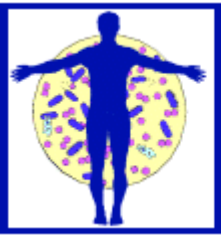
S B I M C | B V I K M



Société belge d'infectiologie et de microbiologie clinique

Belgische vereniging voor infectiologie en klinische microbiologie

Catheter-related infections: practical aspects in 2003

A joint meeting of the *Société Belge d'Infectiologie et de Microbiologie Clinique / Belgische Vereniging voor Infectiologie en Klinische Microbiologie* (21st meeting) and the *Groupement pour le Dépistage, l'Etude et la Prévention des Infections Hospitalières / Group ter Opsporing, Studie en Preventie van Infecties in de Ziekenhuizen*

Thursday 20th November 2003

Catheter-Related Infections

Belgian Epidemiological Data

Pierrette Melin

Medical Microbiology
University Hospital of Liege

Introduction

- Major role of catheters in modern medecine
- Major cause of morbidity & mortality
  - Multiple infectious complications
    - Local site infections
    - Systemic infections
      - bacteremia/fungemia, sepsis
    - Infective endocarditis
    - Septic thrombo-phlebitis
    - Other metastatic infections

Incidence of catheter-related infections (CRI)

- Considerable variations by
  - Catheter -related parameters
    - Type, site of insertion, duration in situ
  - Frequency of manipulations
  - Patient-related parameters
  - Hospital size, hospital service/unit
- Major source of confusion
  - Inconsistent use of terms and definitions
  - Lack of standard definitions
- Diagnosis of CR-BSI (Blood Stream Infection) still problematic

Catheter-related infections: Examples of definitions

- **Catheter exit-site infection**
  - Erythema or induration within 2 cm of the catheter exit site, in the absence of concommitant bloodstream infection
    - Without concommitant purulence (CDC, 2002)
    - In combination with a positive culture from the skin and/or pus at the insertion site (Polderman, 2002)

- **Significant catheter colonization**
  - Significant growth of a microorganism from the catheter tip, or subcutaneous segment of the catheter
    - >15 CFU, « roll-plate » semiquantitative culture method
    - $>10^3$ CFU, by quantitative culture method

Catheter-related infections: Examples of definitions

- **CR-BSI**
  - Clinical manifestations of infection and no apparent source except the catheter

    in combination with
  - same organism (species and antibiogram) isolated from a (semi)quantitative culture of the catheter segment, and from a peripheral blood culture or from a paired « quantitative » blood culture (peripheral and catheter)
- **Probable CR-BSI**
  - In the absence of laboratory confirmation, normalisation of T° after removal of the implicated catheter (present for >48 h) from a patient with a BSI and without clear focus of infection at other site

Rate of CR-BSIs

- Number of CR-BSIs per 1,000 catheter-days (CDC 2002)

More useful than

- Number of CR-BSIs per 100 catheters

Accounts for BSIs overtime

- Adjusts risk for the No of days the catheter is in use

- Logistic problems to collect data !

US National Nosocomial Infection Surveillance System, January 1992-June 2001

Type of ICU	CVC related BSI/1,000 cath days
Coronary	4.5
Cardiothoracic	2.9
Medical	5.9
Neurosurgical	4.7
High risk nursery	
< 1,000 g	11.3
1,001-1,500 g	6.9
1,501-2,500 g	4.0
2,500 g	3.8
Etc.	

NNISS data to be used as benchmarks by individual hospitals for rate comparison (CDC)

Type of catheter and rates of CR-BSIs

based on 206 published prospective studies, M.K.Schinabeck, Clin Microbiol Newsletter 2003

Type of Catheter	No.of CR-BSI /100 catheters	/1,000 cath-days
Peripheral Venous C	0.2	0.6
Arterial C	1.5	2.9
Central Venous C		
non-tunneled	3.3	2.3
tunneled	20.9	1.2
Pulmonary artery C	1.9	5.5
Totally implantable C	5.1	0.2

Type of catheter and rates of CRI

(BSI, M.K.Schinabeck, Clin Microbiol Newsletter 2003 and Local or BSI, CHU Lg)

Type of Catheter	No.of CR-BSI /100 catheters	No.of CRI (Lg) /100 catheters
Peripheral Venous C	0.2	0.17
Arterial C	1.5	1.2
Central Venous C		2.1
non-tunneled	3.3	
tunneled	20.9	

