Le Malattie infettive del terzo millennio - dall'isolamento all'integrazione
Paestum 13-15 maggio 2004

REVISIONE CRITICA sulla VALIDITA' delle COMUNI MISURE per la PREVENZIONE delle INFEZIONI CORRELATE a CATETERE INTRAVASCOLARE

Francesco Cristini, Pierluigi Viale
Policlinico Universitario di Udine
Clinica di Malattie Infettive

INTRAVASCULAR CATHETER RELATED INFECTIONS

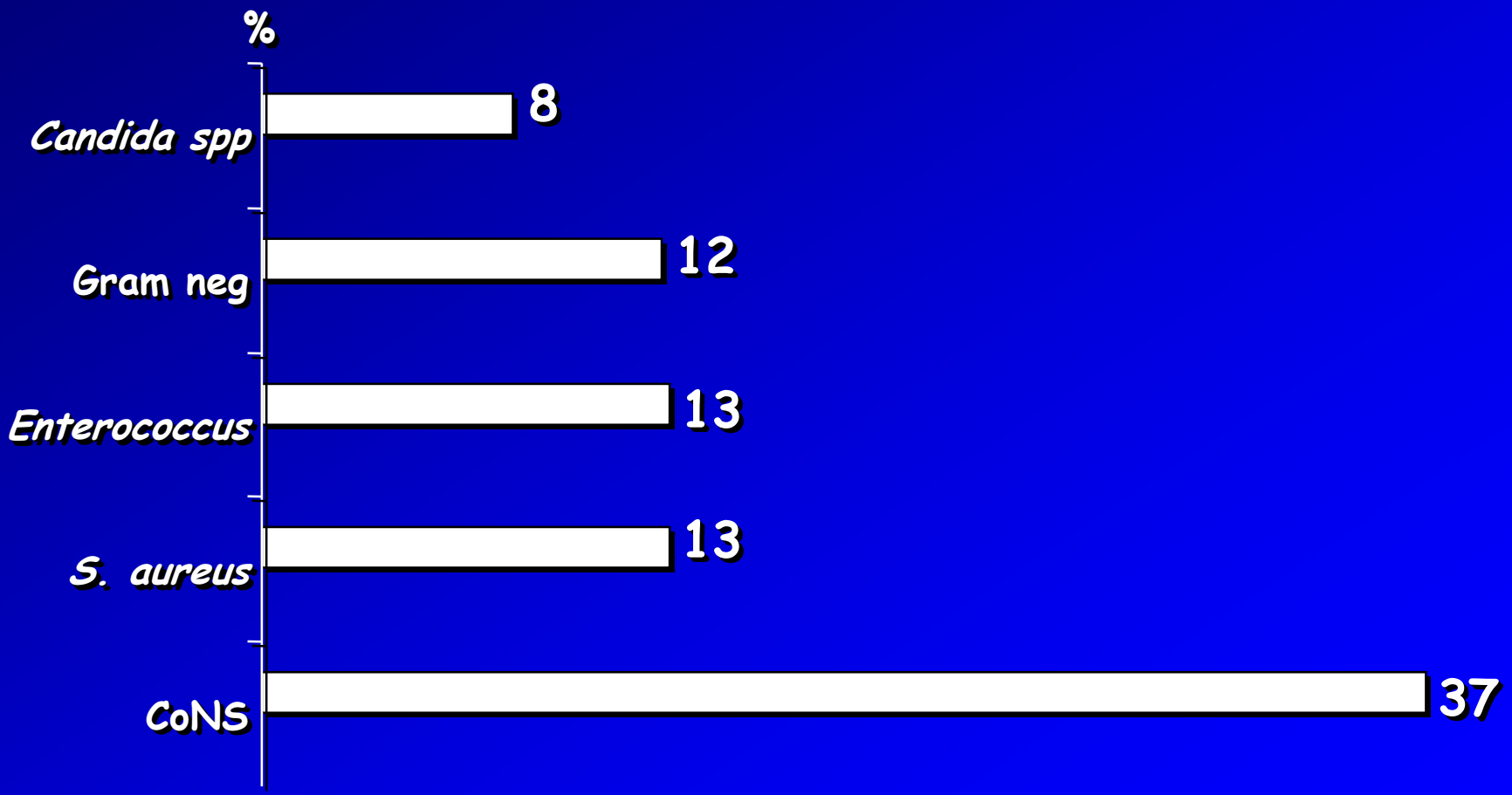
Magnitude of the problem (U.S.)

Mermel, Arch Int Med 2000

- Patient-day annually in ICUs: 31.000.000
- Number of CVC: 5.000.000
- Risk of exposure to this devices: 48%
- Central line-days per year in ICUs: 15.000.000
- Mean incidence of associated BSI : 5.3 cases x 1000 catether-days
- Attributable mortality: 3-10 % - CoNS 0,7% *S. aureus* 8,2%
- Attributable cost per infection from $ 3.700 to $ 19.000

NNISS : Most commons isolates in CR-BSI (1992-99)

