

Novas tecnologias para o diagnóstico e prevenção das infecções em terapia intensiva  
 Alexandre Marra, Hospital Israelita Albert Einstein, São Paulo  
 Patrocinador GOJO (www.gojo.com.br)

**Novas tecnologias para o diagnóstico e prevenção das infecções em terapia intensiva**

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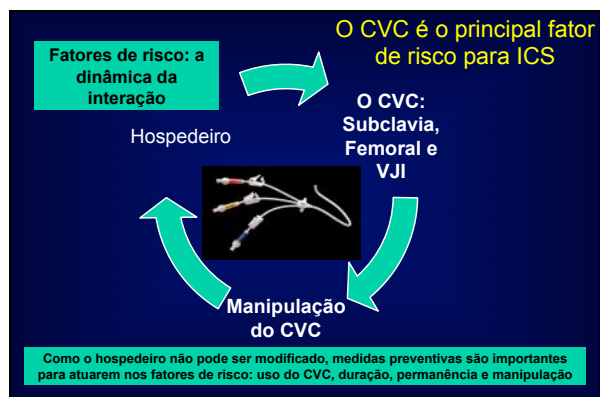
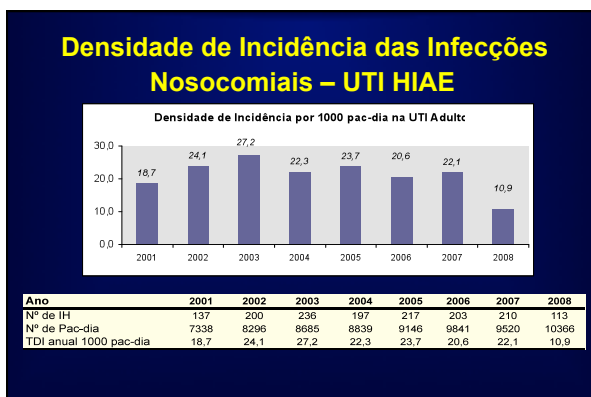
www.webbertraining.com 29 Outubro, 2013

**Conflito de interesse**

- Nada a declarar

**Objetivos**

- “Novas” e “velhas” tecnologias
- Prevenção – estratégias para redução de risco
- Diagnóstico – novos métodos para tomada de decisão (é ou não é infecção?)
- Medidas de desfechos clínicos
- Da bancada à beira leito



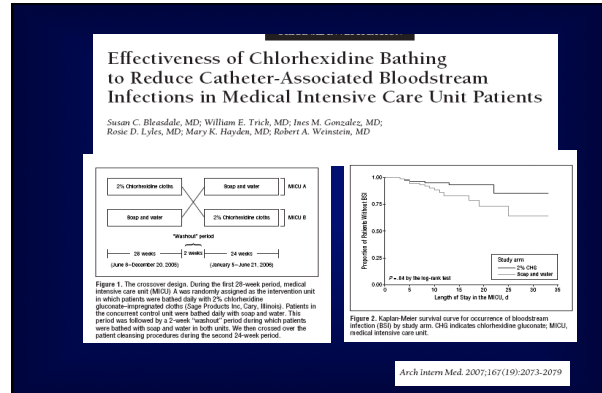
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## Alexandre Marra, Hospital Israelita Albert Einstein, São Paulo

### Patrocinador GOJO (www.gojo.com.br)

### Infecção da corrente sanguínea associada ao cateter venoso central - HIAE

UNITS	CVC-associated BSI (per 1000 CVC-days)			CVC rate		
	2007	2008	Comparison between 2 periods	Dec 2008	2007	2008
	UTI Adulto	5.7	3.0	↓ 47.4%	0	0.72
Semi Adulto	1.6	1.6	0	0	0.36	0.37
Coronariana	5.1	2.5	↓ 51.0%	0	0.29	0.31
Oncologia	3.6	2.0	↓ 44.4%	0	0.55	0.60
TMO	9.6	5.3	↓ 44.8%	11.2	0.95	0.98
UTI Neonatal	13.3	5.9	↓ 55.6%	13.9	0.17	0.15
CTI Pediátrico	2.0	3.7	↑ 85%	23.3	0.37	0.34
CMC	5.3	1.0	↑ 81.3%	0	0.13	0.12
<b>HIAE</b>	<b>4.7</b>	<b>2.2</b>	<b>↓ 53.2 %</b>	<b>1.1</b>	<b>0.25</b>	<b>0.26</b>