Belgian Data

- National Surveillance of Hospital Infections (NSIH) / ISP
  - Nosocomial Septicemia (> 48h post-admission)
    - Cumulative data 1992-96 & 1998-June 2003
    - Year 2002 data
    - Available denominators:
      - No. of admissions
      - No. of patient-days
    - ≥ 1 participation: 145 hospitals (80 % of Belgian H)
    - ≥ 3 participations: +/- 70 hospitals

Data from CHU of Liège

Based on a retrospective review of laboratory results

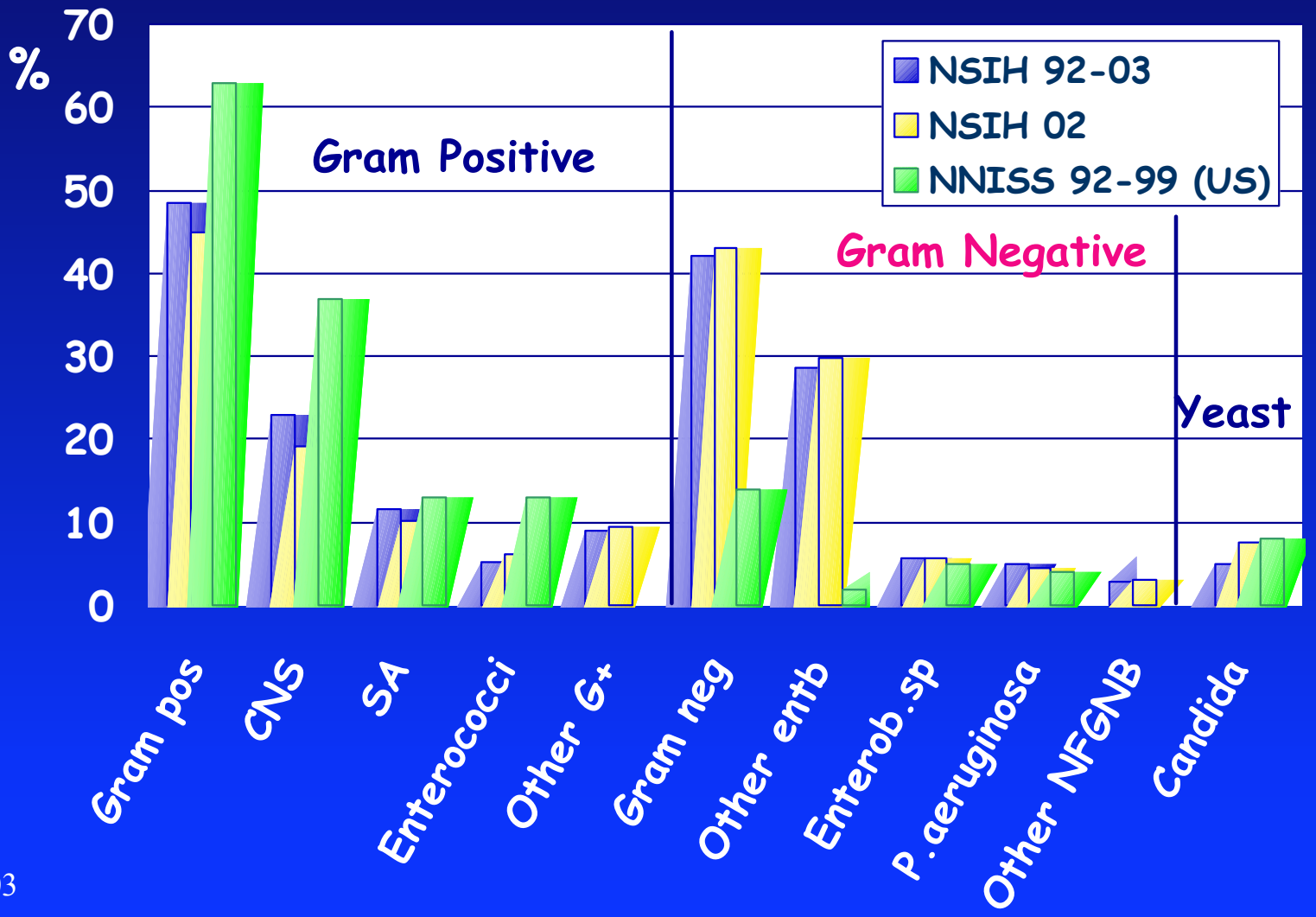
- Period November 2002-October 2003
- Culture of catheter if suspicion of CRI
- Colonized Catheters
  - Positive "Roll plate"culture with > 15 CFU
  - No.= 525; Mean: 1,9 /Positive patient (1-17)
- Patients (No.= 95 episodes) with the same organism cultured concommittantly from blood and from catheter
- No denominator !!

