Surveillance of nosocomial infections

My experience from the last 10 years

Petra Gastmeier
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Situation in Germany 1993

A lot of infection control people wanted to start with surveillance, but

- no agreement about the definitions for NI (too difficult?)
- no agreement about surveillance methods
  - active or passive surveillance?
  - hospital wide or concentration on patients at risk?
  - number of risk factors to record
  - methdos for standadization and stratification
- no structures to establish a national database

German national prevalence survey NIDEP 1 (1994)

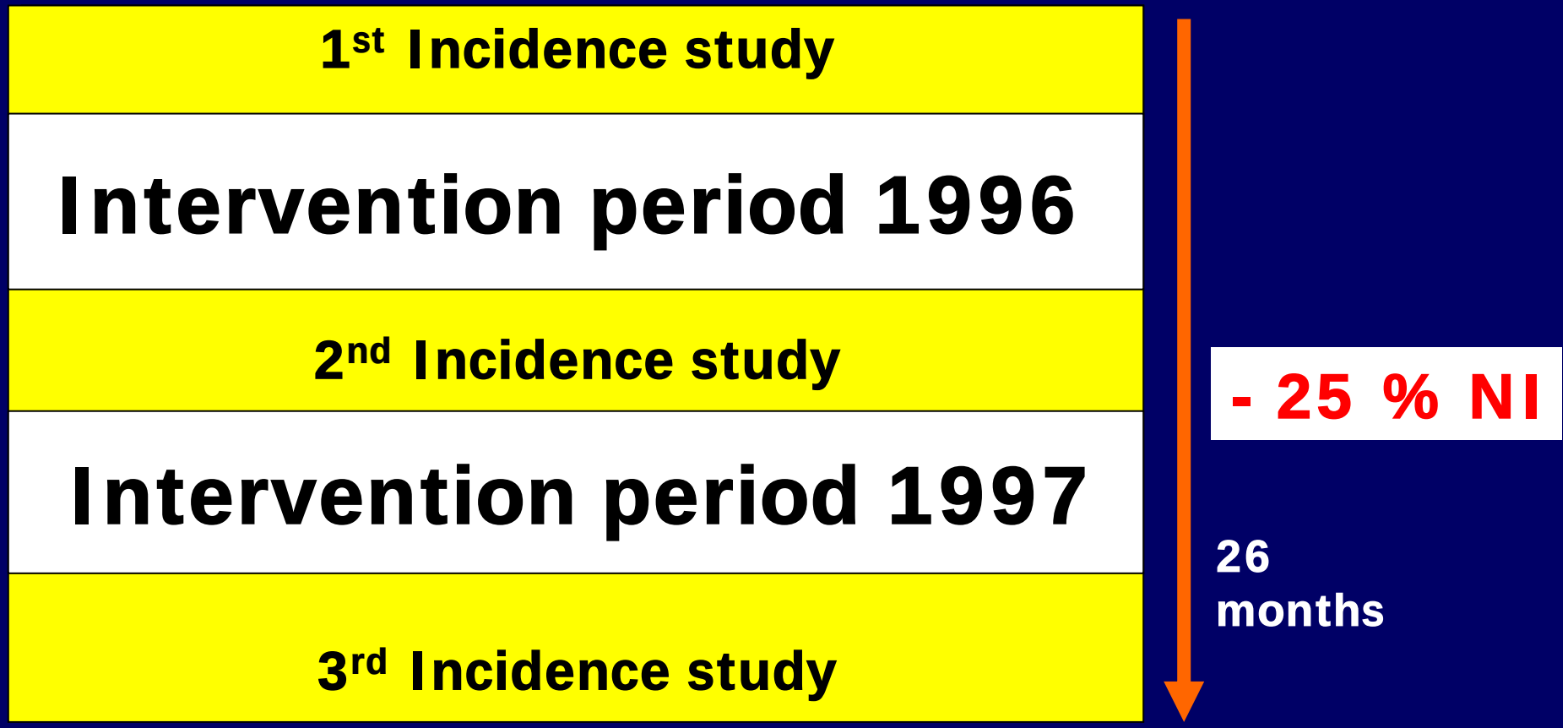
- National point-prevalence survey of nosocomial infections in 72 random selected acute care hospitals (14,966 patients)
- Overall prevalence of nosocomial infections **3.5 %**

Gastmeier P, Kampf G, Wischnewski N, Hauer T, Schulgen G, Schumacher M, Daschner F Rüden H.
J.Hosp Infect 1998; 38: 37-49

NIDEP 1 conclusions

- CDC definitions are useful, but it is necessary to train people diagnosing NI according to CDC criteria
- It is not useful to perform surveillance in all hospoital departments, it makes sence to concentrate on high risk areas and high risk infections