### Table 2. Comparison of Incidence of Infection by Method of Bathing Patients and Infection Category

Infection Category	Bathing Method		Events	Rate <sup>a</sup>	Difference (95% CI)	P Value
	Soap and Water	2% CHG				
Primary BSI	22	10	4	4.1	6.3 (1.2 to 11)	.01
UTI/sepsis	9	4	4	1.6	2.4 (0.9 to 3.7)	.06
Clinical sepsis	9	4	16	7.2	-3.0 (-7.8 to 1.8)	.20
Urinary tract infection	17	6	10	5.9	2.1 (-2.6 to 7)	.41
Ventilator-associated pneumonia	15	6	18	7.8	-1.1 (-6.3 to 4.1)	.69
Secondary BSI	5	2	5	2.5	0.2 (-2.8 to 3.0)	.06
<i>Clostridium difficile</i> /diarrhea	20	2	2	0.5	0.1 (-5.9 to 5.7)	.08

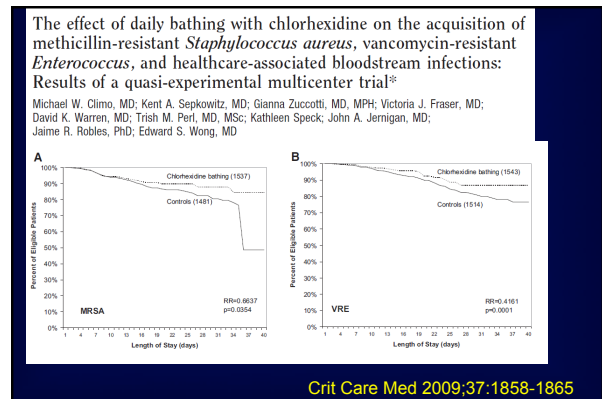
Abbreviations: BSI, bloodstream infection; CHG, chlorhexidine gluconate; CI, confidence interval.  
<sup>a</sup> Rates are expressed per 1000 patient-days. There were 2119 patient-days in the soap and water arm and 2216 patient-days in the CHG arm.

### Table 4. Microorganisms Isolated in Primary Bloodstream Infections

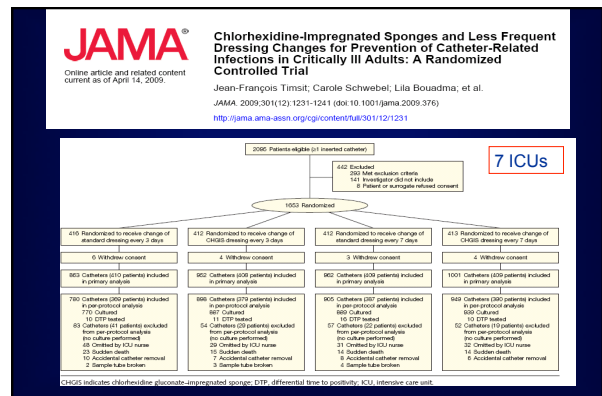
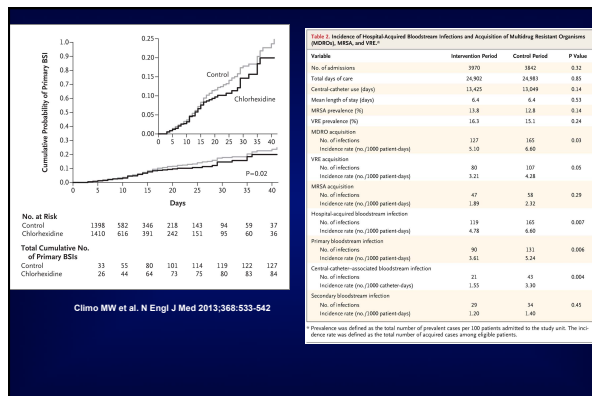
Microorganism <sup>a</sup>	Bathing Method	
	Soap and Water (n=27)	2% CHG (n=11)
<b>Gram-positive bacteria</b>		
Coagulase-negative staphylococci	15	3
<i>Bacillus</i> species	1	0
Enterococcus species	7	4
<i>Staphylococcus aureus</i>	1	0
<b>Gram-negative bacteria</b>		
<i>Escherichia coli</i>	1	1
<i>Klebsiella pneumoniae</i>	0	1
<b>Fungi</b>		
<i>Candida albicans</i>	1	0
<i>Candida tropicalis</i>	1	0
<i>Candida krusei</i>	0	2