Type of catheter and rates of CR-BSIs

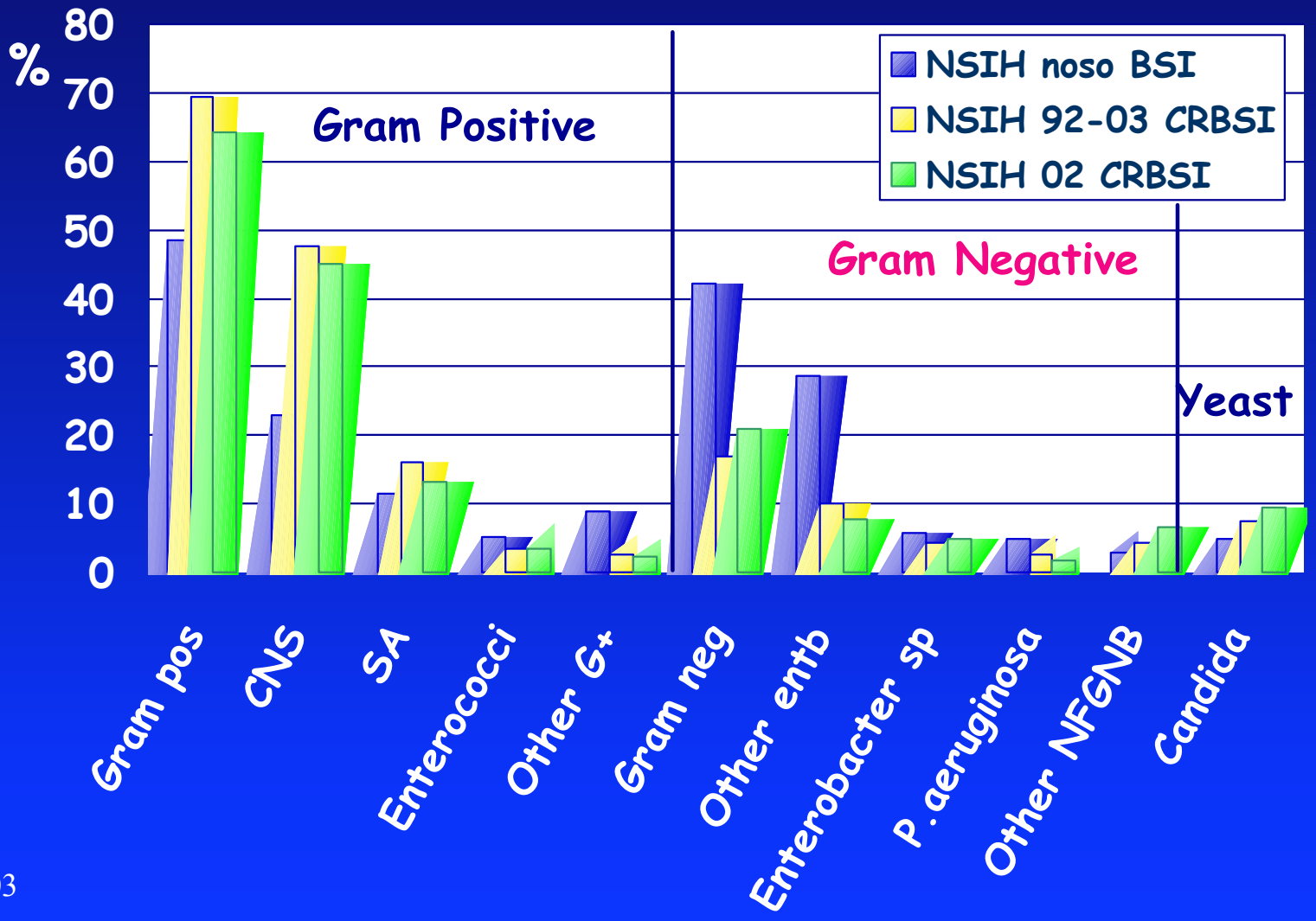
1992-2003 (& 2002), NSIH, ISP Belgium

Type of Catheter	% of CR-BSI / Nosocomial BSI		
	Probable	Definite	Total
Catheter-related	8.9 (8.8)	14.1 (12.9)	23.0 (21.7) *(1.7/10,000 pt-days)*
Central C	8.1 (7.2)	8.1 (10.6)	19.5 (18.5)
Peripheral C	1.6 (1.4)	1.6 (1.4)	2.6 (2.6)
Arterial C	0.3 (0.3)	0.3 (0.3)	0.7 (0.7)
Total No of Nosocomial BSI (septicemia > 48 h)			30570 (2705)