MMWR 2002



ACCESS SITE INFECTIONS in DIALYSIS

a 18-month Prospective survey

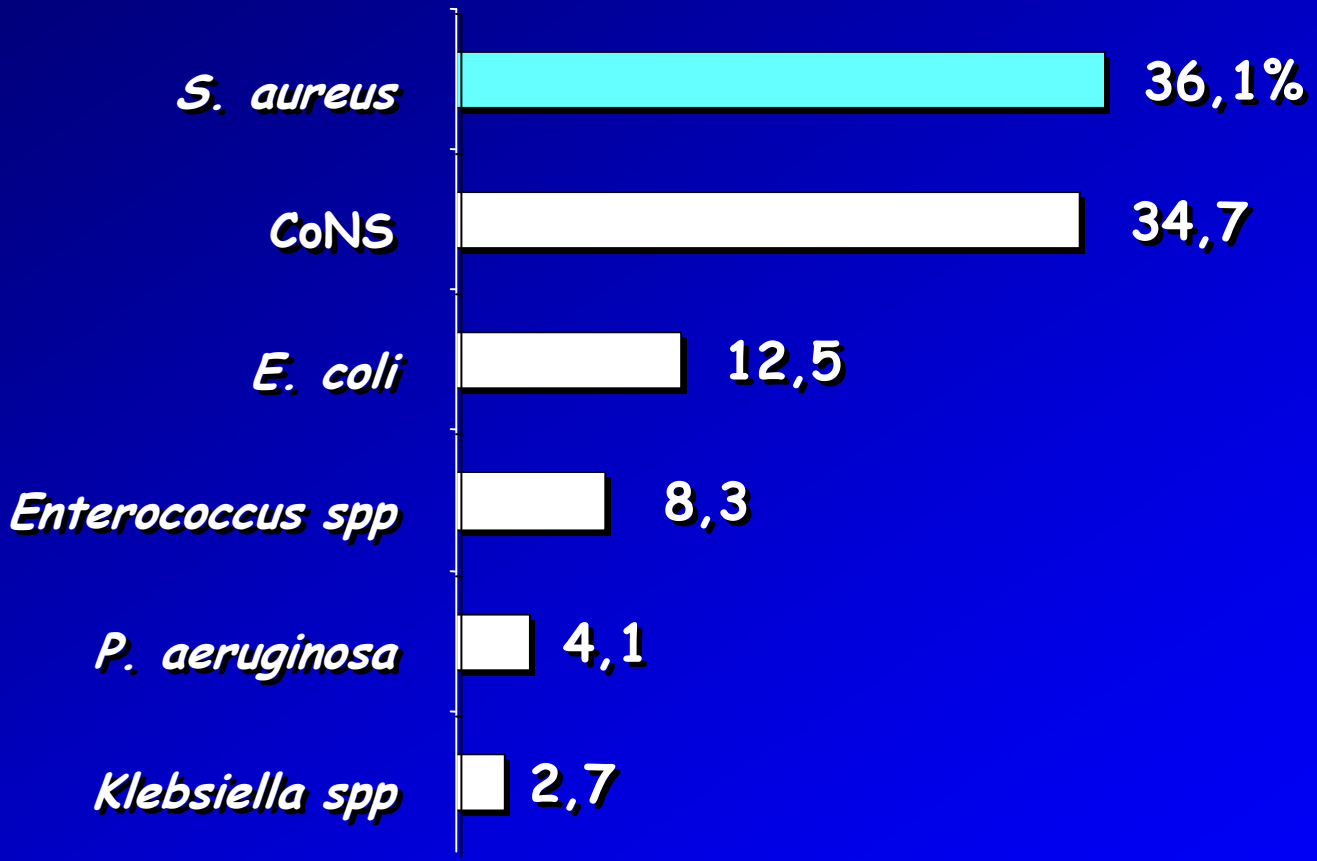
Stevenson et al, Infect Contr Hosp epidemiol 2000

isolates

S. aureus	51%
CoNS	23%
Enterococcus spp.	8%
Gram negative Bacilli	10%
Others	8%

Access Site Related Infections in italian Dialysis: *Isolates*

Scudeller et al, ECCMID 2004



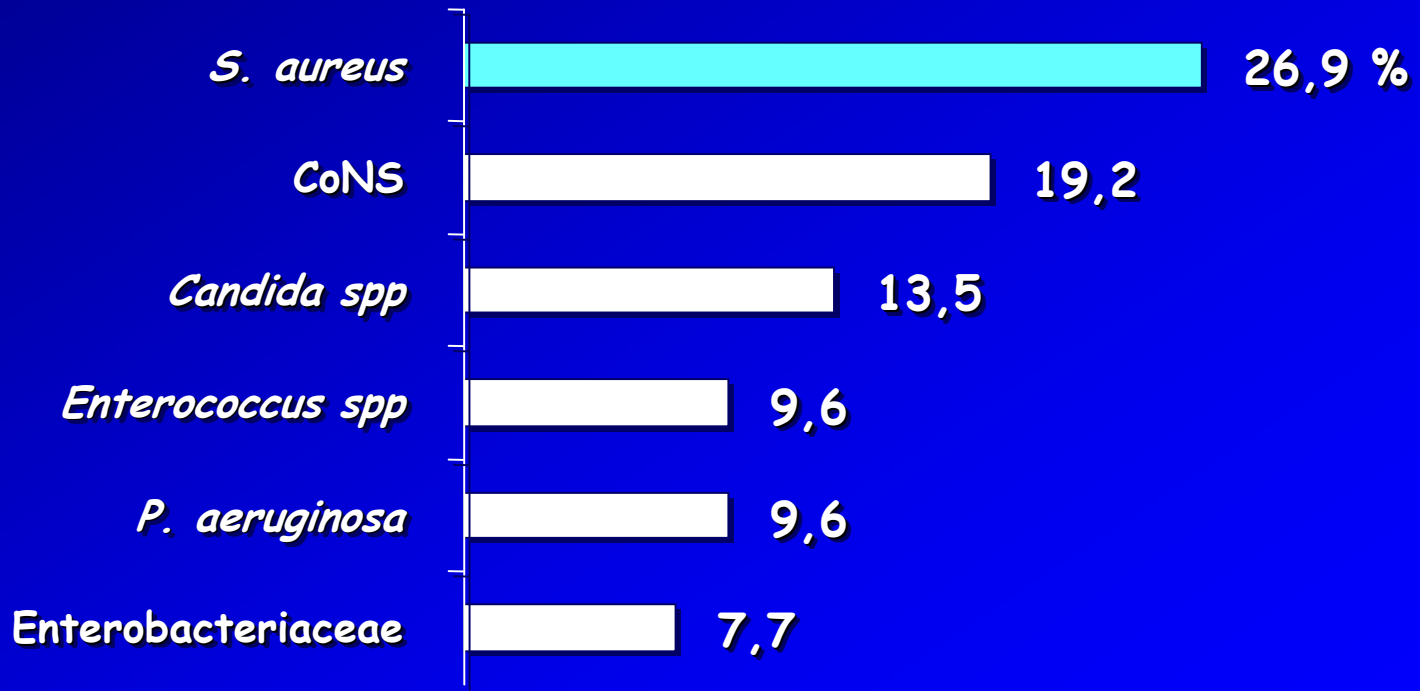
A.St.R.I.D.

