil

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Annals of Internal Medicine | ARTICLE

### Device-Associated Nosocomial Infections in 55 Intensive Care Units of 8 Developing Countries

Victor D. Rosenthal, MD; Dennis G. Maki, MD; Reinaldo Salomao, MD; Carlos Alvarez-Moreno, MD; Yalin Mehta, MD; Francisco Higuera, MD; Luis E. Cuellar, MD; Olay Akan Arkan, MD; Réouane Abouqal, MD; and Hakan Leblebicioğlu, MD, for the International Nosocomial Infection Control Consortium\*

**Background:** Health care-associated infections from invasive medical devices in the intensive care unit (ICU) are a major threat to patient safety. Most published studies of ICU-acquired infections have come from industrialized western countries. In a Centers for Disease Control and Prevention (CDC) National Nosocomial Infection Surveillance (NNIS) System report, the U.S. pooled mean rates of central versus catheter (CVC)-related bloodstream infections, ventilator-associated pneumonia, and catheter-associated urinary tract infections were 4.0 per 1000 CVC days, 5.4 per 1000 mechanical ventilator days, and 3.9 per Foley catheter days, respectively.

**Objective:** To ascertain the incidence of device-associated infections in the ICUs of developing countries.

**Design:** Multicenter, prospective cohort surveillance of device-associated infection by using the CDC NNIS System definitions.

**Setting:** 55 ICUs of 46 hospitals in Argentina, Brazil, Colombia, India, Mexico, Morocco, Peru, and Turkey that are members of the International Nosocomial Infection Control Consortium (INICC).

**Measurements:** Rates of device-associated infection per 100 patients and per 1000 device days.

**Results:** During 2002-2005, 21 069 patients who were hospitalized in ICUs for an aggregate 137 140 days acquired 3095 device-associated infections for an overall rate of 14.7% or 22.5 infections per 1000 ICU days. Ventilator-associated pneumonia posed the greatest risk (41% of all device-associated infections or 24.1 cases [range, 10.0 to 52.7 cases] per 1000 ventilator days), followed by CVC-related bloodstream infections (30% of all device-associated infections or 12.5 cases [range, 7.8 to 18.6 cases] per 1000 catheter days) and catheter-associated urinary tract infections (29% of all device-associated infections or 8.9 cases [range, 1.7 to 12.8 cases] per 1000 catheter days). Notably, 96% of *Staphylococcus aureus* infections were caused by methicillin-resistant strains, 51% of *Enterobacteriaceae* isolates were resistant to ceftriaxone, and 99% of *Pseudomonas aeruginosa* isolates were resistant to fluoroquinolones. The crude mortality rate for patients with device-associated infections ranged from 35.2% (for CVC-associated bloodstream infection) to 44.3% (for ventilator-associated pneumonia).

**Limitations:** These initial data are not adequate to represent any entire country, and likely variations in the efficiency of surveillance and institutional resources may have affected the rates that were detected.

**Conclusions:** Device-associated infections in the ICUs of these developing countries pose greater threats to patient safety than in U.S. ICUs. Active infection control programs that perform surveillance of infection and implement guidelines for prevention can improve patient safety and must become a priority in every country.

*Ann Intern Med* 2006;145:582-91. [www.ama-assn.org](http://www.ama-assn.org)  
For author affiliations, see end of text.  
\*For a list of members of the International Nosocomial Infection Control Consortium, see the Appendix.

Annals of Internal Medicine | ARTICLE

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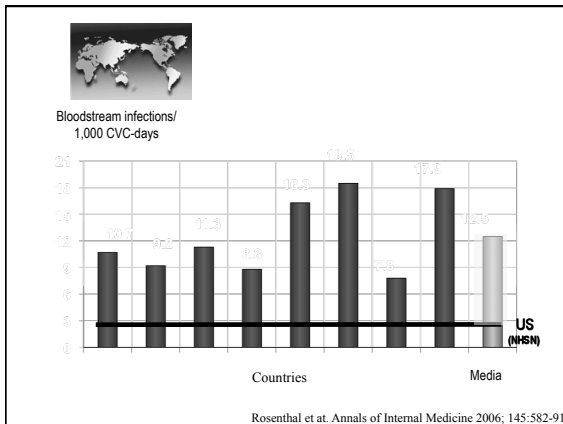
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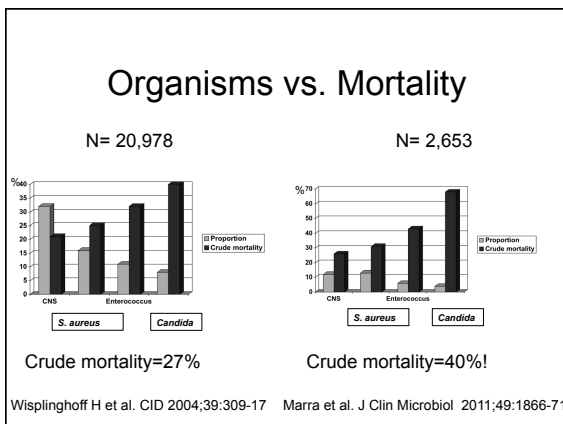