NIDEP 2 (1996-98): Quality management project in 8 hospitals



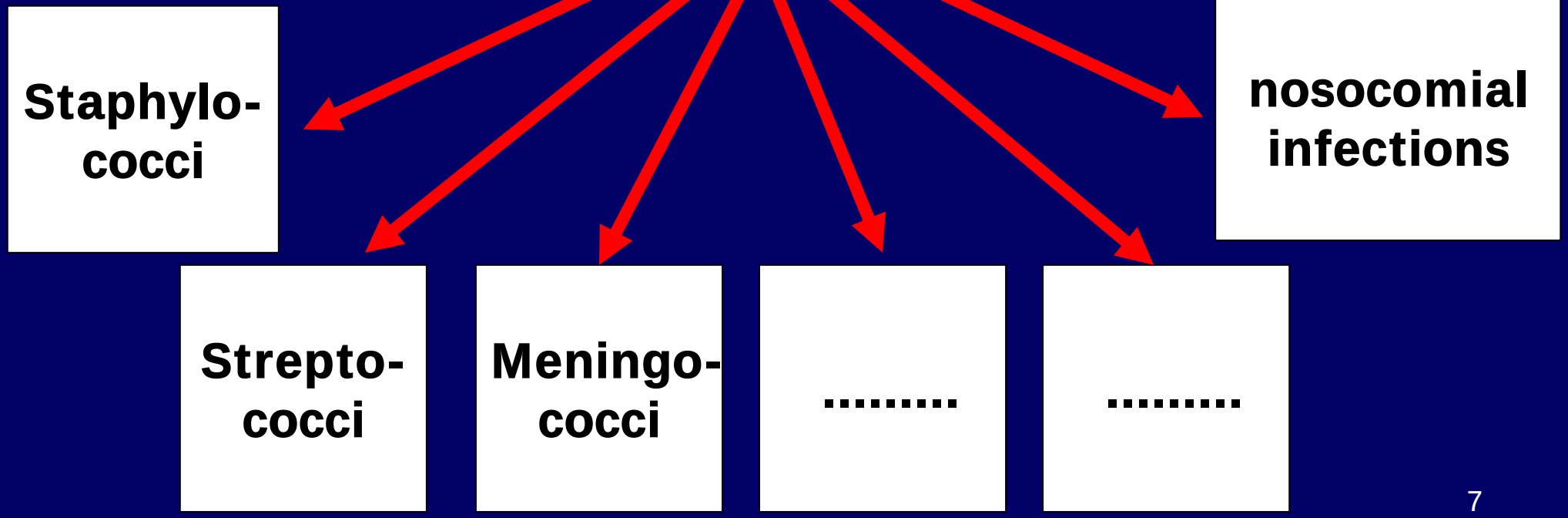
Gastmeier P et al. ICHE 202; 23:91-97

NIDEP 2 conclusions

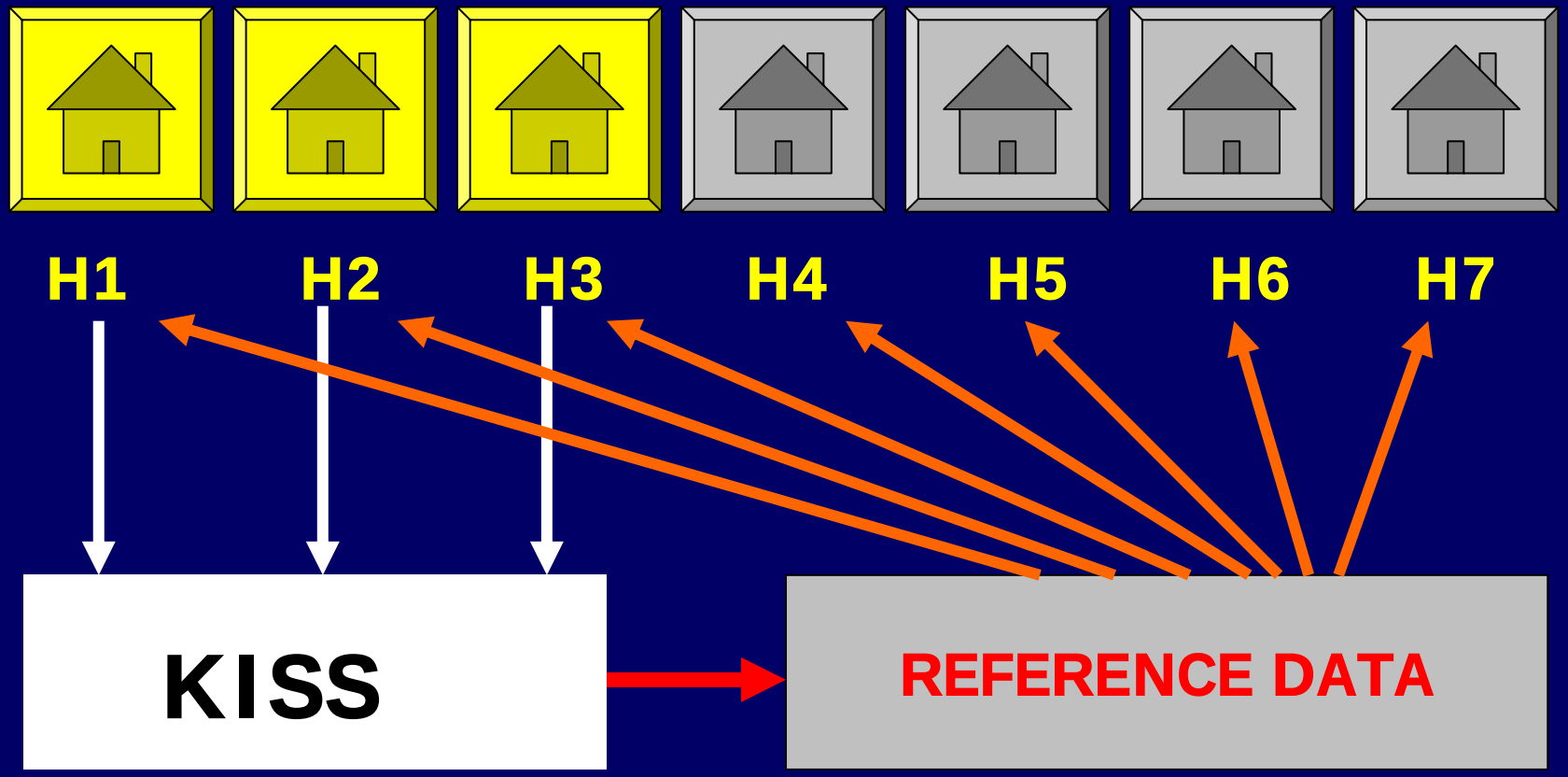
- It is possible to decrease nosocomial infection rates significantly by introducing surveillance and using surveillance data in quality circles to improve infection control measures

1996: Robert Koch-Institute

Network of National Reference Centres

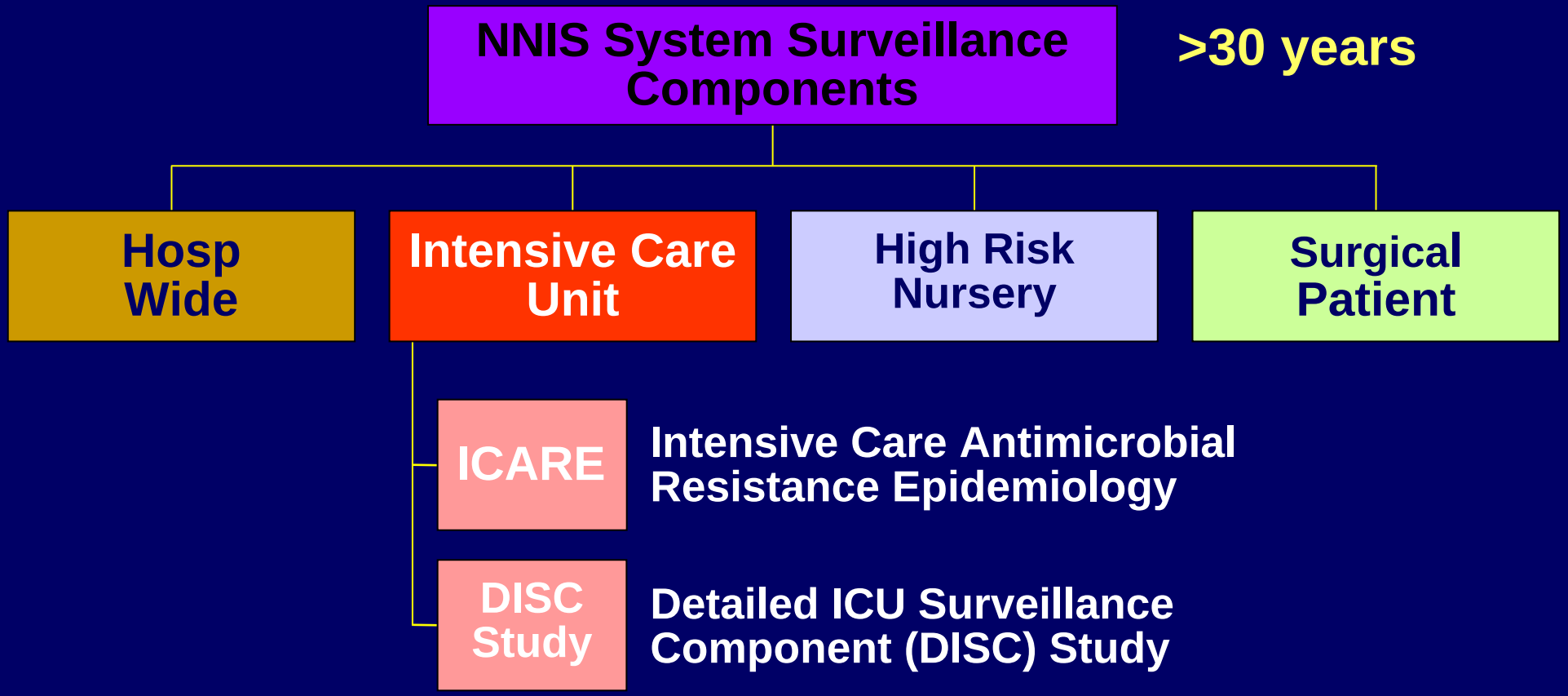


Reference data for nosocomial infections Krankenhaus-Infektions-Surveillance System (KISS)



1. Steps of the development of the surveillance system
2. Workload for surveillance
3. Reduction of infection rates

National Nosocomial Infections Surveillance (NNIS) System



HIP Hospital Infections Program

KISS components 2004

ICU KISS	OP KISS	NEO KISS	ONKO KISS	DEVICE KISS	AMBU KISS
For ICUs	**For operated patients**	**For neonatal ICU patients**	**For BMPSCT patients**	**For Non-ICU patients**	**For out-patient surgery**
289 ICUs	285 depart-ments	39 NICUS	17 centres	95 units	105 centres

Uniform definitions

- Translation of CDC definitions
- Training of diagnosing according to CDC definitions
  (atwo day introductory course is mandatory)

Appropriate methods for the various patient groups

- Considering the most important risk factors
- Considering cost effectiveness

ICU-KISS

Method (ICU-KISS)

Concentration on:

Ventilator associated pneumonia

CVC associated Bloodstream infections

Urinary catheter associated urinary tract infections

Method (ICU-KISS)

Standardisation:

$$\text{VAP rate} = \frac{\text{Pneumonias in ventilated patients}}{\text{ventilator days}}$$

Stratification:

separate data for different types of ICUs

STANDARDIZATION: VAP pneumonia rates

	Days on ventilation	Mean	Median	75th percentile
All ICUs (n=289)	989,259	8.5	7.0	11.8