GHIO - BLOODSTREAM INFECTIONS in AIDS PATIENTS

Petrosillo, Viale et al for GHIO, Clin Infect Dis 2002

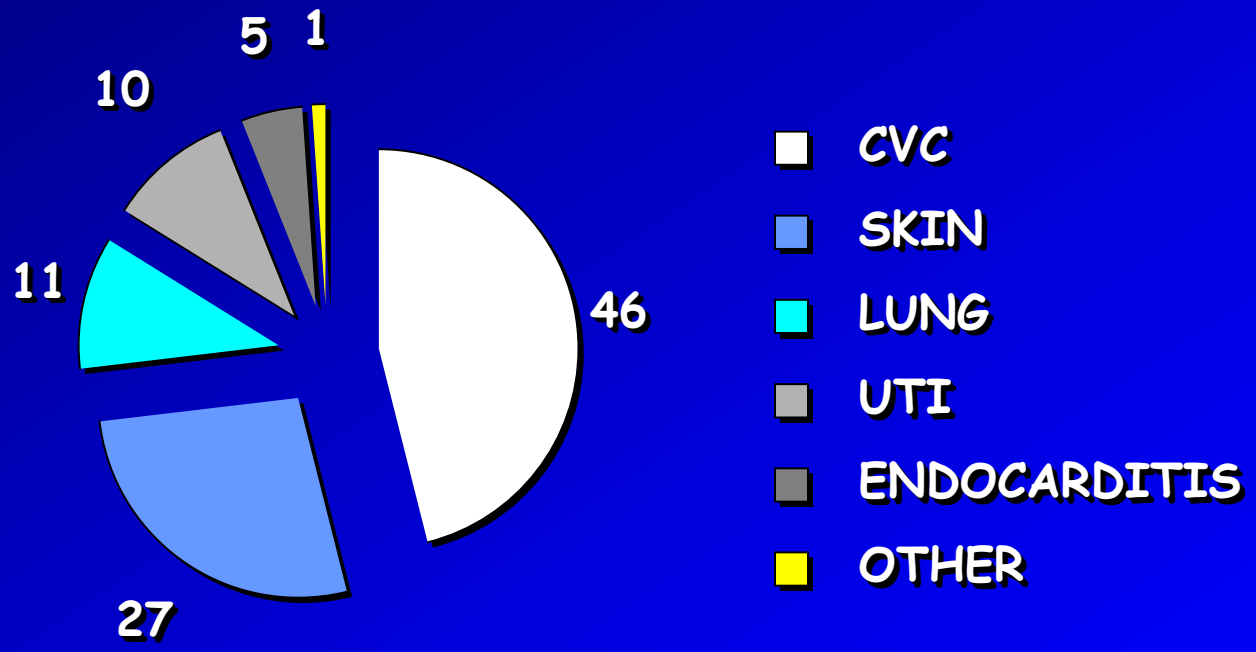
CATHETER ASSOCIATED BSI

MAIN ETIOLOGIC AGENTS

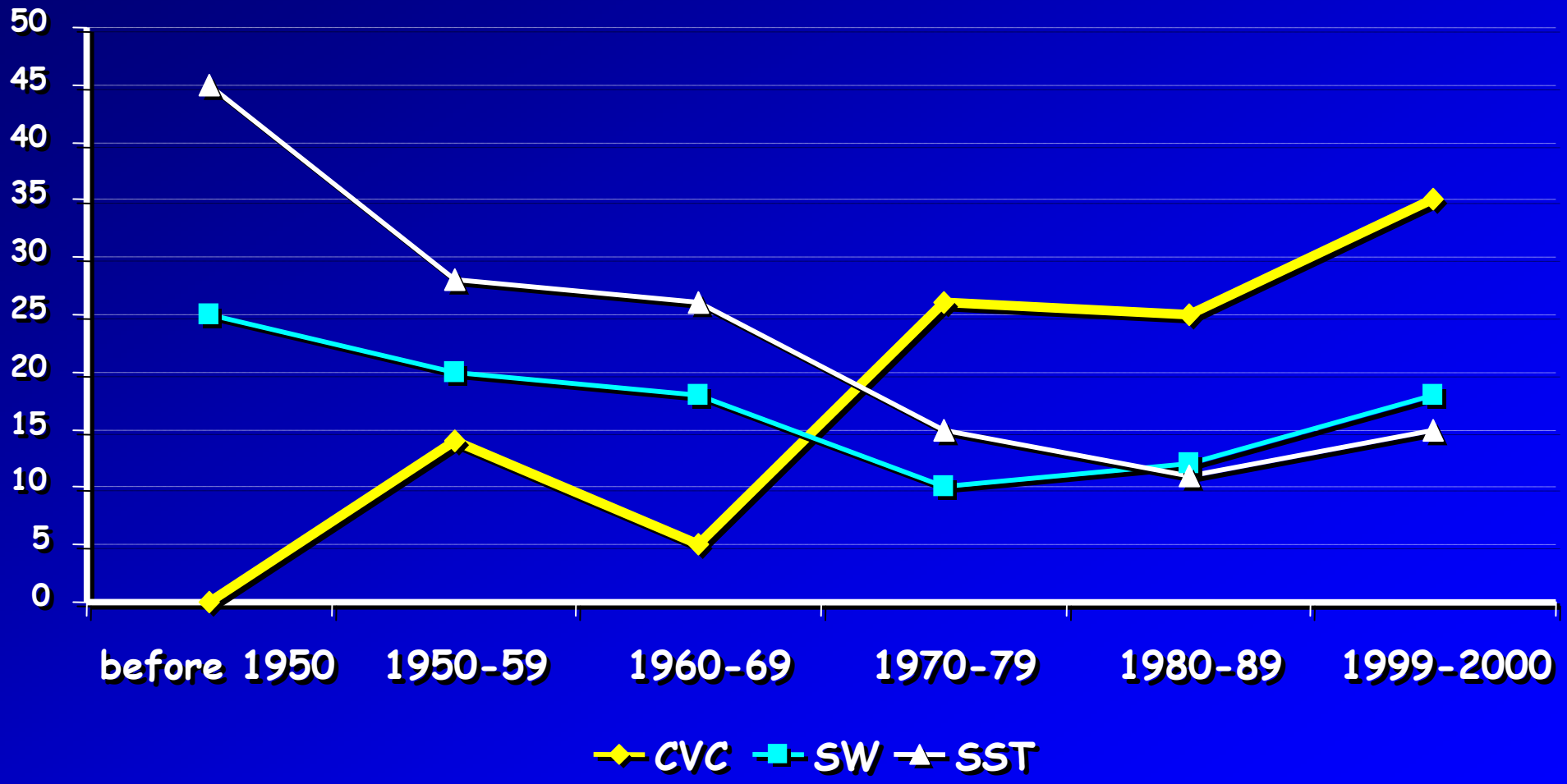


S. aureus SEPSIS - infection foci

von Eiff et al. , NEJM 2001

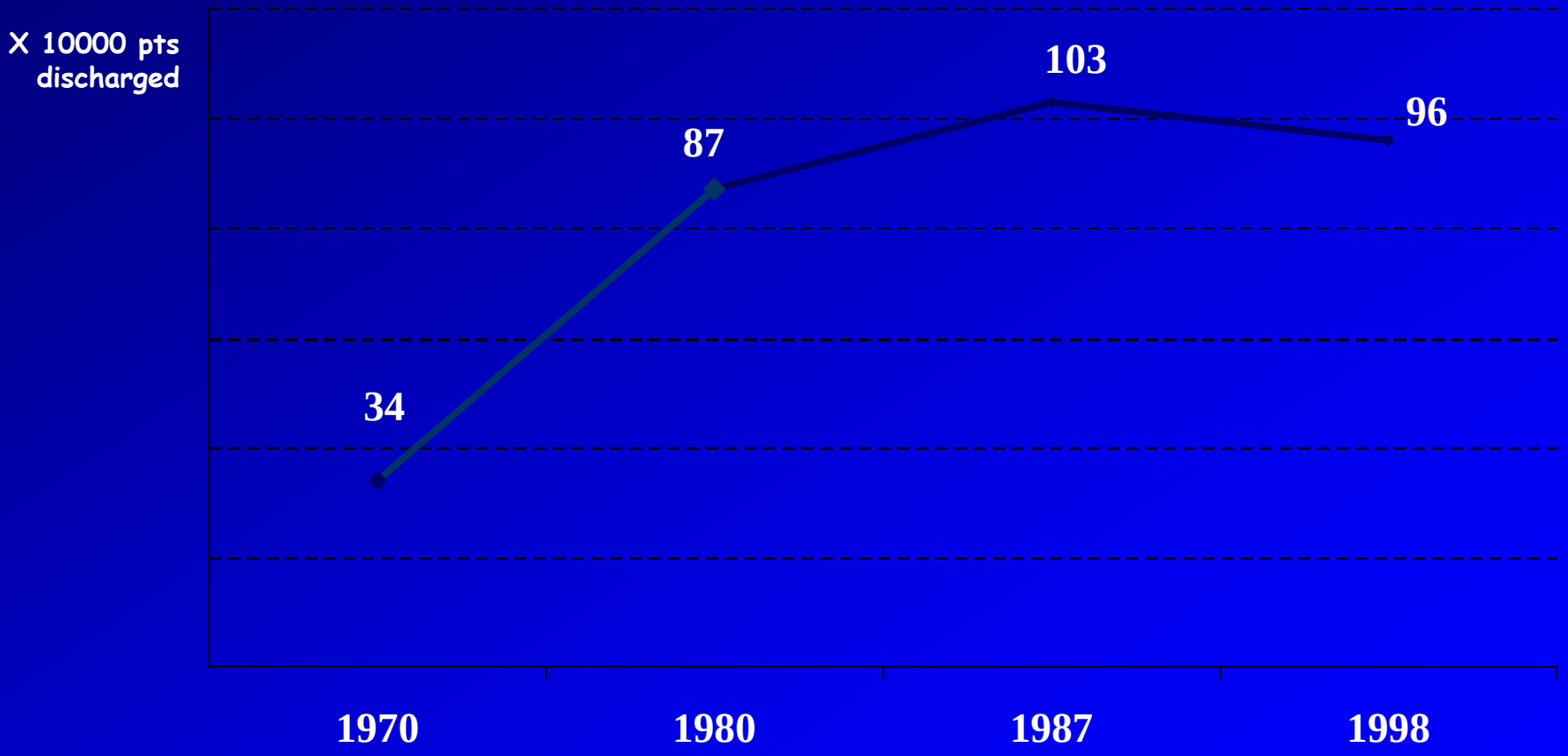


S. aureus BSI : distribution of primary foci according to time period



BLOODSTREAM INFECTIONS IN A COMMUNITY HOSPITAL: A 25-YEAR FOLLOW-UP

Infect Control Hosp Epidemiol 2003;24:936-941



Central Venous Catheters : Prospective surveillances

INDEPENDENT RISK FACTORS for CATHETER RELATED INFECTIONS

Moro et al, Infect Contr Hosp Epidemiol 1994

	Odds ratio			
• Duration of catheterization > 7 < 14 days	3.9			
• Duration of catheterization > 14 days	5.1			
• Coronary Care Unit	6.7			
• Surgical UTI	4.4			
• 2nd catheterization	7.6			
• Skin colonization at insertion site	56.5	SI	3.2	BSI
• Hub colonization	17.9		36.6	

Central Venous Catheters : Prospective surveillances

RISK FACTORS FOR OVERALL INFECTIOUS EVENTS

Viale et al, J Hosp Infect 1998

PATIENTS RELATED FACTORS