Arch Intern Med. 2007;167(19):2073-2079

Redução de 61% - incidência ICS primária (16,8 vs. 6,4/1.000 cateteres dia)



Crit Care Med 2009;37:1858-1865

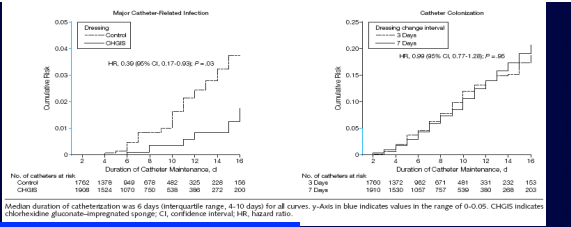


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## Chlorhexidine-Impregnated Sponges and Less Frequent Dressing Changes for Prevention of Catheter-Related Infections in Critically Ill Adults

A Randomized Controlled Trial



CHGIS reduced risk of infection even when background infection rates were low (<2/1,000 catheter days)

**Trial Registration** clinicaltrials.gov Identifier: NCT00417235  
 PMID: 2005/01/12/1231-1241

## VASCULAR ACCESS ULTRASOUND



## VASCULAR ACCESS ULTRASOUND

Outcome measures in the ultrasound group versus the landmark group of patients		
Outcome measures	Ultrasound group (n = 450)	Landmark group (n = 450)
Access time (seconds)	17.1 ± 16.5 (11.5 to 41.4)*	44 ± 95.4 (33.2 to 77.5)
Success rate	450 (100%) <sup>a</sup>	425 (94.4%)
Carotid puncture	5 (1.1%) <sup>a</sup>	48 (10.6%)
Haematoma	2 (0.4%) <sup>a</sup>	38 (8.4%)
Haemothorax	0 (0%) <sup>a</sup>	8 (1.7%)
Pneumothorax	0 (0%) <sup>a</sup>	11 (2.4%)
Average number of attempts	1.1 ± 0.6 (1.1 to 1.5) <sup>a</sup>	2.6 ± 2.0 (1.5 to 6.3)
CVC-BSI	47 (10.4%) <sup>a</sup>	72 (16%)

\*Comparison of the outcome measures between the ultrasound group and the landmark group of patients (p < 0.001). Access time and average number of attempts are expressed as mean ± standard deviation (95% confidence interval). Success rate, carotid puncture, haematoma, haemothorax, pneumothorax, and CVC-BSI are expressed as the absolute number of patients and percentage of their group. CVC-BSI, central venous catheter-associated blood stream infection.

Crit Care 2006; 10(6): R162

## Nosocomial Bloodstream Infections

- 12-25% attributable mortality
- Risk for bloodstream infection: BSI per 1,000 catheter/days

Subclavian or internal jugular CVC	5-7
Hickman/Broviac (cuffed, tunneled)	1
PICC	0.2 - 2.2

Catheter type and expected duration of use should be taken into consideration

## New choices for CVC – Financial implications

Variables	Standard vs. CSS CVC	Standard vs. RM CVC	CSS vs. RM CVC
Primary BSI incidence	33.0 x 13.6	33.0 vs. 5.1	13.6 vs. 5.1
Saving primary BSI	\$165.88	\$200.48	\$283.53

Shorr FAH et al. Chest 2003;124:275-84

## Double-lumen central venous catheters impregnated with chlorhexidine and silver sulfadiazine to prevent catheter colonisation in the intensive care unit setting: a prospective randomised study