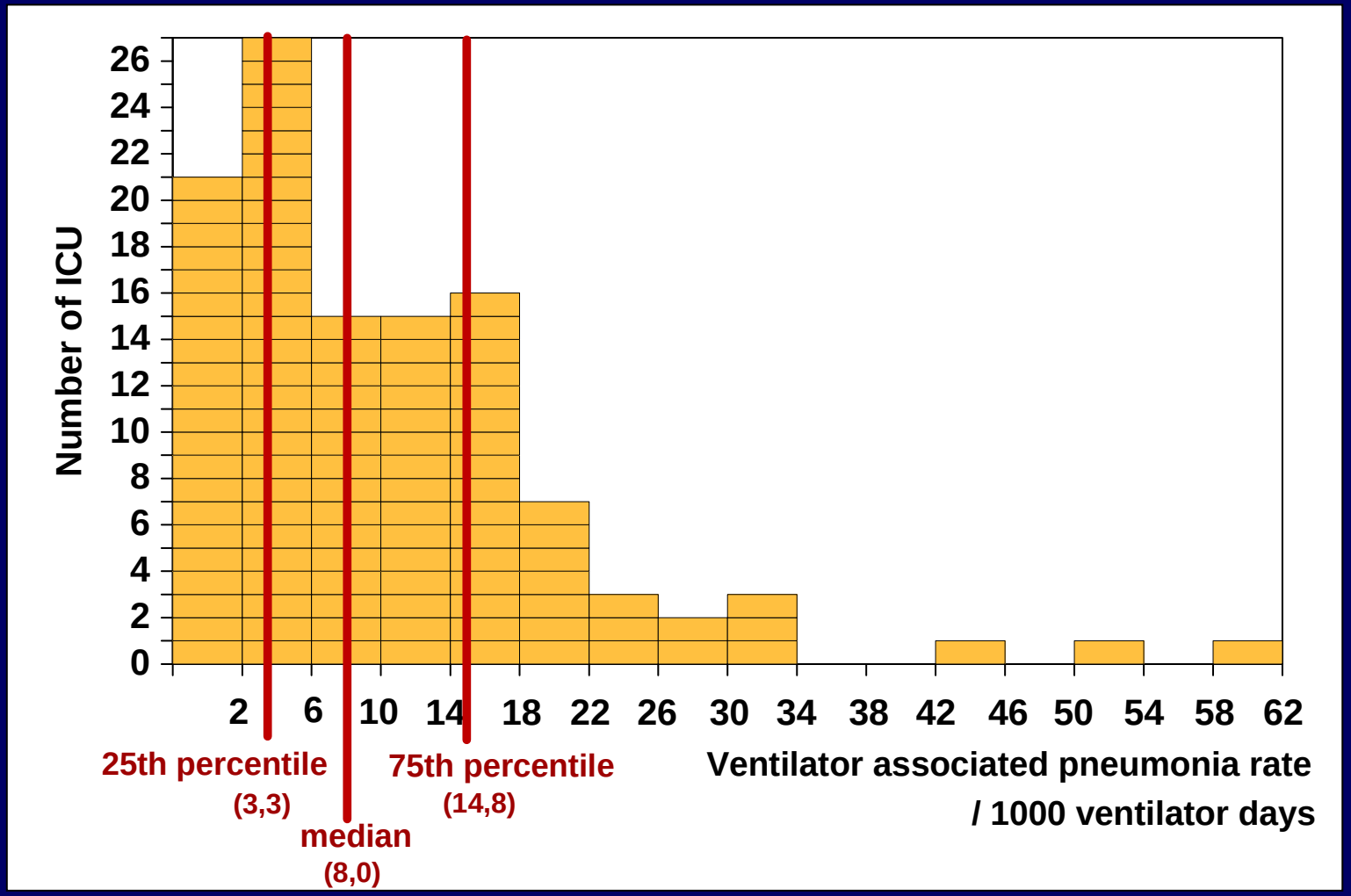
KISS 6/2003

STRATIFICATION: VAP pneumonia rates

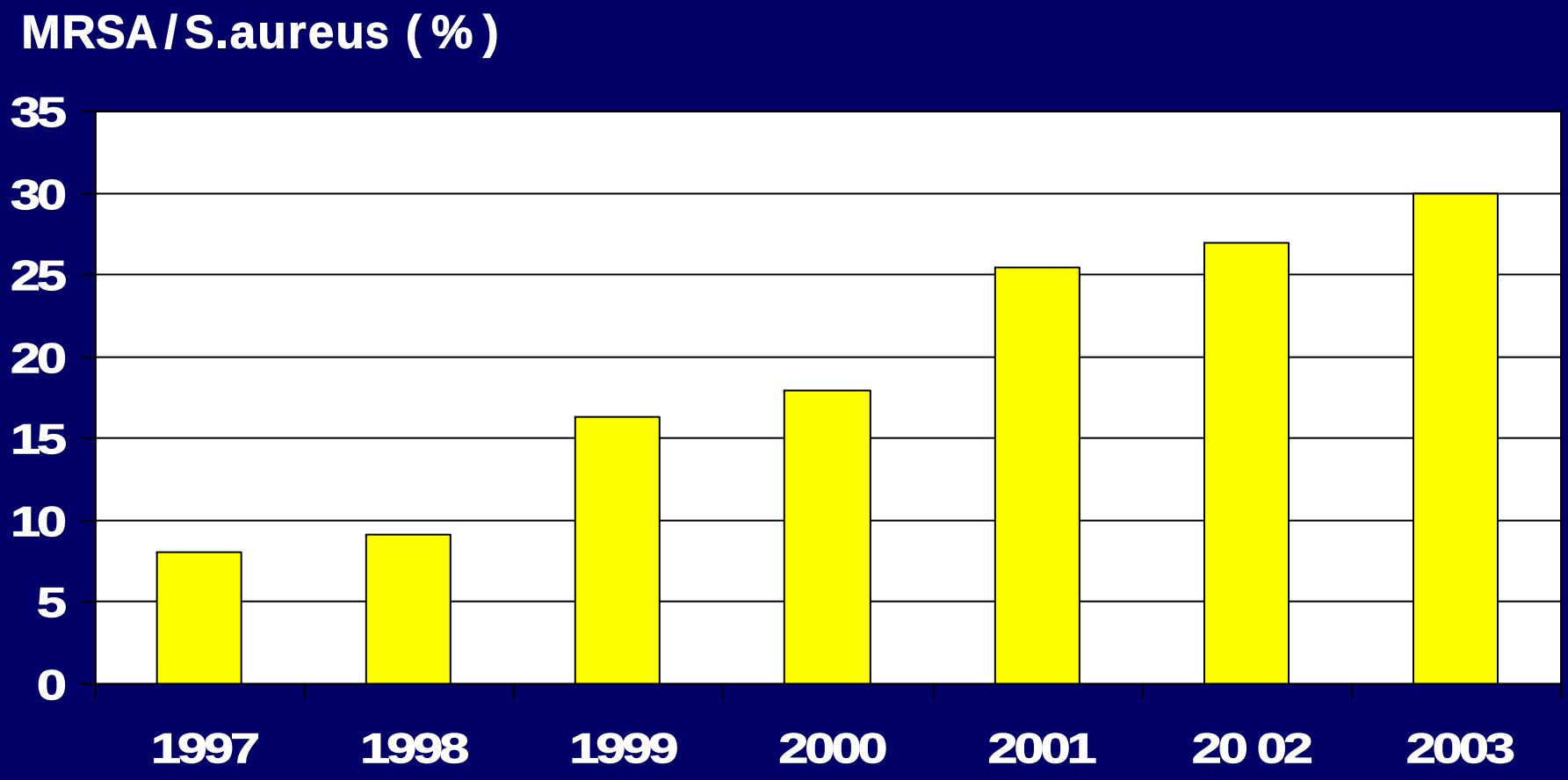
	Days on ventilation	Mean	Median	75th percentile
Medical ICUs (n=59)	156,427	7.5	6.0	9.4
Surgical ICUs (n=73)	279,237	10.2	8.2	13.1
Neurosurgical ICUs (n=10)	46,119	10.7	9.1	12.9