	p	*OR*
• Age > 60		1.46
• Sex		0.78
• DRG "importance"		0.60
• Surgical DRG		0.37
• Catheterization duration > 14 days	<0.001	5.16
• Catheterization duration > 7 days	<0.006	3.82
• Concomitant Invasive Procedures :		0.16

Central Venous Catheters : Prospective surveillances

RISK FACTORS FOR OVERALL INFECTIOUS EVENTS

Viale et al, J Hosp Infect 1998

INSERTION MODALITIES

	p	*OR*
• CVC insertion outside operating room		0.95
• Urgent insertion		0.90
• Difficult insertion		0.55
• Jugular insertion	0.04	1.95
• Concomitant antibiotic treatment		0.56
• Antibiotic Prophylaxis		0.90
• Multilumen CVC :		0.58
• Skin Cleaning		0.90
• Antiseptic choice		0.20

Central Venous Catheters : Prospective surveillances

RISK FACTORS FOR OVERALL INFECTIOUS EVENTS

Viale et al, J Hosp Infect 1998

CARE PRACTICES	*p*	*OR*
• Absence of daily dressing change		0.36
• Absence of daily dressing line change		0.34
• Three way stopcocks	0.04	1.82
• Total Parenteral Nutrition		0.21
• Hemodynamic Monitoring	0.02	1.34
• Continuos Infusion		0.80
• CVC use for blood drawing	< 0.01	3.16
• Hub manipulations > 4/die	< 0.001	6.23