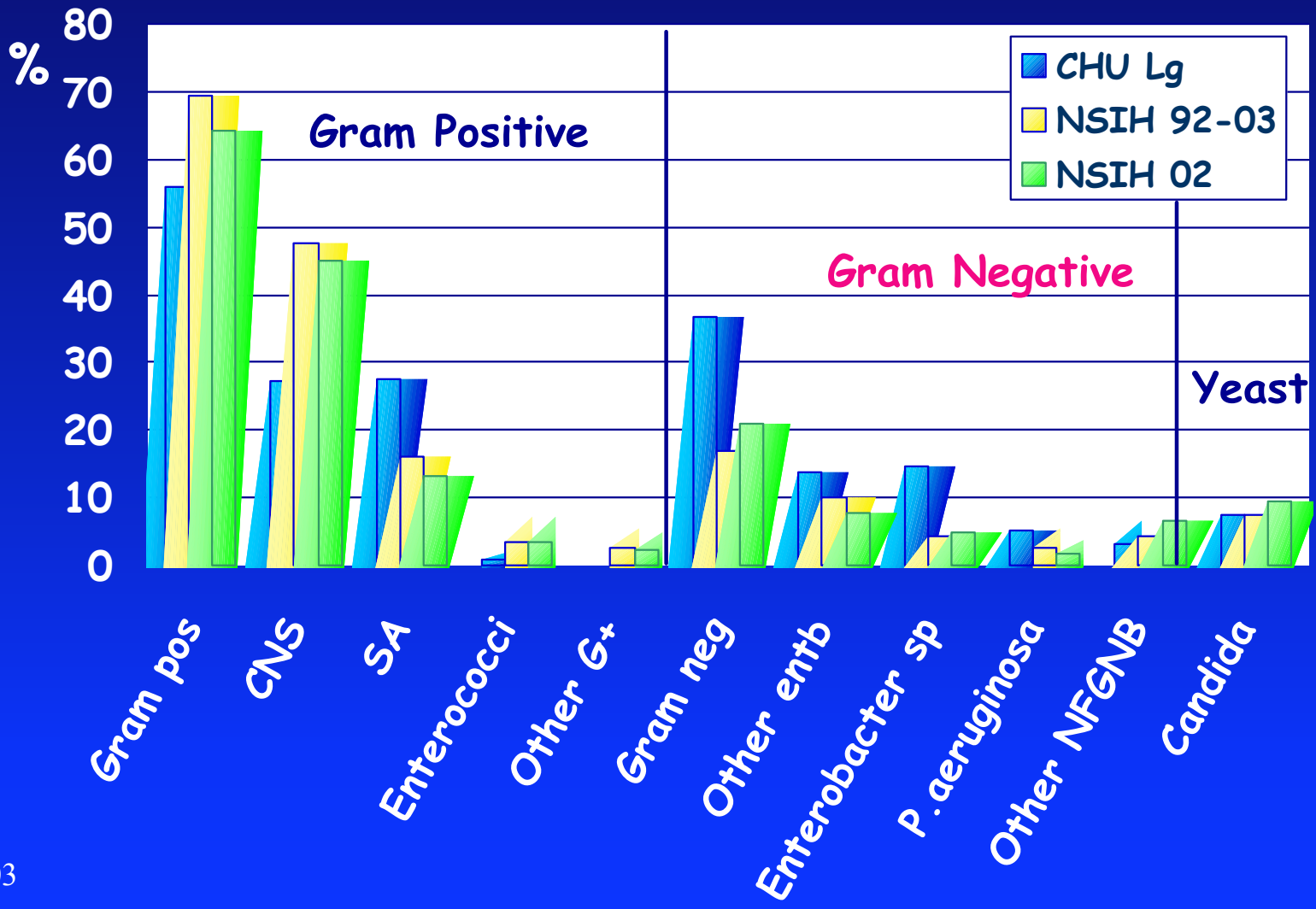
Distribution of microorganisms in « nosocomial » BSI (Belgium - USA)



Distribution of microorganisms in CR-BSI & Nosocomial BSI (Belgium)



Distribution of microorganisms in CR-BSI (Chu Lg & Belgium)