KISS 6/2003

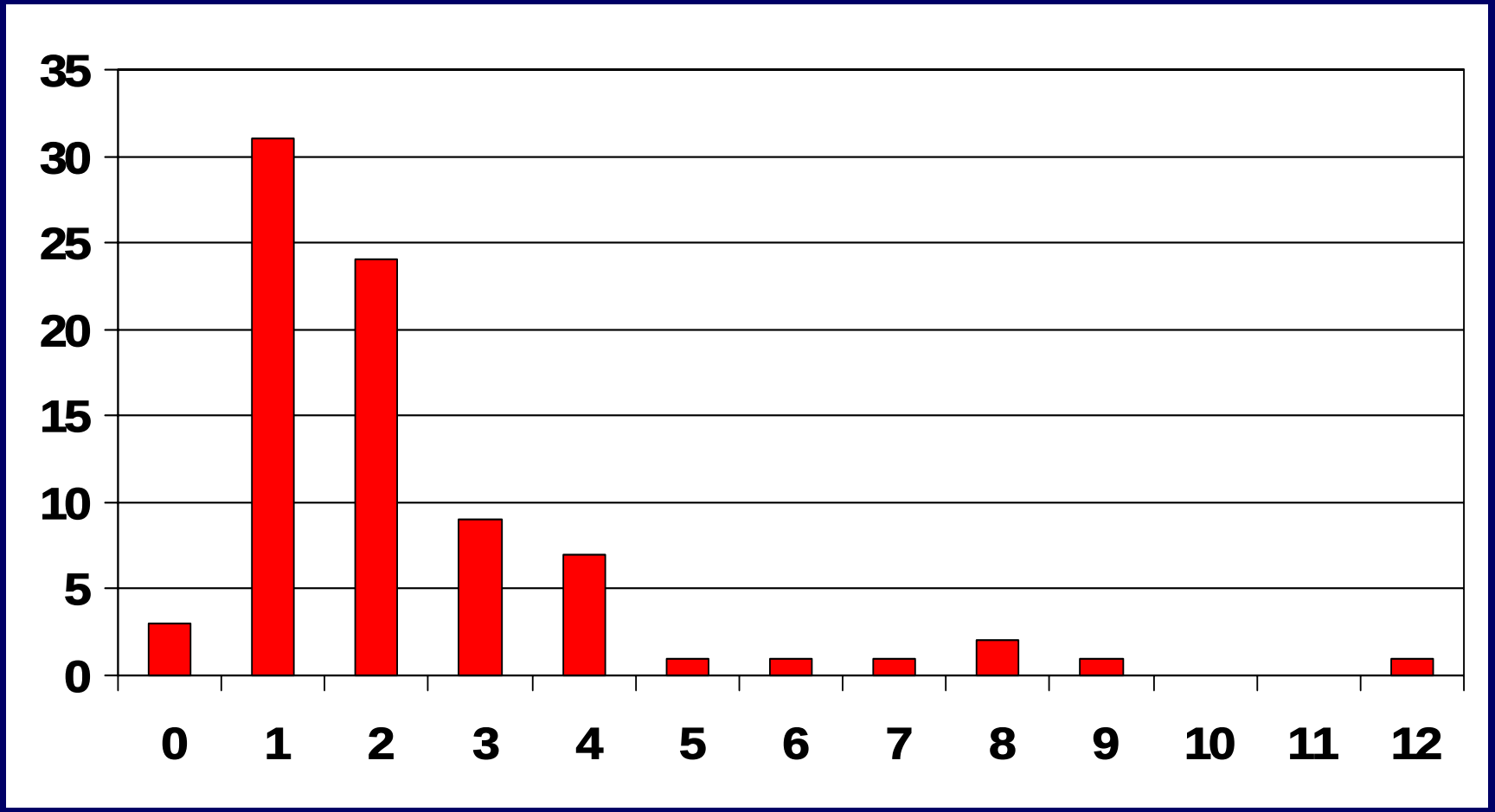
DISTRIBUTION of VAP rate



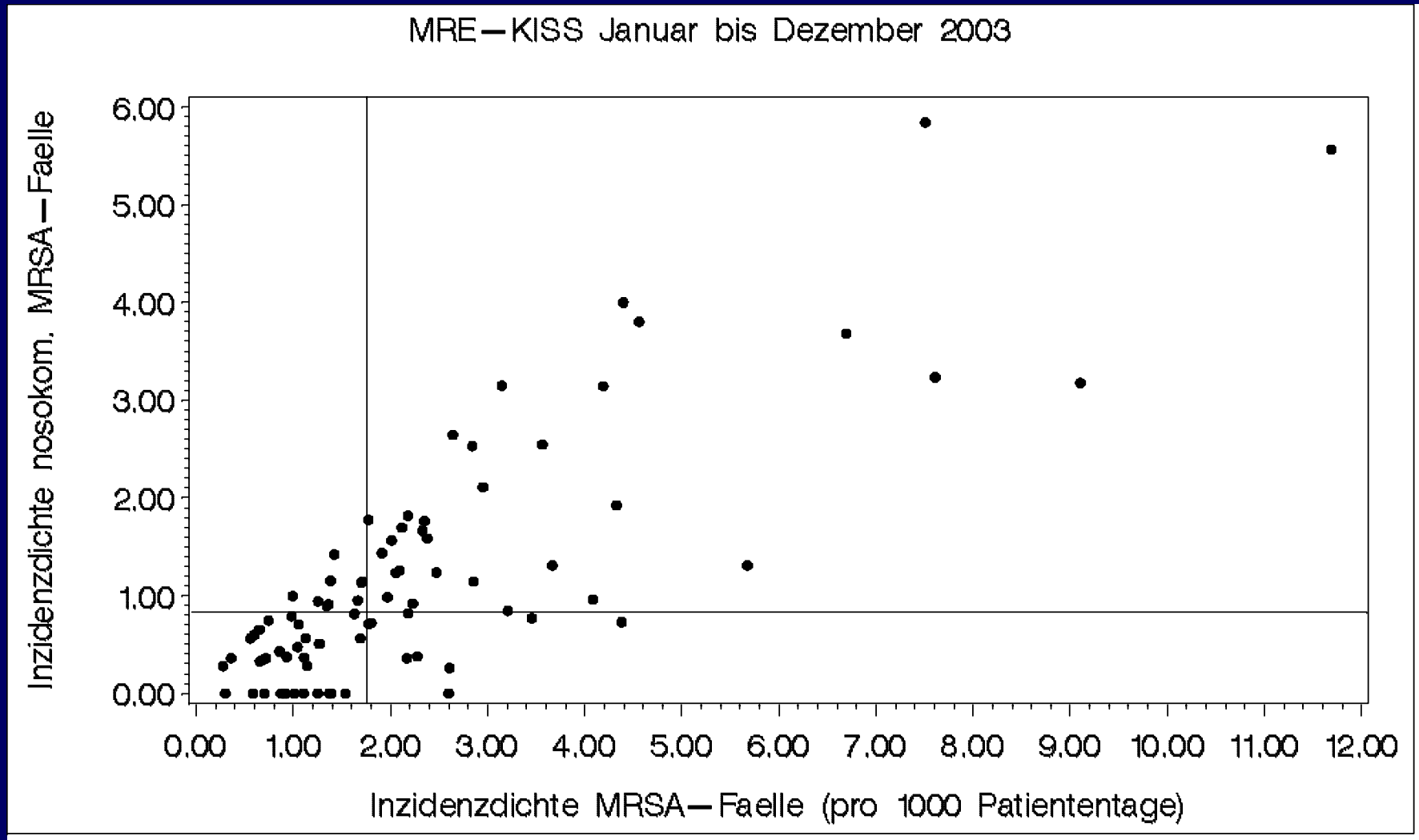
Development of nosocomial MRSA-infections in KISS ICUs



Distribution of MRSA incidence density in KISS ICUs

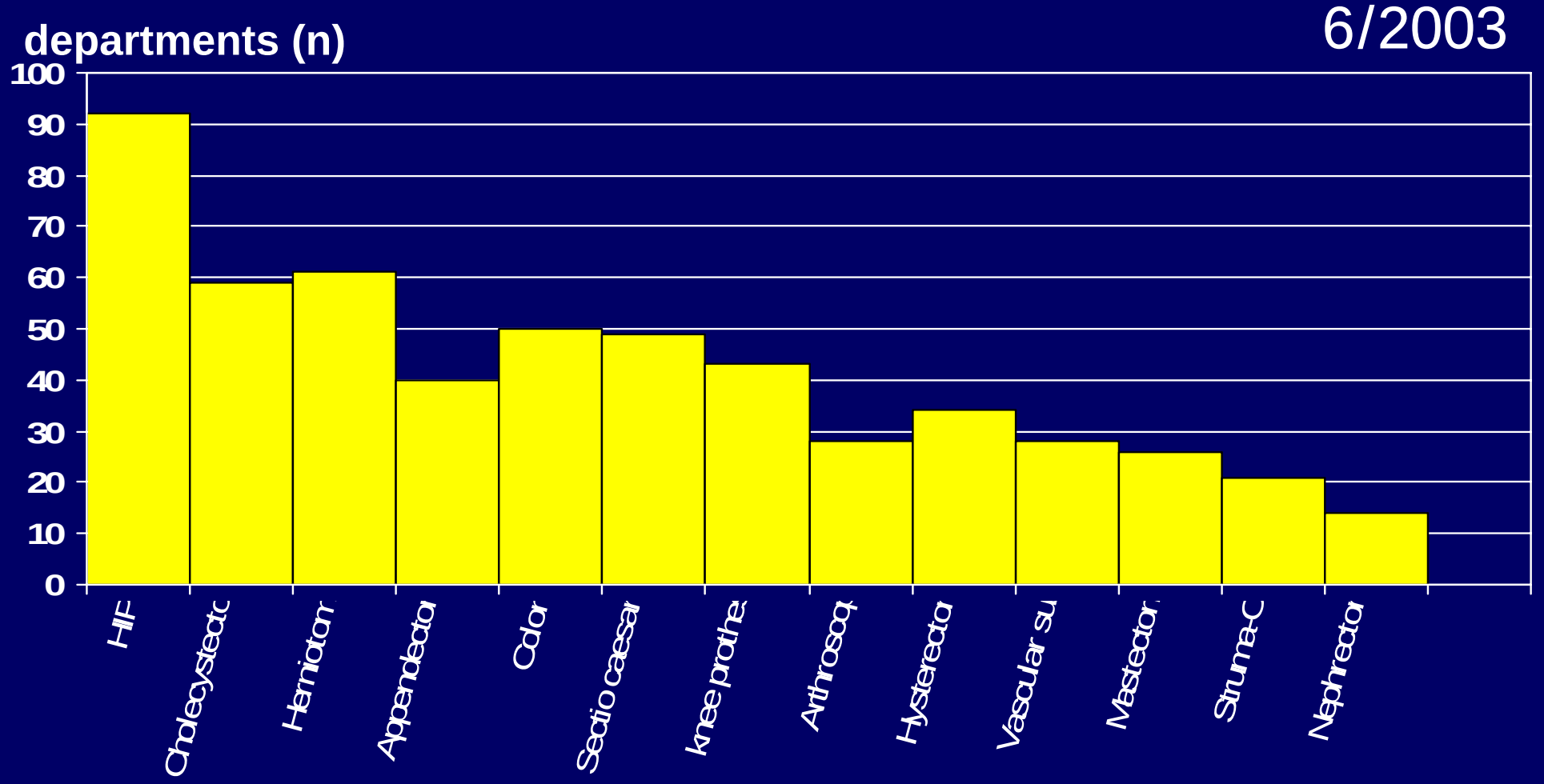


Correlation between MRSA incidence density and nosocomial MRSA cases in KISS ICUs