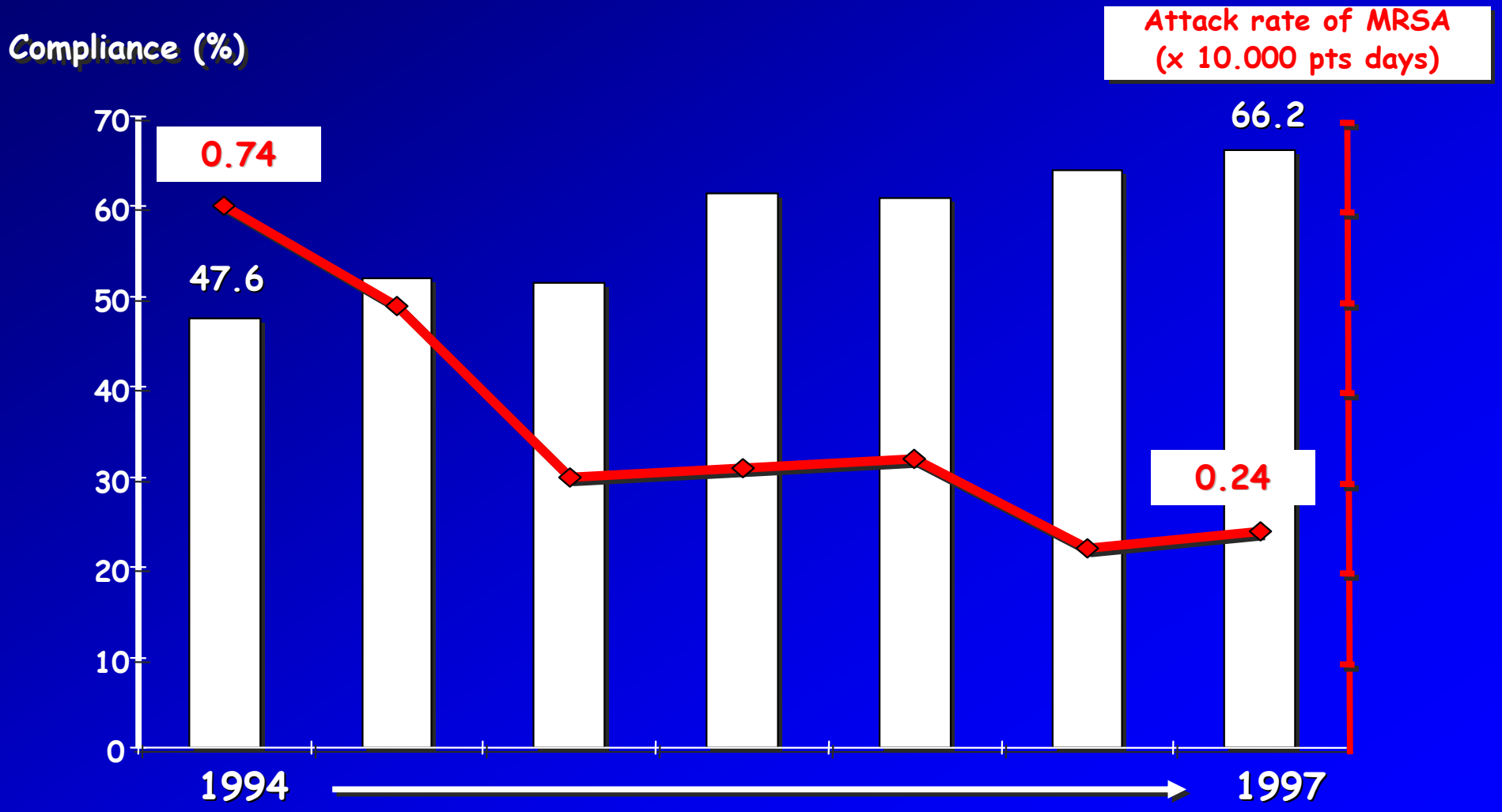
CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Routine guidewire exchange
- "Aggressive" diagnosis and prompt treatment

the best solution may be to give up on hand washing and get people simply to stop touching patients.

Effectiveness of a hospital-wide program to improve compliance with hand hygiene

Pittet et al, Lancet 2000



Prevention of CR-BSI: a global approach *Pittet et al, Lancet 2001*

MATERIALS AND METHODS

Setting

MICU (18 beds): 1400 patients/year; mean LOS: 4 days

Study objective

Implementation of a global strategy on vascular access care

Assessment of its impact on the overall NI rates

Timetable

All adult patients admitted to the MICU for > 48 hrs

10.1995 - 02.1997 (17 months): prospective survey for NI

03.1997 (washout): implementation

04.1997 - 11.1997 (8 month): prospective survey for NI

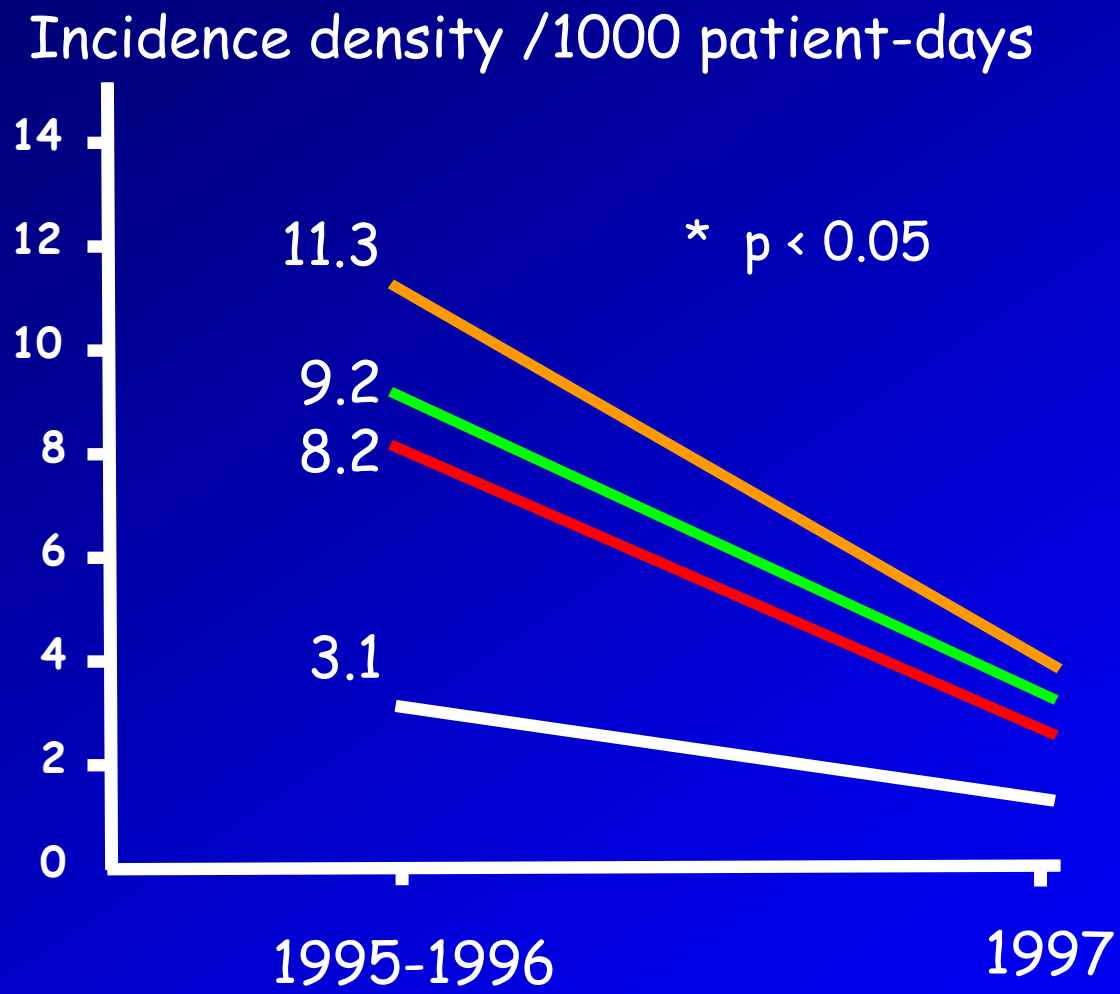
Prevention of CR-BSI: a global approach *Pittet et al, Lancet 2001*