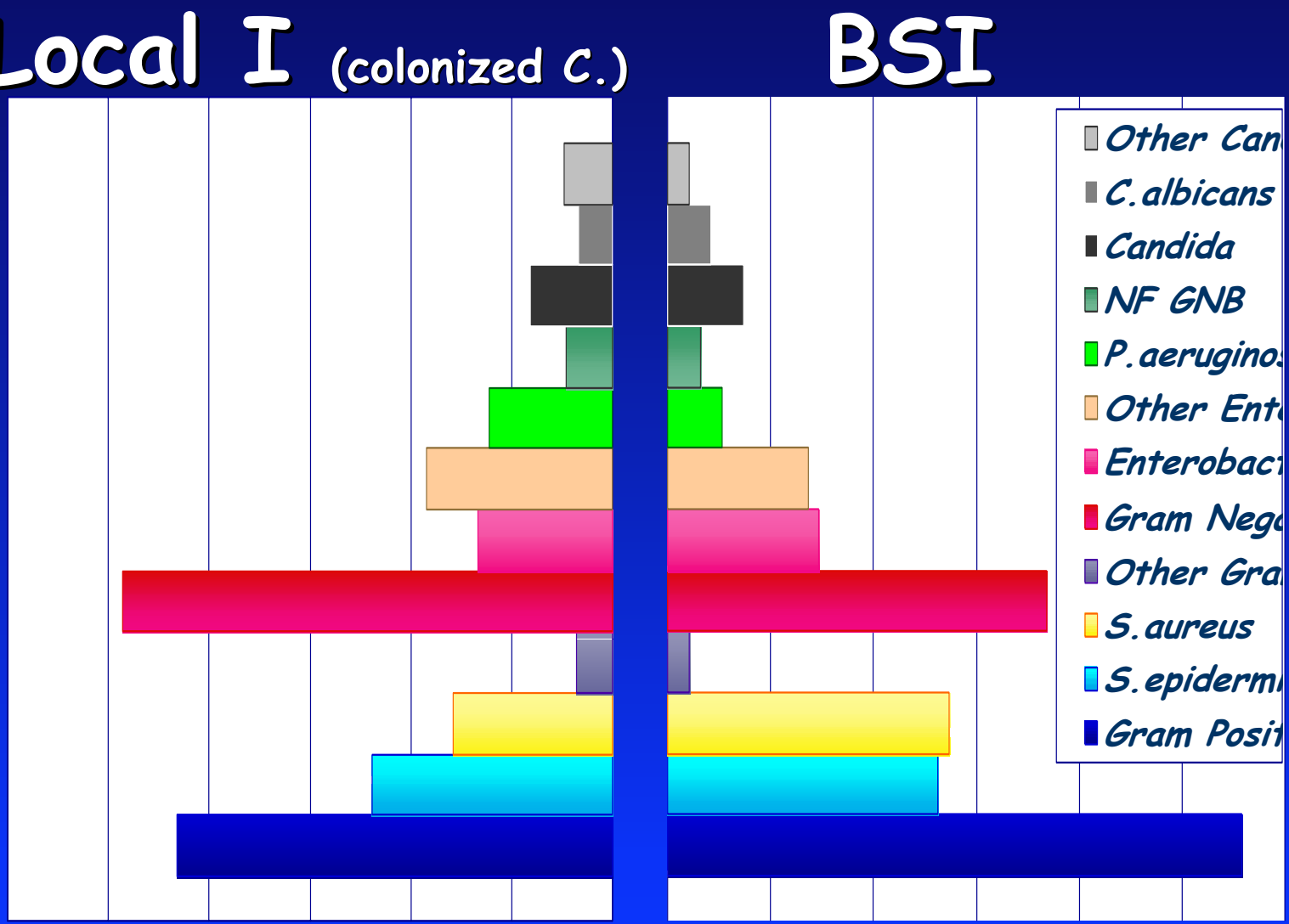


Colonized Catheter & Bloodstream Infection

Quantitative or semiquantitative culture of a catheter segment

- Positive Catheter
  - Risk Factor for BSI
  - About 20- 30 % lead to CR-BSI confirmed by microbiology
- Negative Catheter
  - Does not exclude a clinical CR-BSI

Microbial profile (in %) of CRI (CHU Lg)



Risk factors for CRI
Related to the patient

- Age (< 1 or > 60)
- Distant infectious focus
- Neutropenia
- Immuno-suppressive therapy (except corticosteroids)
- Malignancy
- Previous or concommittant bacteremia
- Birth weight <1,500 g (neonates)
- Severity of underlying diseases
- Burns and extensive wounds