OP-KISS

Departments per indictaor operation



Method (OP-KISS)

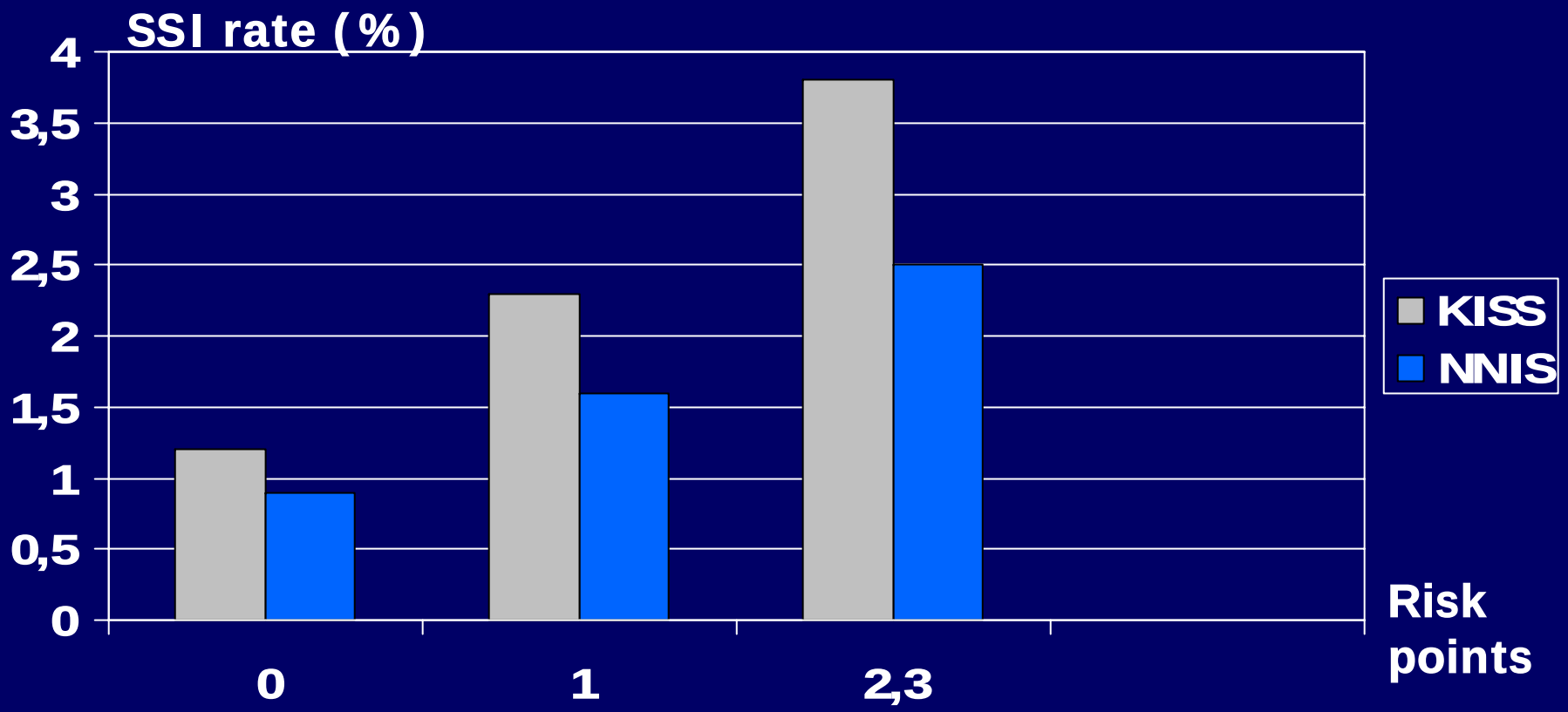
Stratification:

separate data according to the number of risk points
(Risk points for wound class, ASA score, duration of surgery)

Standardisation: **calculation of SIR for each department**

$$SIR = \frac{\text{observed SSI}}{\text{expected SSI}}$$

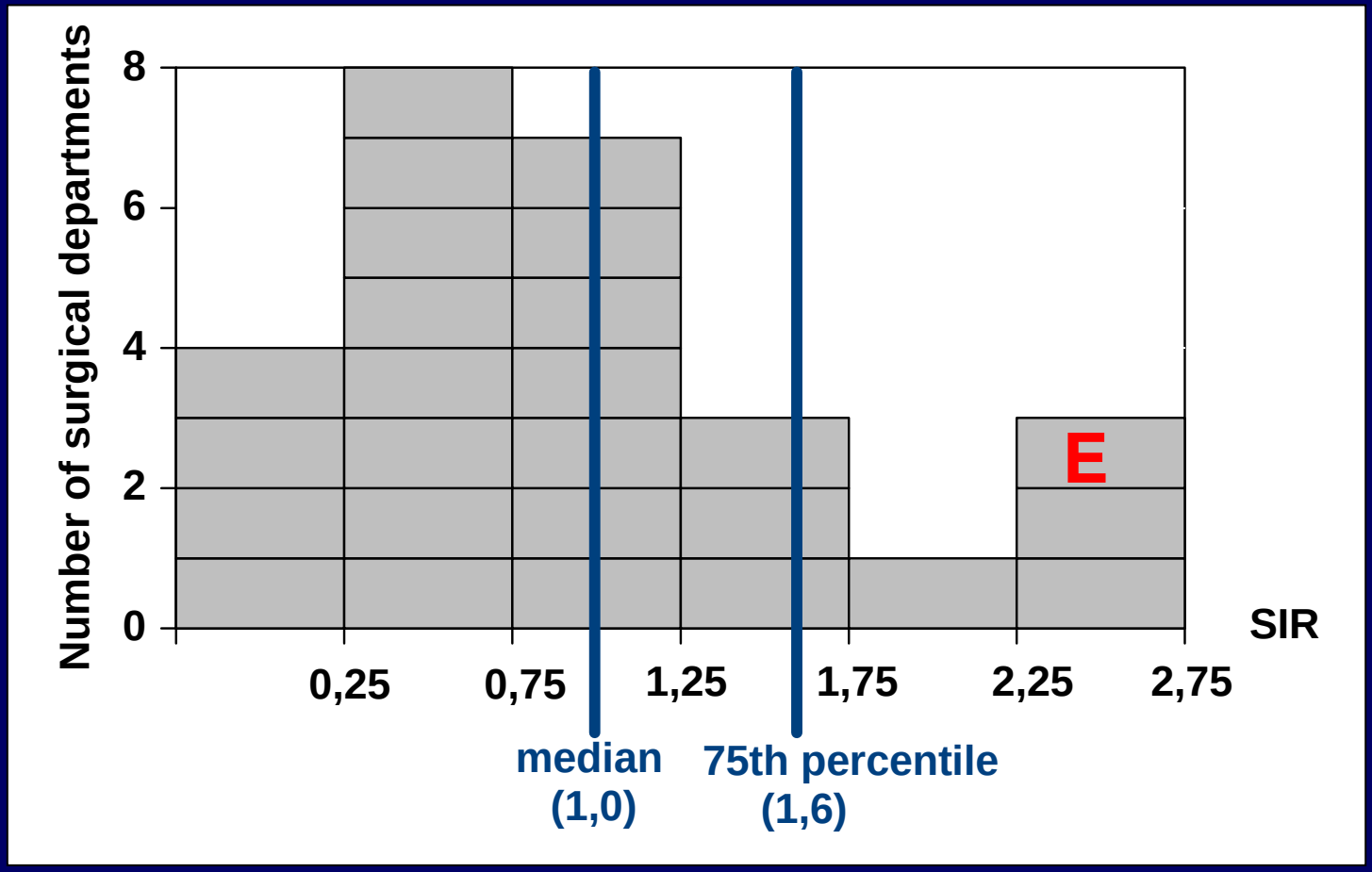
STRATIFICATION: Hip prothesis



NNIS: 112,025 operations (12/2002), 153 hospitals

KISS: 47,347 0perations (6/2003), 92 hospitals

STANDARDISATION: Colon surgery (2,851 operations)



KISS June 1999

NEO-KISS

Method (NEO-KISS)
for neonates with < 1500g birth weight

- Modified NNIS method and modified definitions
- Concentration on:
  - Ventilator associated pneumonia
  - CVC associated Bloodstream infections
  - NEC
- Stratification according to birth weight categories

- 12/2002: 33 departments with

< 500 g:	61 Newborns
500-999 g:	1 318 Newborns
1000-1500 g:	1 978 Newborns

ONKO-KISS

Method (ONKO-KISS)
for patients with bone marrow and stem cell transplantation

- newly developed
- concentration on blood stream infections and pneumonia
- Standardization according to neutropenia days

- 6/2003: 17 centers with
  929 patients with allogen transplantation
  547 patients with autolog transplantation

- mean observation period: 15 days

German Protection Infection Act 2001 § 23

It requires the ongoing surveillance of nosocomial infections in at least one hospital department with a high risk of these infections, such as intensive care units or surgical departments.