GUIDELINES

Insertion	skin preparation: hair cutting instead of shaving Use of maximal sterile barriers
Antisepsis	chlorhexidine 0.5% in alcohol 70° max. barrier precautions: gown, cap, mask, drapes
Site	promotion of subclavian /wrist vein Avoid lower extremity for insertion site
Removal	central lines over guidewire as clinically indicated catheter removal when no longer needed
Hygiene	hand antisepsis strongly emphasized for any care (site/hub) designated intravenous therapy team

Prevention of CR-BSI: a global approach *Eggimann et al, Lancet 2000*

IMPACT AFTER 8 MONTHS



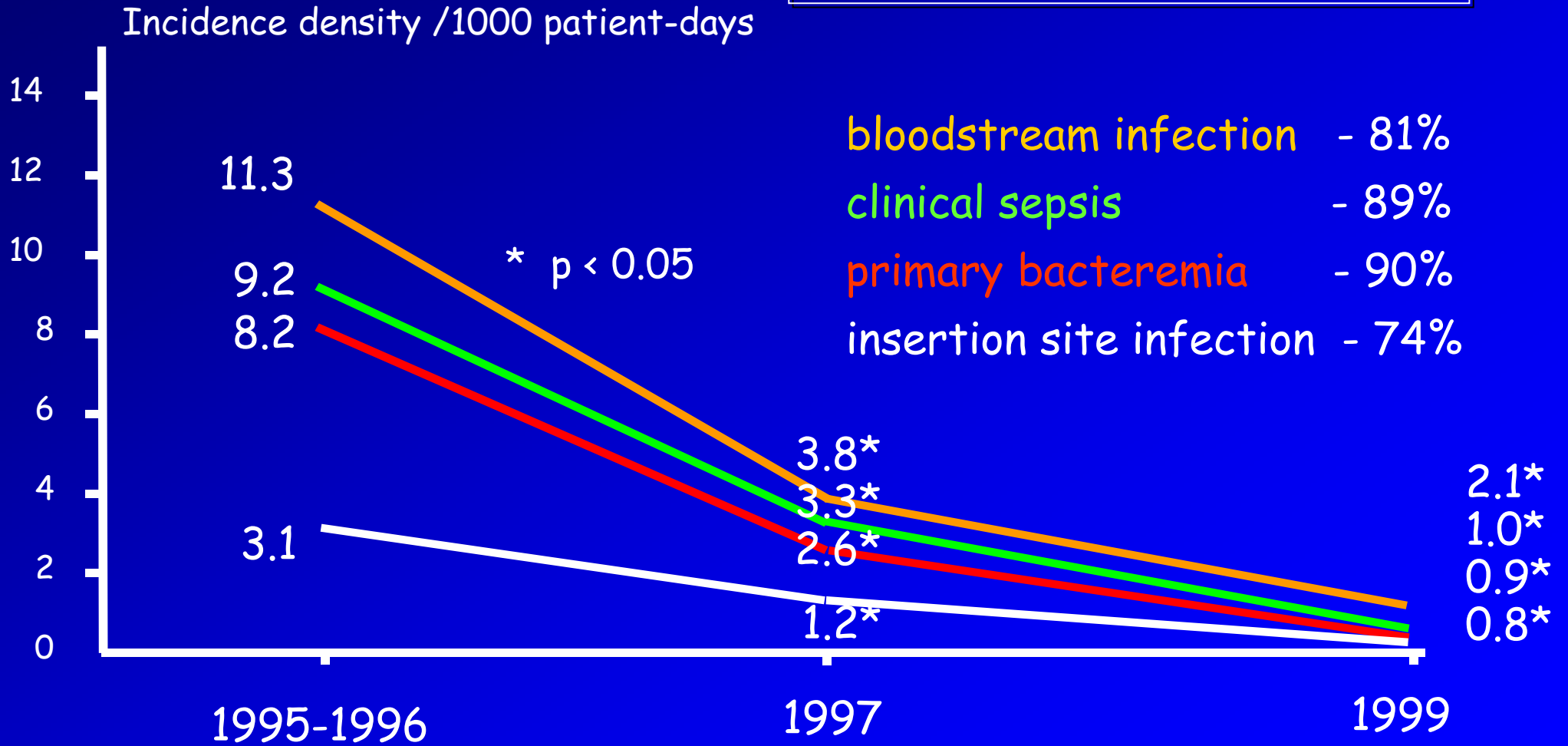
- 67% bloodstream infection
- 68% clinical sepsis
- 63% primary bacteremia
- 64% insertion site infection

3.8*
3.3*
2.6*
1.2*

Hand washing

Prevention of CR-BSI: a global approach *Eggimann et al, Lancet 2000*

IMPACT AFTER 30 MONTHS



CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Routine guidewire exchange
- "Aggressive" diagnosis and prompt treatment

THE "COLONIZATION GAME"

Nasal carriage of *S. aureus* as a risk factor for infection in Hemodialysis and CAPD patients. ***Kluytmans et al, Clin Microbiol Rev, 1997***