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### Program Brazilian SCOPE (2007-2010)

- Clinical data prospectively collected using standardized case-report form.
- Inclusion criteria: HA-BST.

- 1 - Hospital São Paulo
- 2 - Hospital do Rim e Hipertensão
- 3 - Hospital de Diadema
- 4 - Instituto de Oncologia Pediátrica
- 5 - Hospital Nove de Julho
- 6 - Hospital Israelita Albert Einstein
- 7 - Santa Casa de Porto Alegre
- 8 - Hospital do Coração de Natal
- 9 - Hospital Universitário Walter Cantídio
- 10 - Santa Casa do Pará
- 11 - Hospital da Unimed de Natal
- 12 - Hospital das Clínicas de Goiânia
- 13 - Hospital de Base de Brasília
- 14 - Hospital Conceição de Porto Alegre
- 15 - Hospital Espanhol de Salvador
- 16 - Hospital Estadual Universitário do Triângulo Mineiro



### Hand hygiene – Category IA

Hand hygiene is a major factor in reducing transmission of microorganisms

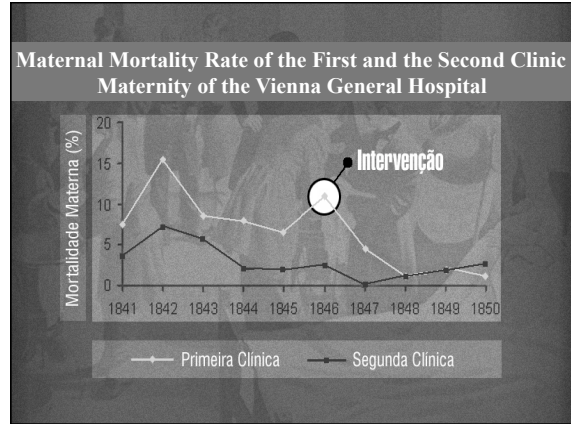
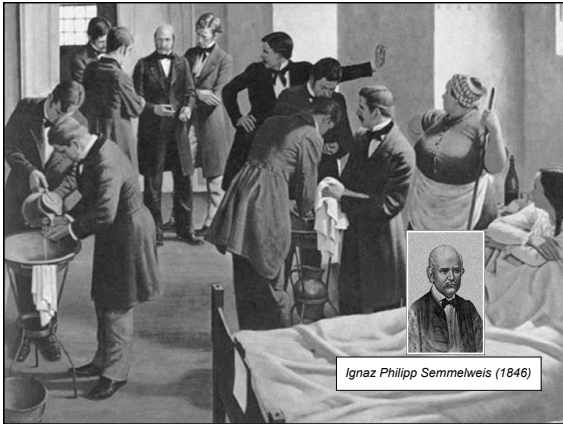
Hand Hygiene Compliance	Comments
Background	Observational studies have reported hand hygiene compliance rates of 5-81%
Main reasons for non-compliance	<ul style="list-style-type: none"> <li>✓ Insufficient time</li> <li>✓ Work overload</li> <li>✓ Excess of patients</li> <li>✓ Lack of knowledge of the recommendations</li> <li>✓ Skeptical about hand hygiene as a prevention method</li> <li>✓ Inconvenient locations from sinks and soap dispensers</li> <li>✓ Lack of incentive for promotion of hand hygiene</li> </ul>

MMWR Oct 25, 2002 / 51(RR16):1-44

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### Time Line – Infection Control