In addition, it also requires the surveillance of surgical site infections in surgical outpatient settings.

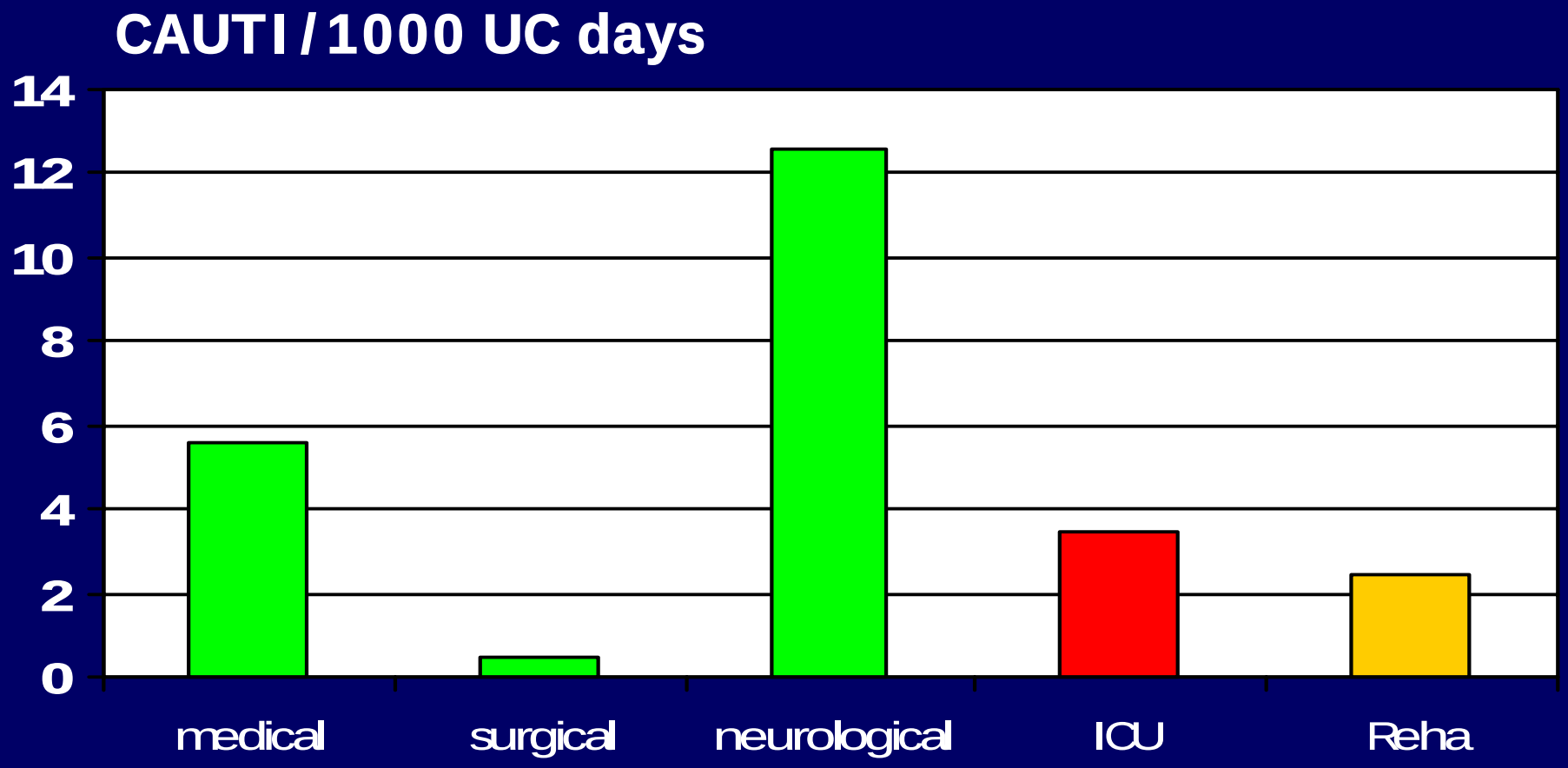
DEVICE-KISS

Method (DEVICE-KISS)
for patients with devices in non-ICUs

- use of the method for ICUs (device associated NI)
- concentration on
  CVC associated BSI and
  urinary catheter asociated urinary tract infections

- 6/2003: Data from 63 wards

Data from 63 device-KISS wards urinary catheter asociated UTI 6/2003



AMBU-KISS

Method (AMBU-KISS)
for SSI in outpatient settings

Calculation of crude SSI rates:

$$= \frac{\text{number of SSI for a given indicator operation}}{\text{number of operations of this type}} \times 100$$

Comparison with hospital data

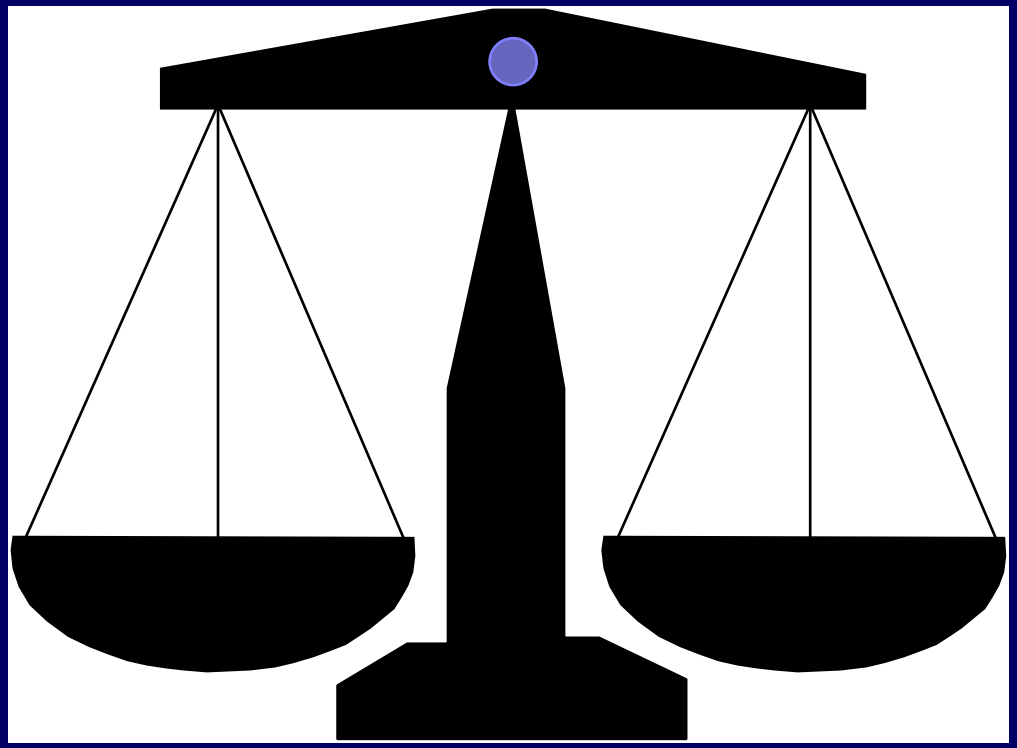
	KISS data for hospitals			KISS data for outpatient settings	
	OPs	SSI rate (%)	SSI rate (%) NNIS index 0	OPs	SSI rate (%)
Hernia repair	29 121	1,36	0,78	3 094	0,65
Varicosis OP	3 878	0,80	0,64	5 020	0,38
Arthroscopic knee procedures	23 163	0,20	0,11	7 931	0,09