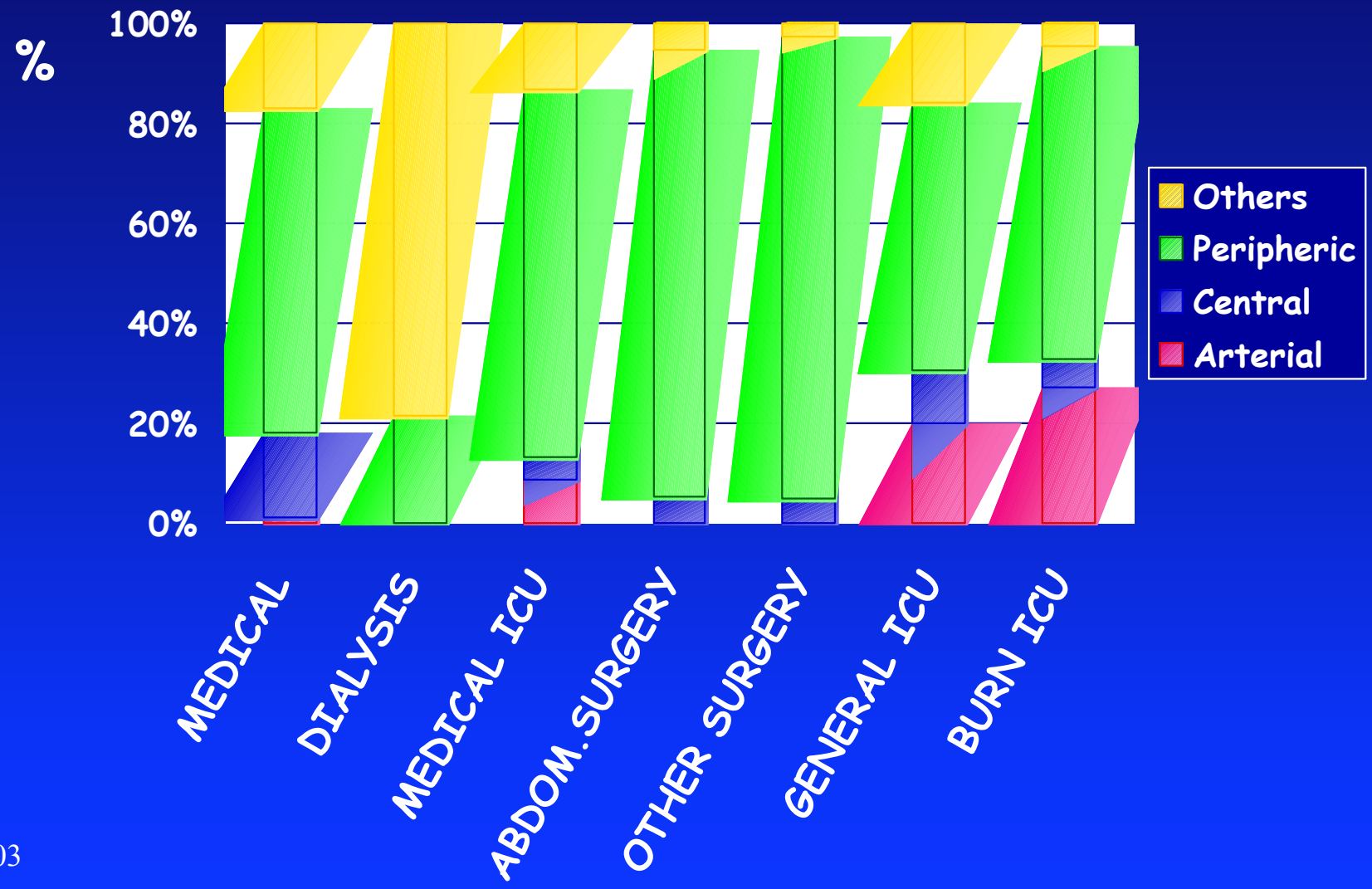
Risk factors for CRI
Related to the catheter and care

- Catheter types and materials
- Insertion site
  - Risk Femoral > jugular > subclavian vein
  - // density of skin colonisation
- Indwelling time
  - < 3 days, RF: +/- zero
  - 3-7 days, RF ↗ 3-5 % and > 7 days, RF ↗ 5-10 %
- Parenteral feeding
- Care and maintenance
- Dressing, etc.