**Compliance with Handwashing in a Teaching Hospital**  
Didier Pittet, MD, MS; Philippe Mourouga, MD, MSc; Thomas V. Perneger, MD, PhD; and the Members of the Infection Control Program

**Pittet D et al. Ann Intern Med 1999;130:126-130**

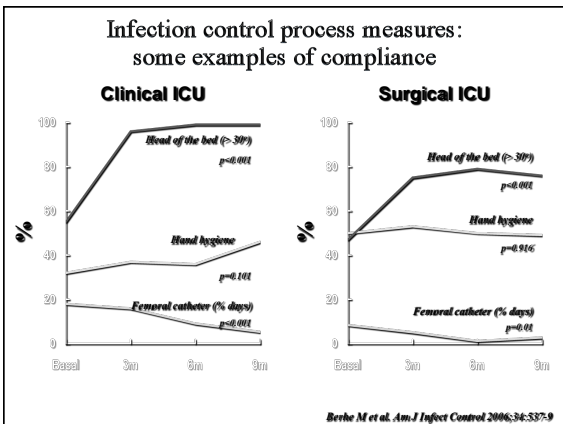
Once upon a time...

1847 → 1999

### Table. Factors Associated with Noncompliance with Handwashing at the University of Geneva Hospitals

Variable	Handwashing Opportunities n (%)	Compliance %	ORs Ratio (95% CI) in Univariate Analysis*	ORs Ratio (95% CI) in Multivariate Analysis*
Type of health care worker				
Nurse†	1876 (66)	52	1.00	1.00
Physician	291 (10)	30	2.20 (1.64-3.20)	2.80 (1.91-4.10)
Physio assistant	377 (13)	47	1.10 (0.94-1.51)	1.26 (1.01-1.54)
Other	360 (13)	38	1.90 (1.11-3.26)	2.10 (1.41-3.25)
Hospital location				
Medical ward†	1114 (39)	52	1.00	1.00
Surgical ward	960 (35)	47	1.27 (0.98-1.64)	1.26 (1.00-1.60)
Obstetrics-gynecology ward	147 (5)	46	1.16 (0.73-1.85)	1.12 (0.69-1.82)
Pediatric ward	133 (4.7)	59	0.72 (0.45-1.12)	0.70 (0.45-1.10)
Intensive care unit	450 (16)	36	2.10 (1.41-3.32)	2.00 (1.33-3.06)
Level of risk for contamination†				
High risk procedure	522 (19)	38	1.74 (1.37-2.22)	1.84 (1.43-2.38)
Medium risk procedure†	190 (6)	49	1.00	1.00
Low risk procedure	352 (13)	52	1.00 (0.88-1.35)	1.00 (0.84-1.32)
Ability index (handwashing opportunities per hour)				
<20†	473 (17)	58	1.00	1.00
21-40	1258 (46)	51	1.23 (1.01-1.70)	1.23 (1.01-1.74)
41-60	825 (30)	40	2.06 (1.49-2.80)	2.10 (1.50-2.93)
>60	276 (10)	37	2.46 (1.44-4.20)	2.15 (1.26-3.53)
Time of week				
Weekday†	2470 (87)	46	1.00	1.00
Weekend	364 (13)	59	0.61 (0.44-0.84)	0.61 (0.43-0.85)
Time of day				
Morning†	1410 (50)	45	1.00	-
Afternoon	967 (35)	48	0.80 (0.67-1.12)	-
Night	497 (18)	55	0.66 (0.49-0.88)	-
Total	2538 (100)	46		

48% overall compliance  
36% ICU compliance  
Pittet D et al. Ann Intern Med 1999;130:126-130




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**HAND HYGIENE –  
CATEGORY IA**



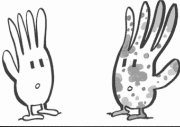
It is quick: 5- 15 seconds

Easy

Alcohol gel

CDC. Guideline for prevention of healthcare-associated pneumonia, 2004

It is effective for hand antisepsis due to the bactericidal properties of alcohol