1982

6 studies on CAPD → > 500 pts → RR from 1.8 to 14.0

4 studies on dialysis → > 300 pts → RR from 1.8 to 4.7

1993

Nasal carriage of *S. aureus* as a risk factor for infection in surgical patients

Kluytmans et al, Clin Microbiol Rev, 1997

1959

18 studies → > 14.000 pts

1996

1959

14 studies → Mean RR 1.8

95% CI 1.6 - 2.1

1970

1990

4 studies → Mean RR 7.1

95% CI 4.6 - 11.0

1996

Colonization with MRSA in ICU pts: morbidity, mortality and Glycopeptide use

Garrouste-Orgeas et al, Infect Contr Hosp Epidemiol, 2001

1044 pts followed during a 3 years period

Risk factors for MRSA infection:

- SAPS II > 36	HR 1.64
- Male gender	HR 2.20
- Nasal colonization	HR 3.84

Nasal carriage as a source of *S. aureus* Bacteremia

Von Eiff et al, N Engl J Med, 2001

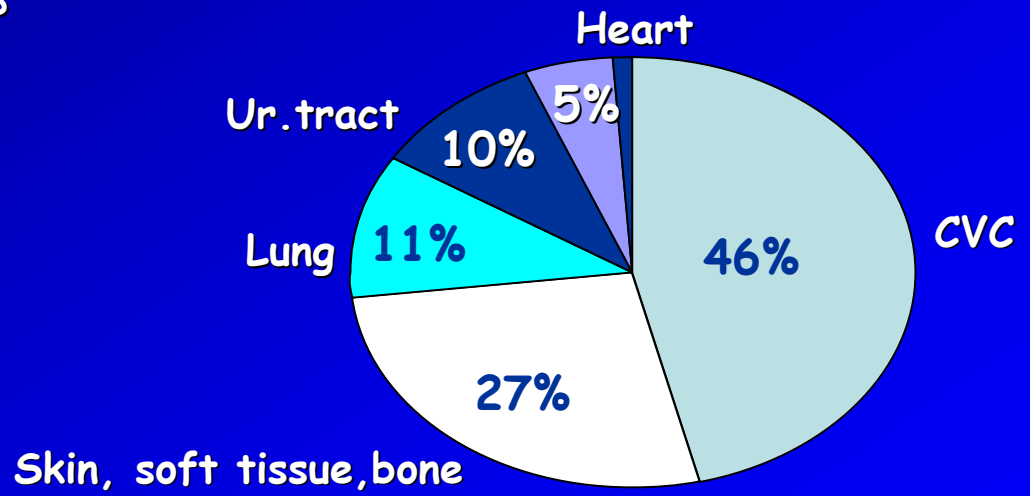
STUDY 1 - Nasal swabs from patients with S. aureus BSI

723 strains isolated from 219 pts

-> 350 from nares

154 from others sites

219 from blood



180/219 [82.2% (95% CI 76.4-87.1)]

isolates from blood and nares were identical by pulsed-field gel electrophoresis

Nasal carriage as a source of *S. aureus* Bacteremia

Von Eiff et al, N Engl J Med, 2001

STUDY 2 - Prospective collection of nasal swabs and surveillance of BSI

1640 strains from nares of 1278 pts -> 14 cases of BSI

12/14 [85.7% (95% CI 57.1-98.2)]

isolates from blood and nose were identical by pulsed-field gel electrophoresis

Nasal carriage as a source of *S. aureus* Bacteremia

Von Eiff et al, N Engl J Med, 2001

MONITORING of NASAL COLONIZATION

PROVIDES INFORMATION REGARDING the RISK of BSI

ELIMINATION of NASAL CARRIAGE

MAY PREVENT SYSTEMIC INFECTIONS

Mupirocin Prophylaxis to Prevent *S.aureus* Infection in Patients Undergoing Dialysis: A Meta-analysis

Tacconelli E et al, Clin Infect Dis 2003

Ten studies analyzed. 2445 patients included.

Mupirocin reduced the rate of *S. aureus* infections by 68% (95% - CI, 57%–76%) among all patients undergoing dialysis.

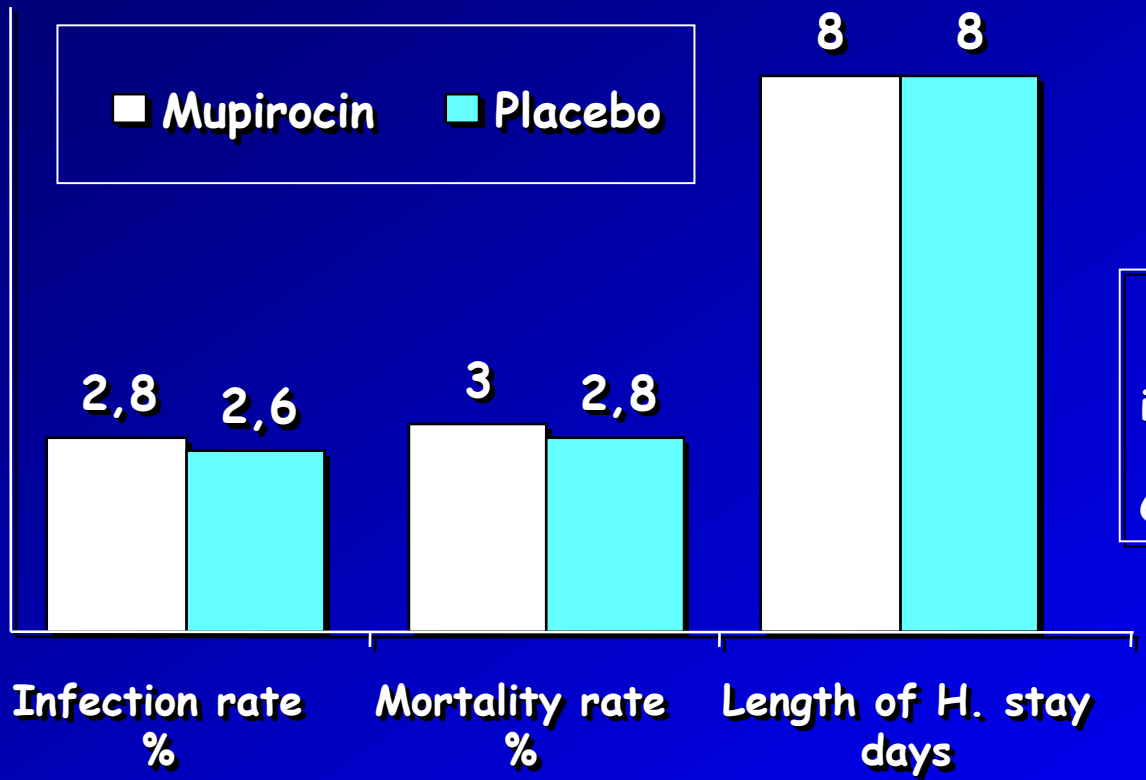
Risk reductions were
80% (95% CI, 65%–89%) among patients undergoing HD
63% (95% CI, 50%–73%) among patients undergoing PD.