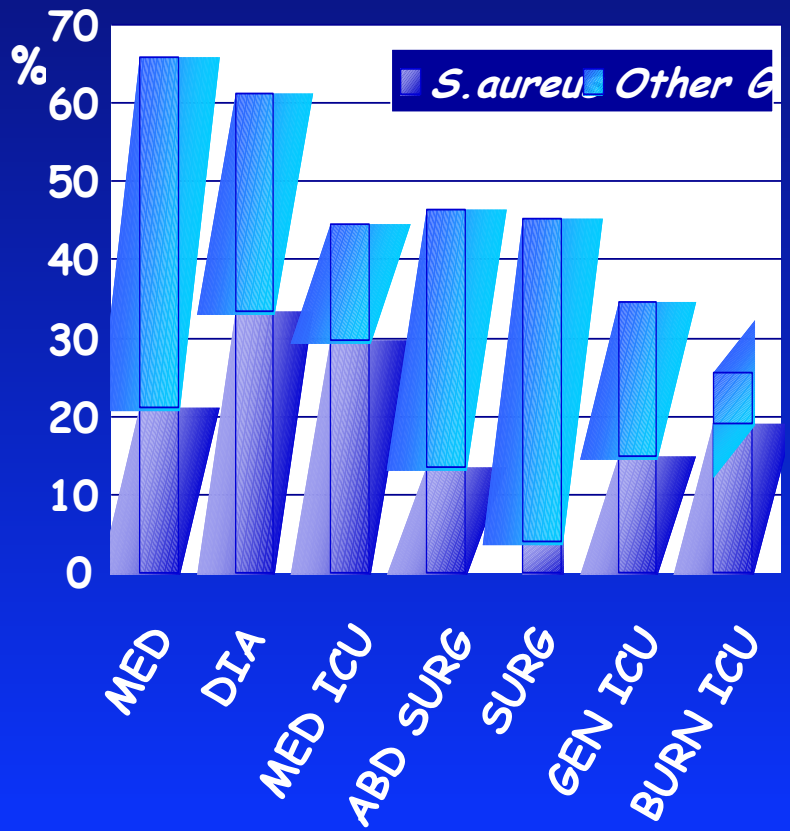
Risk factors for CRI
Related to hospital, unit

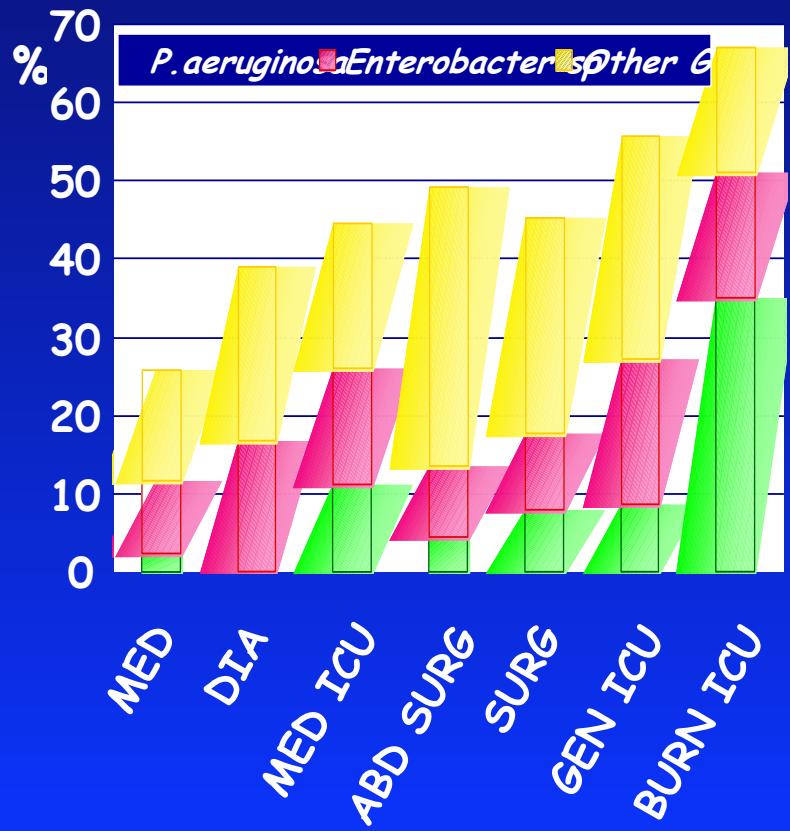
- Insertion procedure
  - Sub-optimal asepsis
  - operator's experience
- Emergency
- Time from admission
- Intensive Care Unit

Type of colonized catheters per care unit (CHU Liège)