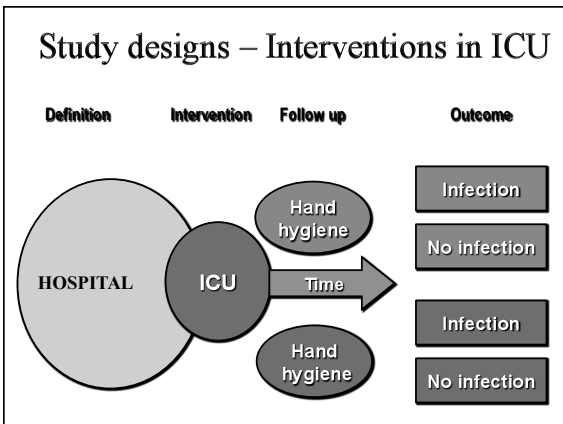
**HAND HYGIENE IN  
HOSPITALS :  
US, EUROPE AND BRAZIL**

STUDY YEAR	%COMPLIANCE	SETTINGS
1995 (1)	29%	Hospital and ICU
1995 (2)	41%	Hospital
1996 (3)	41%	ICU
1998 (4)	30%	Hospital
2005 (5)	48%	Hospital
2002 (6)	52%	ICU

1. Gould D. *J Hosp Infect* 1994;28:15-30. 2. Larson, *J Hosp Infect* 1995;30:88-106.  
 3. Slaughter S, *Ann Intern Med* 1996;3:360-365. 4. Watanakunakorn C, *Infect Control Hosp Epidemiol* 1998;19:858-860.  
 5. Pittet D, *Lancet* 2000;356:1307-1312.  
 6. Camargo LFA, Marra AR Braz *J Infect Dis*, 2009;13:330-4.

Interventions for improving hand hygiene compliance

• What is the best evidence?



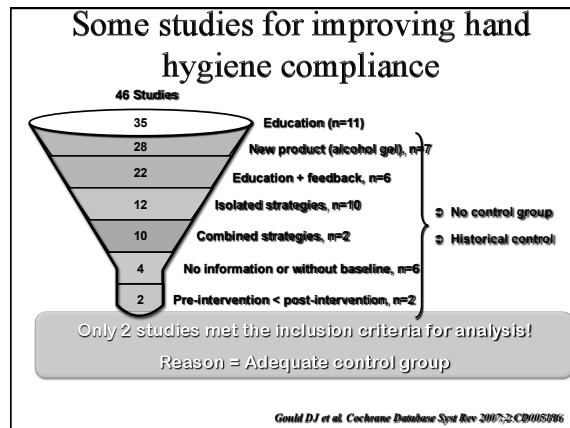
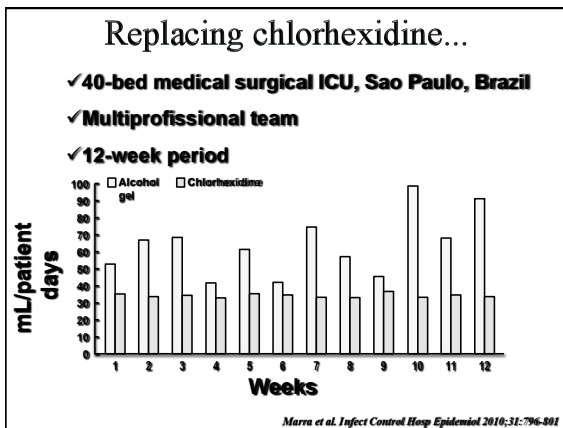
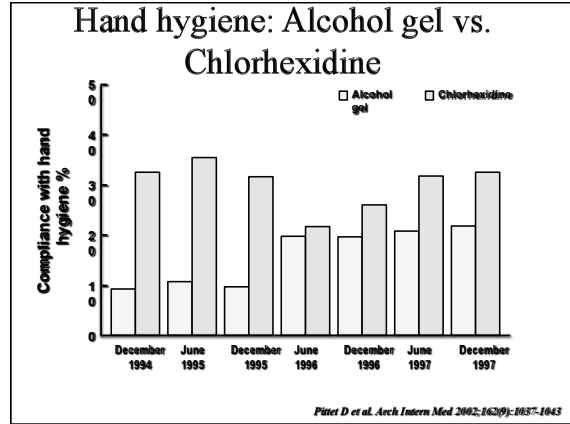
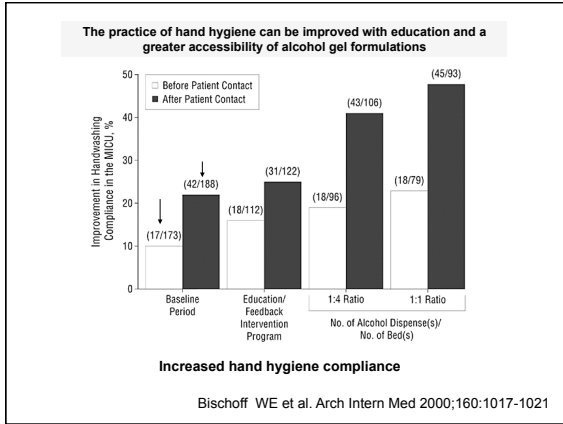
**The first studies**