Among patients undergoing HD …
S. aureus bacteremia was found to be reduced by 78%

Among patients undergoing PD …
peritonitis was found to be reduced by 66%
exit-site infections were found to be reduced by 62%

Mupirocin Prophylaxis against Nosocomial *S. aureus* infections in Nonsurgical Patients: A Randomized Study

Wertheim HFL et al, Ann Intern Med 2004



	M (n 793)	P (n 809)
in ICU	34 (4.3%)	53 (6.6%)
CVC	15 (1.9%)	14 (1.7%)

CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Routine guidewire exchange
- "Aggressive" diagnosis and prompt treatment

Antimicrobial-impregnated central venous catheters

CHLORHEXIDINE – SILVER SULFADIAZINE impregnated

Only extra-luminally

Reduced rate of infections for CVC in situ ≤ 10 days

RR 0,4 (IC 0,2-0,8)

Cost-effective for a rate > 3,3 x 1000 CVC-days

MINOCYCLINE – RIFAMPIN impregnated

Intra and extra-luminally

Reduced rate of infections for CVC in situ ≤ 7 days

RR 0,1 (IC 0-0,6)

Cost-effective for a rate > 2,5 x 1000 CVC-days

Antimicrobial-impregnated central venous catheters

1994

18 randomized trials

Antimicrobial-impregnated CVCs

Vs

Non-impregnated CVCs

2000

4250 CVCs

Catheter colonization

-46% colonized CVCs

CR-BSI

-40% CR-BSI

Crnich CJ and Maki DG Clin Infect dis 2004

Antimicrobial-impregnated central venous catheters

Review of 11 trials:

Several methodological flaws:

- inconsistent definitions of CRBSI
- failure to account for confounding variables
- suboptimal statistical and epidemiological methods
- rare use of clinically relevant end points

CONCLUSIONS:

More rigorous studies are required to support or refute the hypothesis that antimicrobial-impregnated CVCs reduce the rate of or prevent CRBSI.

McConnel et al *Clin Infect dis 2003*

Antimicrobial-impregnated central venous catheters

2002 Healthcare Infection Control Practices Advisory Committee of the Centers for Disease Control and Prevention recommends the use of antimicrobial-impregnated CVCs only in institutions where rates of CVC-related BSI remain high (3.3 BSIs per 1000 CVC-days) despite consistent application of appropriate infection-control practices.

CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Scheduled guidewire exchange
- "Aggressive" diagnosis and prompt treatment

Sistemic Antimicrobial Prophylaxis

Mermel LA, Arch Intern Med, 2000

	CVC-BSI / CVC (%)	CVC-BSI x 1000 days CVC	RR
Vancomycin	25	0.15	
No Vancomycin	24	0.14	1.0
Teicoplanin	26	1.5	
No Teicoplanin	21	1.2	1.2
Teicoplanin	21	-	3.4
No Teicoplanin	6.3	-	

CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Scheduled guidewire exchange
- "Aggressive" diagnosis and prompt treatment

Scheduled Replacement of Central Venous Catheters Is Not Necessary

Jean-François Timsit, MD

Author	Design†	Patients	Exclusion From Analysis	Scheduled Replacement Group (/1,000 Catheter-Days)	As-Needed Replacement Group (/1,000 Catheter-Days)
Eyer,[24] 1990	As needed vs GWX (7) vs new site (7) CVC, PAC, AC	122 (SICU)	10 (9%)	BSI: GWX, 4/1,000; new site, 5/1,000 Colonization, GWX: 11/1,000; new site, 12/1,000	BSI: new site: 3/1,000 Colonization: new site, 4/1,000
Cobb,[8] 1992	Factorial design New site (3) or GWX (3) vs as needed or as needed GWX CVC, PAC	192 (ICU)	32 (17%)	BSI: GWX, 6/1,000; new site, 3/1,000 Colonization: GWX, 15/1,000; new site, 18/1,000	BSI: GWX, 3/1,000; new site, 2/1,000 Colonization: GWX, 7.5/1,000; new site, 15/1,000
Berthelot,[26] 1997	As needed vs GWX (4) CVC	150 (ICU)	21 (11%)	BSI: GWX, 5.4/1,000 Colonization: GWX, 7.7/1,000	BSI: new site, 3.7/1,000 Colonization: new site, 7.4/1,000

CVC guidewire exchange

WHEN?

NEVER for secondary prophylaxis

ALWAYS for diagnosis and treatment of infections !

CVC INFECTIONS – ADVOCATED PROPHYLAXIS MEASURES

- Bed side behavior of HCWs
  - -Hand washing
  - -Site / hub care
- Screening and treatment of colonization
- Antimicrobial impregnated catheters
- Antimicrobial prophylaxis
- Scheduled guidewire exchange
- "Aggressive" diagnosis and prompt treatment

Staphylococcus aureus bacteremia and endocarditis: The Grady Memorial Hospital experience with MSSA and MRSA bacteremia

Am Heart J 2004;147:536-9

	MSSA (n = 53)	MRSA (n = 51)	P
Age (y)	48.5 ± 13.6	47.0 ± 12.8	.555
Male (%)	36 (67.9)	37 (72.6)	.671
Black (%)	46 (86.8)	47 (92.2)	.526
IVDA (%)*	10 (18.9)	13 (25.5%)	.483
HIV positive (%)†	12 (22.6)	19 (37.3)	.134
Diabetes mellitus (%)	14 (26.4)	7 (13.7)	.144
Hemodialysis (%)‡	16 (30.4)	8 (15.7)	.104
Predisposing heart disease (%)§	11 (20.7)	6 (11.8)	.291
Community-acquired (%)	40 (75.5)	25 (51)	.017
Other sources of infection (%)‖	29 (54.7)	29 (56.9)	.846
Catheter infection (%)	16 (30.2)	12 (23.5)	.511

33 patients/104 **(31.7% !!)** with TTE/TEE confirmed **endocarditis**

23 patients (43.4%) in the MSSA group

10 patients (19.6%) in the MRSA group (P .009)