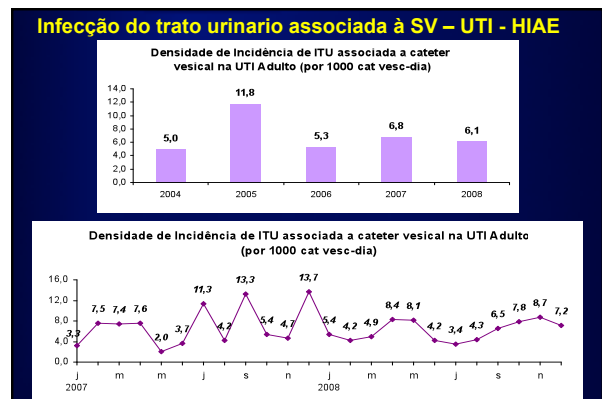
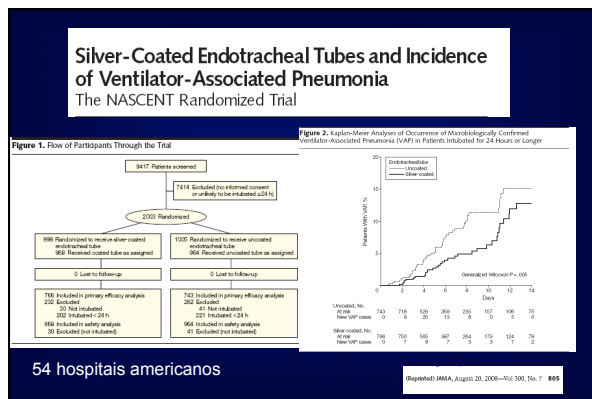
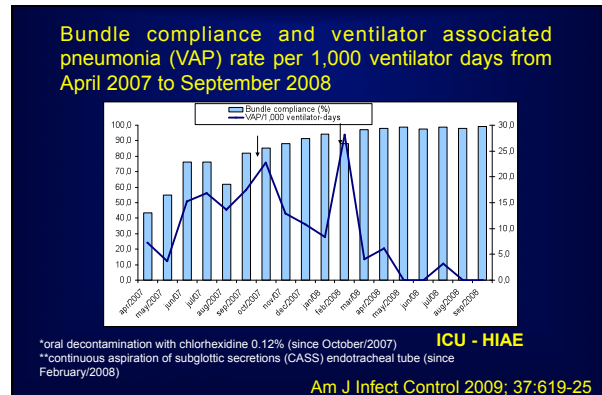
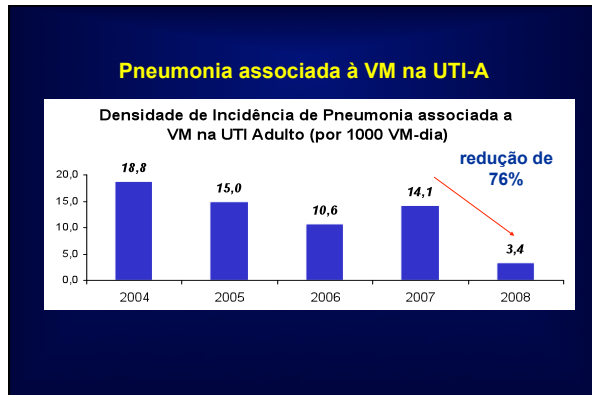
Catheterisation	Impregnated catheter group (N = 51)	Standard catheter group (N = 58)	P-value
Duration of catheterisation (days) median (range)	14 (7.5-21)	12 (8-19)	0.40
Reason for removal, no. (%)			
Catheter no longer needed	37 (72)	43 (73)	0.85
Suspected catheter site infection	4 (8)	10 (17)	0.13
Suspected systemic infection	8 (16)	5 (10)	0.26
Occluded catheter	2 (4)	0	0.15
Colonisation rates			
All catheters	29.4% (15)	34.5% (20)	0.50
Catheters ≤10 days of length of stay (N = 43)	22.2% (4/18)	36% (9/25)	0.33

ICU - HIAE

Camargo LFA et al. J Hosp Infect 2009

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### Portable bladder scanners

Avoid unnecessary catheterization!