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# Strategies to Improve Hand Hygiene Compliance in the ICU

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### Some studies for improving hand hygiene compliance

- Gould 1997 - before/after control study – UK nurses (4 surgical wards)
- Intervention: educational sessions + hand hygiene + universal precautions
- Outcome: unsuccessful intervention after three months

Gould DJ et al. J Clin Nursing 1997;6:55-67

### Some studies for improving hand hygiene compliance

- Huang 2002 (randomized control trial) – 98 chinese nurses (ward)
- Intervention: educational sessions + universal precautions
- Outcome: successful intervention after three months

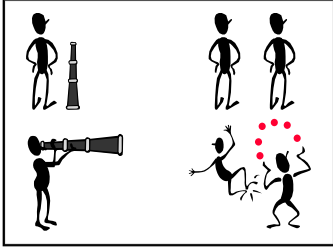
Huang J et al. J Continuing Education in Nursing 2002;33:217-224

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### Limitations of Hand Hygiene Studies

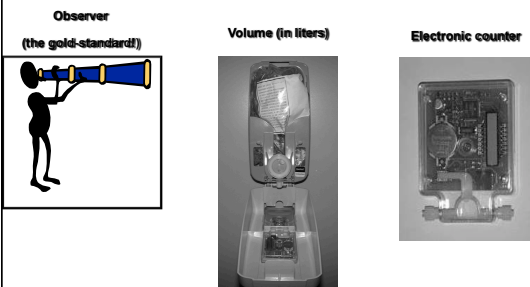
- ↳ Observers (Hawthorne's effect)



- ↳ Sustainability? (studies with time less than 6 months)

Gombi DJ et al. Cochrane Database Syst Rev 2007;2:CD005496

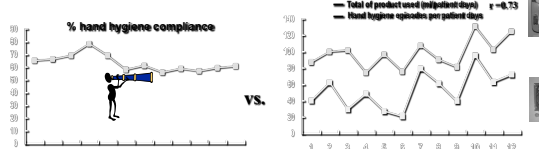
### Methods for evaluating hand hygiene (HH) compliance



### Methods for monitoring hand hygiene (HH) compliance

- ↳ West side ICU – 4 units (total = 18 beds)
- ↳ Period: April - June 2009 (12 weeks)
- ↳ Prospective randomized controlled study

172,457 alcohol gel usage (electronic counters)  
2,249 opportunities for HH observed (observers)  
This represented only 1.3% of opportunities for HH

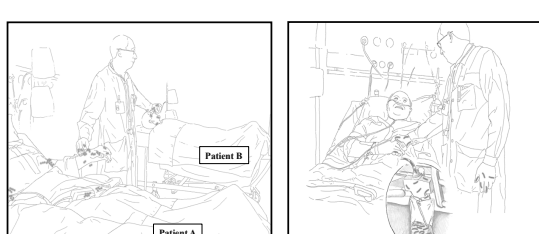


Marra AR et al. Infect Control Hosp Epidemiol 2010;31:796-801

### Methods for monitoring hand hygiene (HH) compliance

Week	Patient/ days	Electronic counters		Direct observation			Product usage (in patient days)		
		Usages	Episodes/ Patient- days	Episodes/HH	Opportunities/ HH	Compliance	Alcohol gel	Chlorhexidine	Total
1	115	4647	40.4	109	167	65.3%	52.2	34.8	87.0
2	120	7501	62.5	116	175	66.3%	66.7	33.3	100.0
3	118	3512	29.8	101	146	69.2%	67.8	33.9	101.7
4	121	5878	48.6	101	129	78.3%	41.3	33.1	74.4
5	114	3123	27.4	101	146	69.2%	61.4	35.1	96.5
6	119	2595	21.1	103	177	58.2%	42.0	33.6	75.6
7	121	9610	79.4	87	142	61.3%	74.4	33.1	107.5
8	122	7488	61.4	122	218	56.0%	57.4	32.8	90.2
9	111	4411	39.7	141	239	59.0%	45.0	36.0	81.0
10	122	11676	95.7	117	205	57.1%	98.4	32.8	131.2
11	117	7379	63.1	156	262	59.5%	68.4	34.2	102.6
12	120	8659	72.2	148	243	60.9%	91.7	33.3	125.0