KISS 6/2003

1. Steps of the development of the surveillance system
2. Workload for surveillance
3. Reduction of infection rates

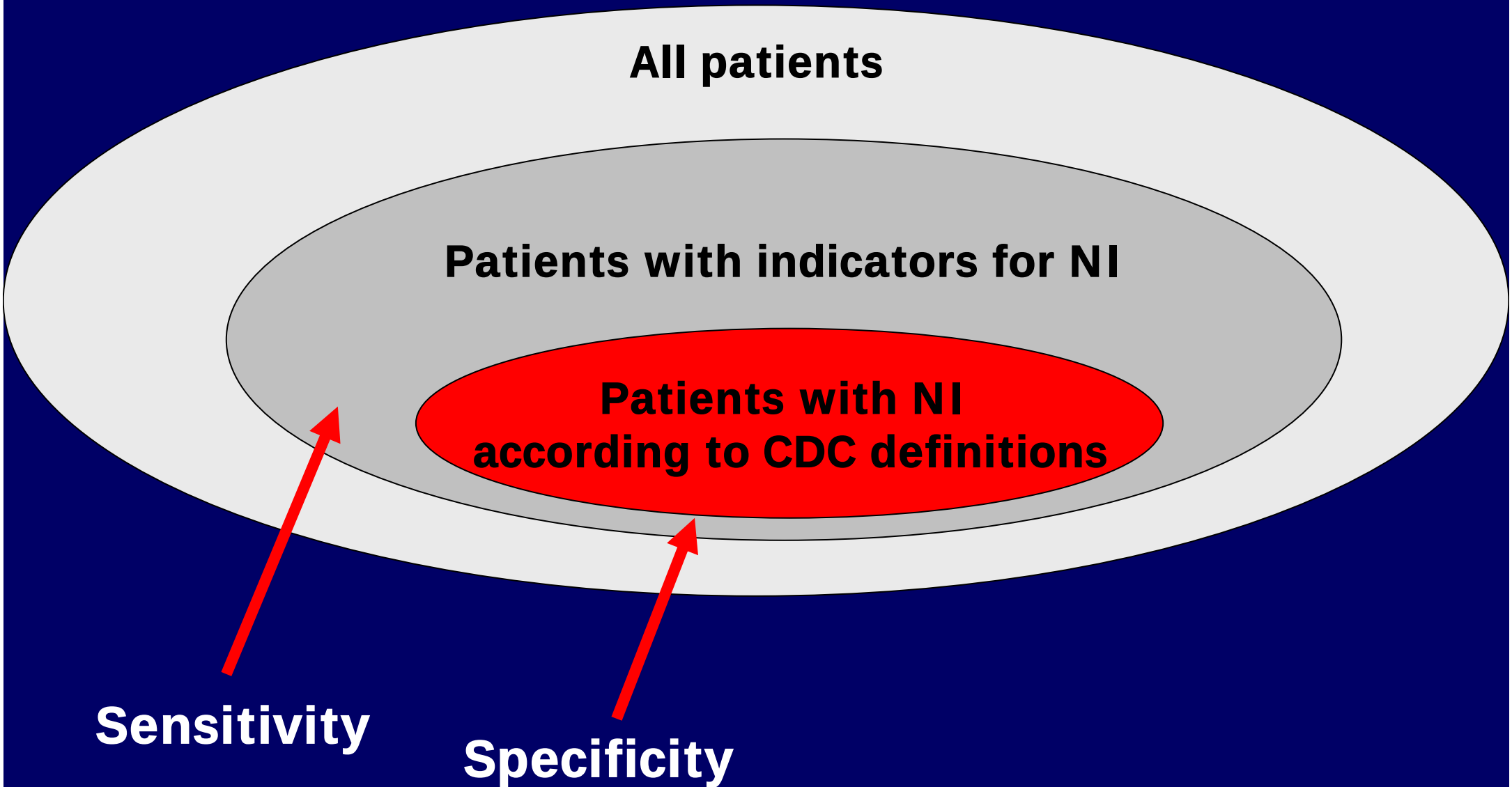
Cost effectiveness of surveillance

Reduction of infection rates



Expenses for surveillance
- Numerator data
- Denominator data

Process of identifying nosocomial infections



Methods for identification of cases

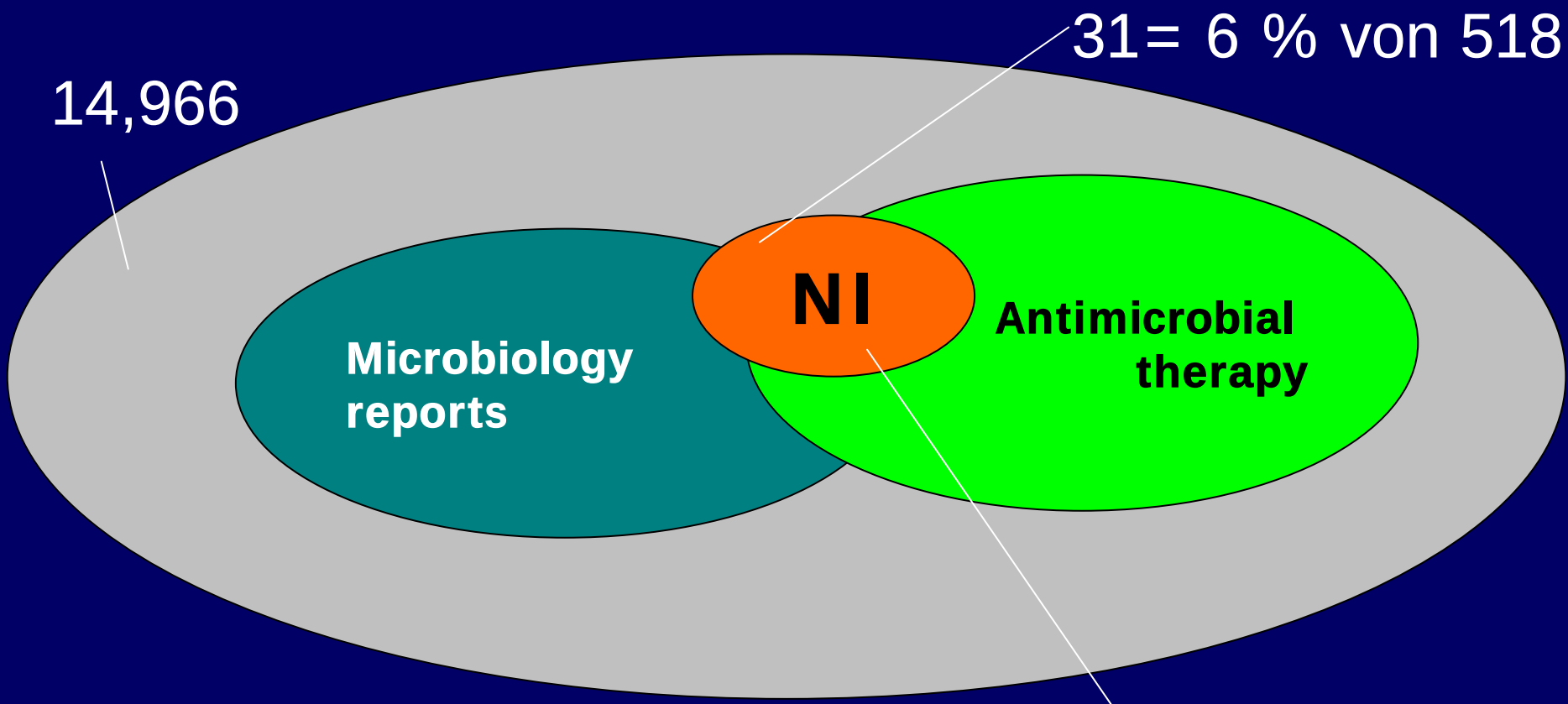
Sensitivity of indicators

Method	Sensitivity (%)	h per week per 100 beds
Laboratory based telefon call	36	1.2
Laboratory based ward visit	51	3.1
Ward rounds	62	3.5
Temperature based chart review	41	3.6
Temperature +treatment based chart review	65	6.5
Laboratory based ward rounds	76	6.4