40%

Clin Infect Dis 2008;46:243-50

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JANUARY 2008, VOL. 32, NO. 1

ORIGINAL ARTICLE

### A Prospective Trial of a Novel, Silicone-Based, Silver-Coated Foley Catheter for the Prevention of Nosocomial Urinary Tract Infections

Table 2. Rate of Urinary Tract Infections (UTIs) in Patients with Silver Catheters versus Non-silver Catheters

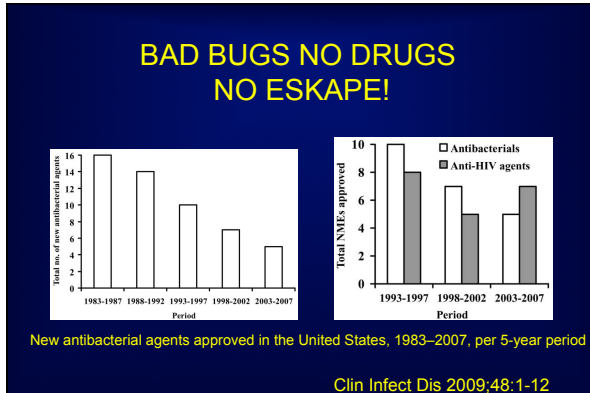
Context, Rate Measure	Rate of UTI, by Type of Catheter	RR or IRR (95% CI)	P		
Overall	UTIs per 1,000 Foley-days	14.29	0.88 (0.76-1.11)	.29	
	UTIs per 100 catheters	9.96	0.86 (0.69-1.05)	.15	
Intensive care unit	UTIs per 1,000 Foley-days	14.57	0.87 (0.48-1.33)	.38	
	UTIs per 100 catheters	17.65	0.92 (0.56-1.45)	.71	
Nonsimultaneous case mix	UTIs per 1,000 Foley-days	14.22	0.90 (0.76-1.16)	.45	
	UTIs per 100 catheters	8.94	0.85 (0.65-1.02)	.07	
Preoperative setting	UTIs per 1,000 Foley-days	12.65	1.83	0.80 (0.37-1.12)	.20
	UTIs per 100 catheters	7.47	13.3	0.95 (0.41-2.13)	.093
Component rooms	UTIs per 1,000 Foley-days	16.71	15.51	1.08 (0.77-1.49)	.67
	UTIs per 100 catheters	13.06	9.2	1.47 (1.04-1.92)	.05

NOTE. CI = confidence interval; IRR = incidence rate ratio; RR = rate ratio.  
 \* IRR.  
 \*\* RR.

Silicone-based, silver-impregnated Foley catheters were not effective in preventing NUTIs!

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### Procalcitonin

- Very useful for endocarditis diagnosis (21 EB vs. 46 NEB\*\*control???)  
Circulation 2004;109:1707-1710
- Prognosis
  - Decreasing PCT levels in <24 hours - (thanks god!)
  - J Clin Endocrinol Metab 2004;89:1512-1525
- Limiting antimicrobial therapy – CAP
  - Median 5 vs. 12 days, p<0.001
  - Am J Resp Crit Care Med 2006;174:84-93

### Empiric contact precautions - 2007-2008 e 2009

	2007	MDR	Rate (%)	2008	MDR	Rate (%)	2009	Rate (%)	2009	Rate (%)
Jan	3	0	0	5	4	80	5	3	60	
Feb	1	0	0	1	1	100	3	3	100	
March	1	0	0	7	2	28	8	6	75	
April	2	0	0	0	0	0	2	1	50	
May	2	0	0	1	1	100				
June	6	2	33	4	4	100				
July	1	1	100	3	3	100				
Aug	4	3	75	3	2	66				
Sept	4	2	50	4	3	75				
Oct	2	2	100	2	1	50				
Nov	1	0	0	4	3	75				
Dec	0	0	0	2	1	50				
<b>Total</b>	<b>27</b>	<b>10</b>	<b>37</b>	<b>36</b>	<b>25</b>	<b>70</b>	<b>18</b>	<b>13</b>	<b>72</b>	