In press: Marra et al. Infect Control Hosp Epidemiol 2010



### Feedback method for hand hygiene

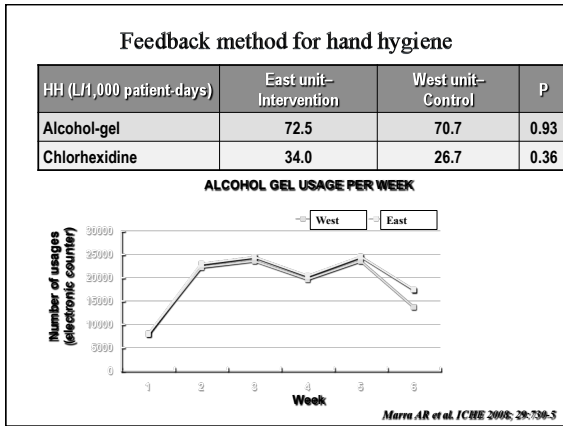
- ↳ Prospective controlled study
- ↳ Infection control in two SDUs (20 beds per SDU)
- ↳ MRSA surveillance at admission and every 4 days
- ↳ Period: from April to September 2007 (6 months)

- ↳ CDC/NISS definitions
- ↳ Electronic counter devices for HH in each room and product usage (chlorhexidine e alcohol gel)
- ↳ Contact precautions for + nasal MRSA patients
- ↳ Feedback (twice per week) in the intervention SDU

Marra AR et al. ICHE 2008; 29:739-5

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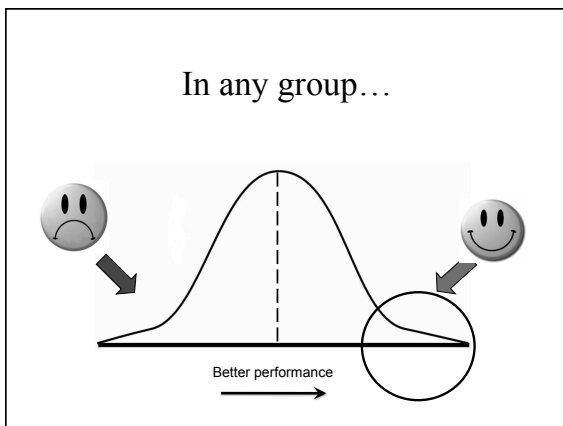
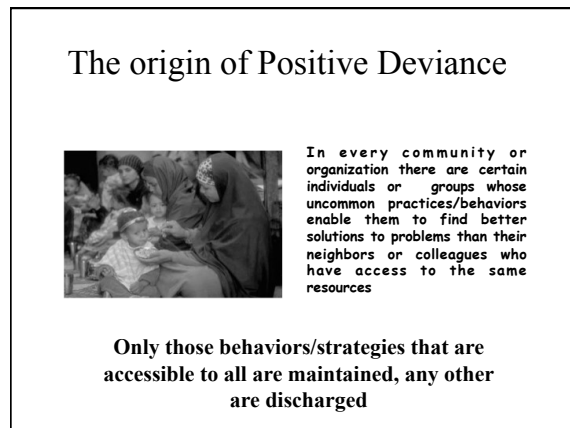
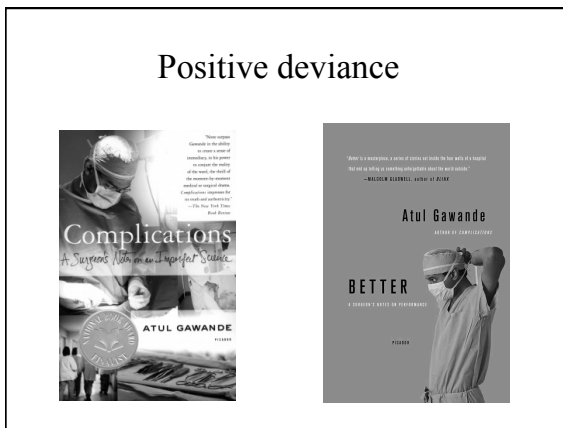
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**Feedback Method for Hand Hygiene**