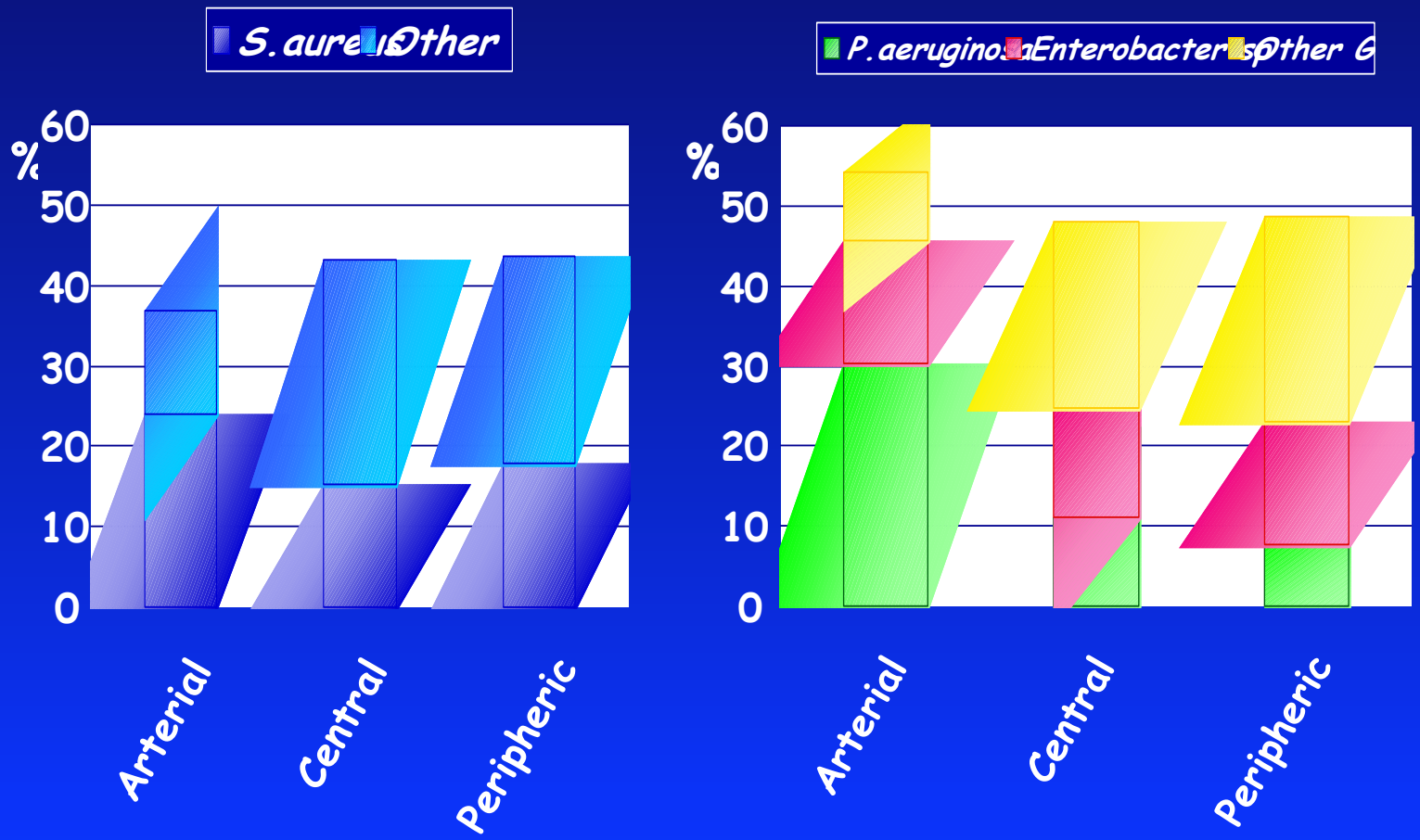


Distribution of bacteria colonizing catheters per care unit (CHU Liège)





Distribution of bacteria colonizing catheters per type of catheter (CHU Liège)



Virulence of multi-resistant bacteria ???

S.aureus, MRSA and CRI

Type of infection	% of MRSA
S.aureus bacteremia	39,7
S.aureus Positive catheters	55
S.aureus CR-BSI (36 % of all SA bacteremia)	40,7

(CHU Lg)

Conclusions

- RF for CRI
  - Great variability
- Basic problems for accurate comparisons
  - Local/systemic CRI
    - Clinical criteria/Microbiological results
  - Parameter to express rate of infections
  - Diagnostic procedures
    - Sub-optimal
  - Human and informatics resources
- Illustration of pitfalls if no clear cut definitions and correct denominators
- Usefulness of retrospective or prospective analysis
  - Quality improvement process