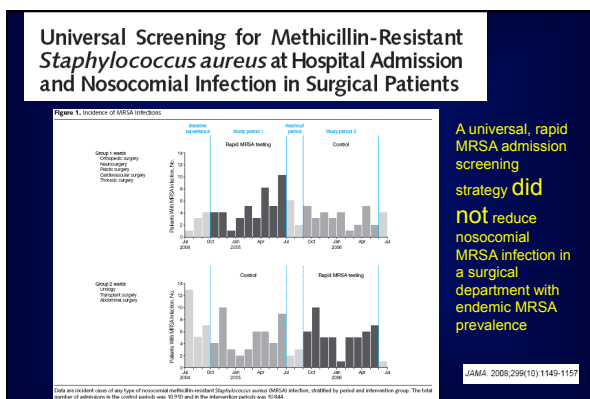
### MRSA - PCR

#### PROS

- PCR for readmission screening reduces:
  - the number of unnecessary preemptive isolation-days by 54% (from 6.88 to 3.14 isolation-days)
  - related costs by 45% (from US dollars 113.2 to US dollars 62.1) for patients who test negative for MRSA
  - median time to notification from four days to one day
  - Uçkay I et al. Infect Control Hosp Epidemiol 2008;29:1077-9
  - Harbarth S et al. Crit Care 2006;10:R25

#### CONS

- It reduces MRSA cross-infections in the medical **but not** in the surgical ICU  
Harbarth S et al. Crit Care 2006;10:R25



### Rapid Screening for Carriage of Methicillin-Resistant *Staphylococcus aureus* by PCR

- PCR tests are valuable for the rapid detection of MRSA carriers
- In patient populations with low MRSA endemicity, the broad use of PCR probably is not cost-effective  
Bühlmann M. J Clin Microbiol 2008;46:2151-56

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## MRSA screening – HIAE experience

From Oct 2008-Mar 2009 (ICU/HIAE)  
 5,576 patient days  
 977 screened patients for MRSA (>85%)  
 20 MRSA+ patients (11 MRSA converted)  
 MRSA incidence=1% or 1.9 MRSA+ per 1,000 patient days

## SeptiFast Project - HIAE

- Real time PCR in blood samples
- Deliver the answers in under 6-hours (without the need for prior incubation or culture steps)
- Identify the 25 most important bacterial and fungal species causing bloodstream infections
- 2,5 mL blood sample EDTA tube - PCR

## Multiplex polymerase chain reaction detection enhancement of bacteremia and fungemia\*

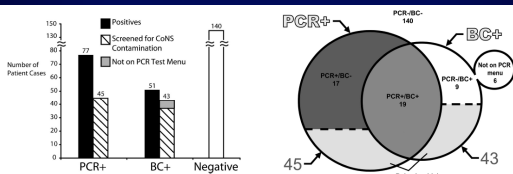
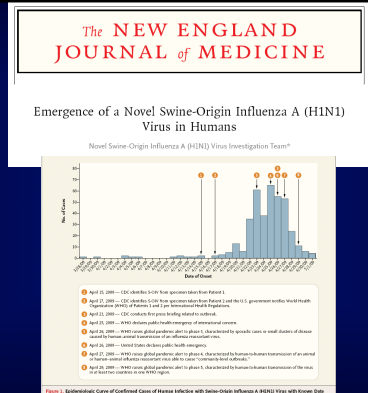


Figure 1. Summary of polymerase chain reaction (PCR) and blood culture (BC) positive cases. The bar graph shows the number of PCR-positive and BC-positive cases before and after screening for coagulase-negative Staphylococci (CONS) contamination. The grey bar represents the BC-positive cases whose organisms detected are not on the PCR test menu.

Early detection of microorganisms has the potential to facilitate evidence-based treatment decisions, antimicrobial selection, and adequacy of antimicrobial therapy

Louie RF et al. Crit Care Med 2008;36:1487-92



## CONCLUSÕES

- Devemos estar abertos às novas tecnologias
- Observem os seus desfechos clínicos
- Observem o mundo real da sua UTI
- Analisem o custo-efetividade de determinados processos

### INFECTO-NEWS

São Paulo, janeiro de 2009  
 Grupo de Suporte de Infecção – UTI-A

"in print" em placa de cultura da mão de profissional da saúde após manipular paciente colonizado com MRSA (*Staphylococcus aureus* resistente à oxacilina).

Veja o que aconteceu após a higienização das mãos com álcool gel na página 2

As colônias em rosa (acompanhando o formato da mão) indicam o crescimento do MRSA.

Página 1

29 Outubro, 2013  
 www.webbertraining.com

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