Outcome	East SDU Intervention	West SDU Control	P
BSI/1,000 CVC-days	3.5	0.79	0.18
UTI/1,000 UC-days	15.8	15.7	1.0
Pneumonia/1,000 tracheo-days	10.7	5.1	0.13

Marra AR et al. ICHE 2008; 29: 730-5

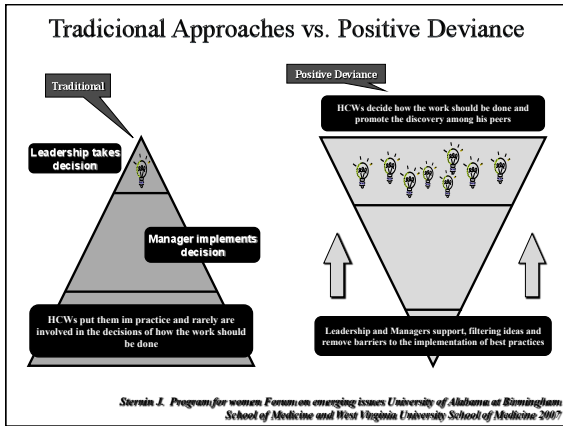


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Positive deviance: A new strategy for improving hand hygiene compliance

- 2 (20 bed each) step-down units (E & W): 9 mo period (3 phases)
  - 1st: Pre-intervention: counted hand hygiene episodes (electronic counters)
  - 2nd: implemented PD strategy in E unit
  - 3rd: PD applied in both units
- HAIs surveillance: performed by trained ICNs

Marra et al. ICHE 2010, 31:12-20

## Positive deviance Approach

- Meeting of all HCWs (2x/mo).
- Opportunities to express their feelings about hand hygiene.
- Needs to improve (changing experiences).
- Monthly HAI rates were shown to HCW.
- Identified “positive deviants\*” HCWs. They identified others and so forth... (\*Are those who wanted to change and develop new ideas for improving hand hygiene and who stimulated other HCWs).

Marra et al. ICHE 2010, 31:12-20



## Results

Study outcomes from July to September 2008 - Positive Deviance

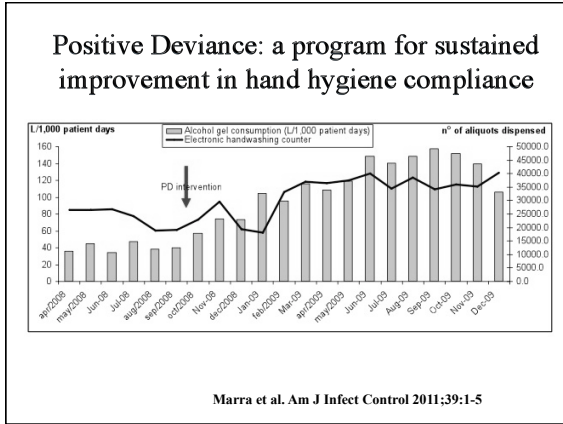
	Intervention unit (E)	Control Unit (W)	P
<b>Hand hygiene</b>			
Alcohol gel aliquots dispensed (total)	109.683	62.178	-
Alcohol gel aliquots dispensed per room (means±SD)	136.41±42.37	68.14±33.81	<0.01
Alcohol gel used (L/1,000 patient days) (means±SD)	83.2±3.02	42.03±4.55	<0.01
Chlorhexidine used (L/1000 patient days) (means±SD)	21.2±11.30	16.7±6.07	0.57
<b>Healthcare associated infections (HAIs)</b>			
Bloodstream infection/1,000 catheter days	1.5	0	-
Urinary tract infection/1,000 catheter days	15.5	29.8	-
Pneumonia/1,000 tracheostomy days	0	18	-
Incidence density of HAIs/1,000 patient days	6.5	12.7	0.04

Callouts: "Increase alcohol gel utilization" (pointing to the alcohol gel used row), "Reduction on HAI" (pointing to the incidence density of HAIs row).

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# Strategies to Improve Hand Hygiene Compliance in the ICU

Dr. Alexandre Marra, Hospital Israelita Albert Einstein, Sao Paulo, Brazil  
Teleclass sponsored by Deb Ltd. (www.debgroup.com)

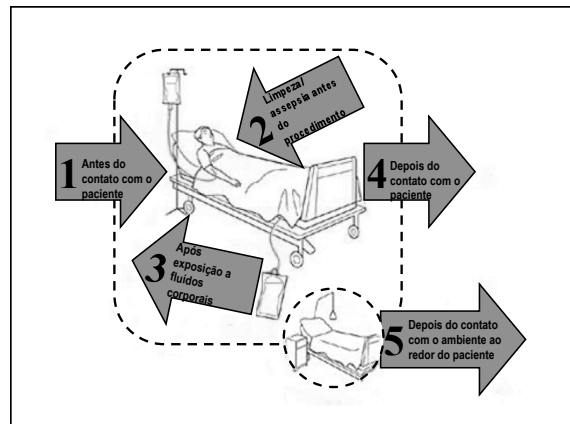
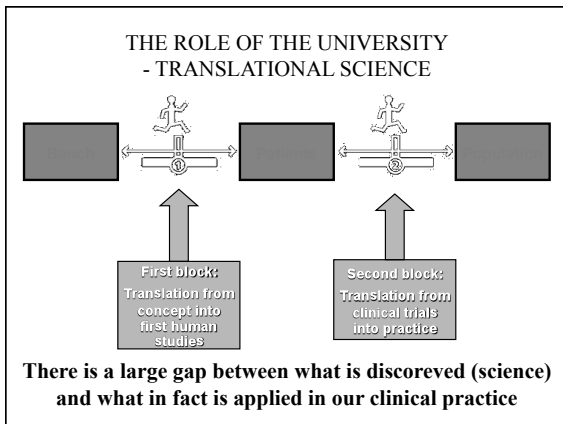


### Hand Hygiene

Our evolution in Albert Einstein ICU, Sao Paulo, Brazil

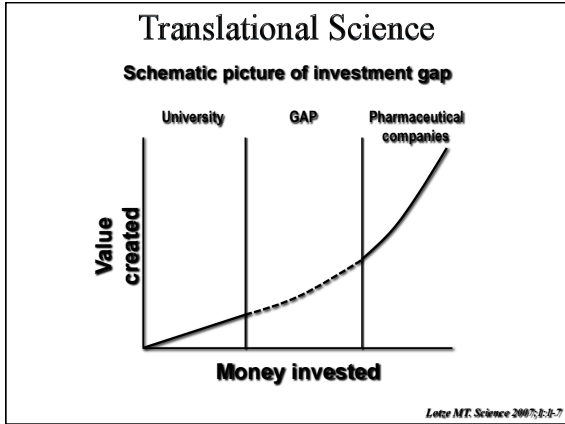
Study Year	% Compliance
2002 (1)	52.0%
2008	52.5%
2009 (2)	62.3%
2010	78.5%

1. Camargo LFA, Marra AR, et al. Braz J Infect Dis, 2009;13:338-4  
2. Marra AR et al. Infect Control Hosp Epidemiol, 2010;31:736-801



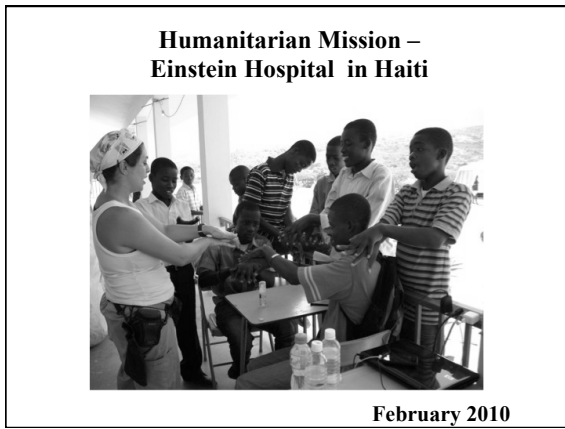
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**Dr. Alexandre Marra, Hospital Israelita Albert Einstein, Sao Paulo, Brazil**  
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**TRANSLATIONAL SCIENCE**

- “it comprises a meaning that should be considered science and academic activity with the development of strategies and tools that actually lead to discoveries that will benefit both patient and society”
- “Considerable gap between basic acquired science and its application: long period between initial experimental results and their transformation into new technologies for health purposes”



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