Glenister HM et al. J Hosp Infect 1993; 23:229-42

Methods for identification of cases

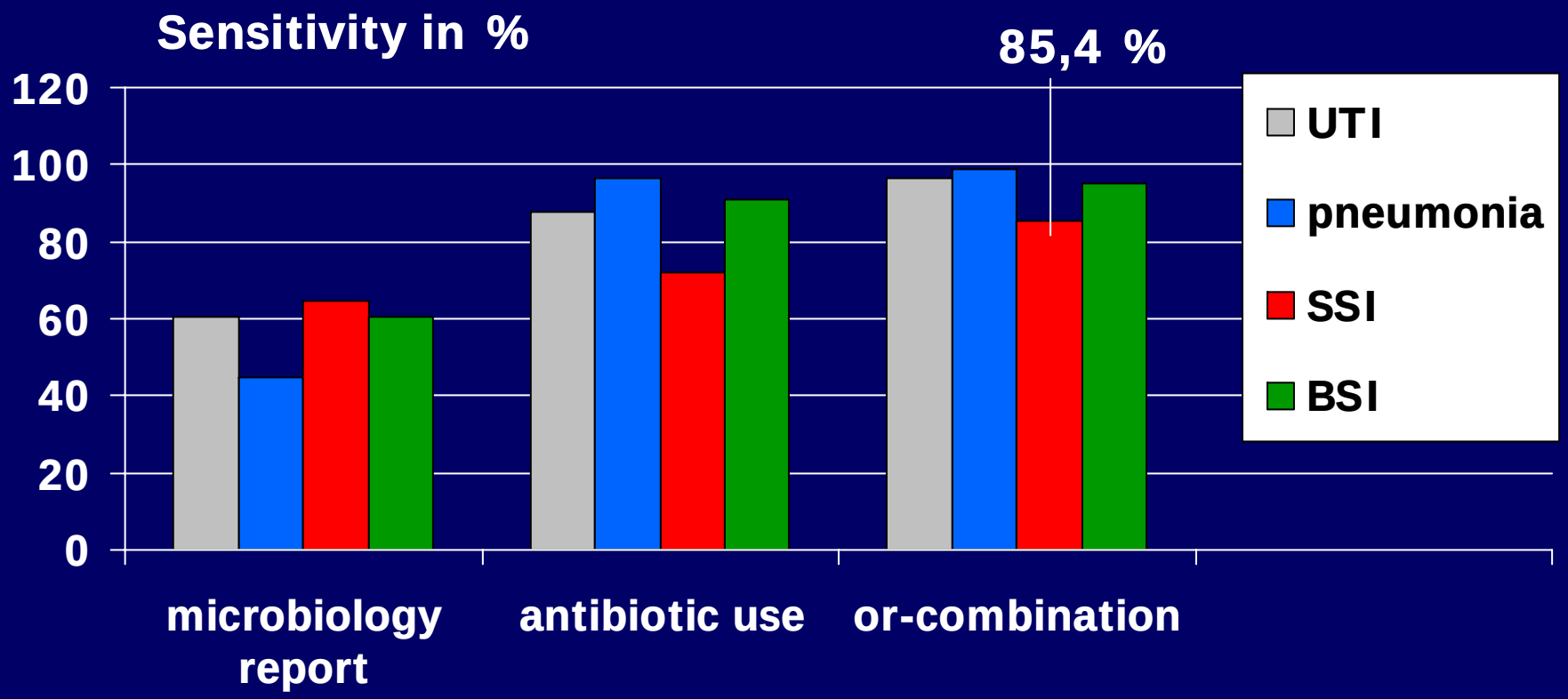
Sensitivity of indicators



Gastmeier et al. ICHE 1999; 20:124-127

Methods for identification of cases

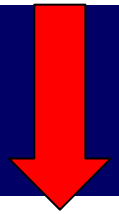
Sensitivity of indicators



Gastmeier et al. ICHE 1999; 20:124-127

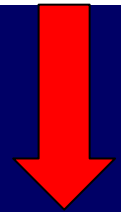
Two strategies

To be present on the wards for several hours a week to gather information



Combination of surveillance and infection control activities

To use hospital databases as much as possile to acquire necessary information



Extra stimulation of infection control activities

Active surveillance is preferred

- In most hospitals infection control nurses are responsible for surveillance (about 70%)
- They get support from link nurses in many hospitals.
- In the remaining hospitals the doctors of the ward are doing surveillance.

Time required for surveillance: questionnaire in KISS hospitals 2002

ICU-KISS

Median:

2 h/week

4-28 ICU beds,
On average 10

OP-KISS

Median:

2 h/week

1-12 indikator operations

Reporting and Using Surveillance Information

"Surveillance without action should be abandoned."

Present surveillance information in a manner to stimulate ideas for process improvement.

Perform follow-up surveillance to monitor for improvement following changes ("close the loop").

ICU-KISS: Validation study 2001/02

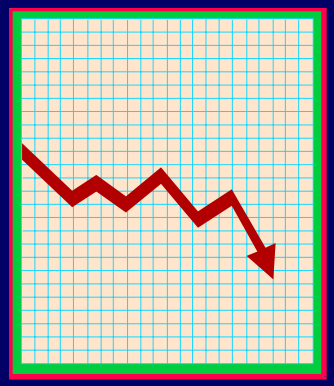
Retrospective study in 20 randomly selected ICUs
A total of 1,481 cases
(286 NI cases, 1,195 Non-NI cases)

Positive predictive value 83 %;
Negative predictive value 98 %

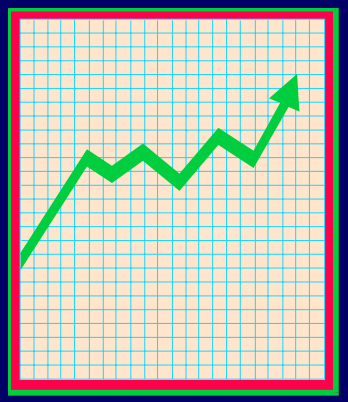
Median specificity 99,6 %
Median sensitivity 79 %

Reporting and Using Surveillance Information

Facility A



Facility B



Use <u>extreme caution</u> when surveillance information is used for external comparisons!

Who gets surveillance information?

CONFIDENCE is the most important principle!

The unit/department itself should decide who gets this information inside and outside the hospital

1. Steps of the development of the surveillance system
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3. Reduction of infection rates

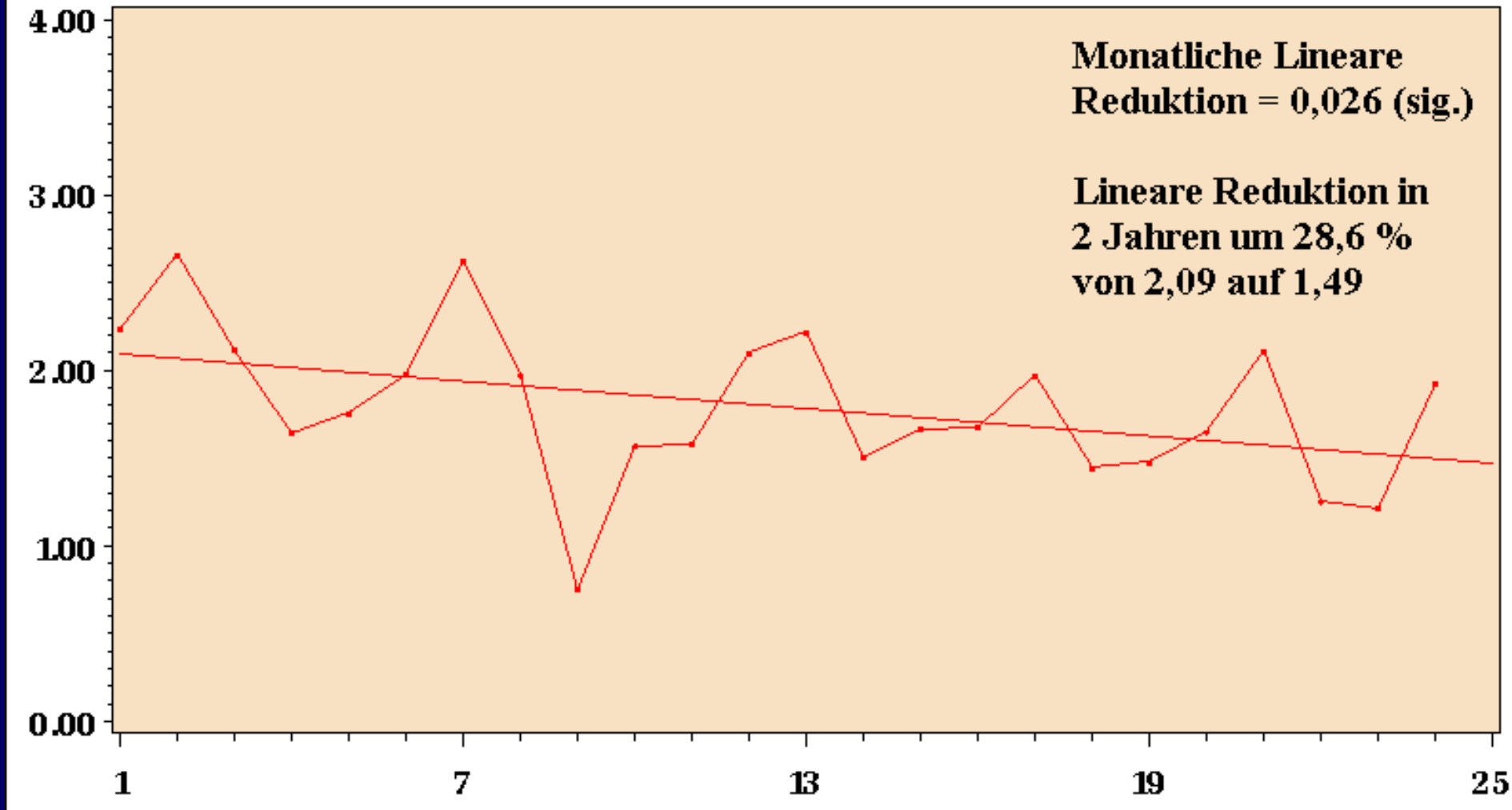
Reduction of CVC associated BSI rate in KISS ICUs

Data from 84 ICUs participating for at least 2 years, only the data from the first 24 months of participation were considered.

Zuschneid et al. ICHE 2002; 24: 501-05

ZVK–assoziierte Sepsisrate

Anzahl ZVK–assoz. Sepsen
pro 1000 ZVK–Tage

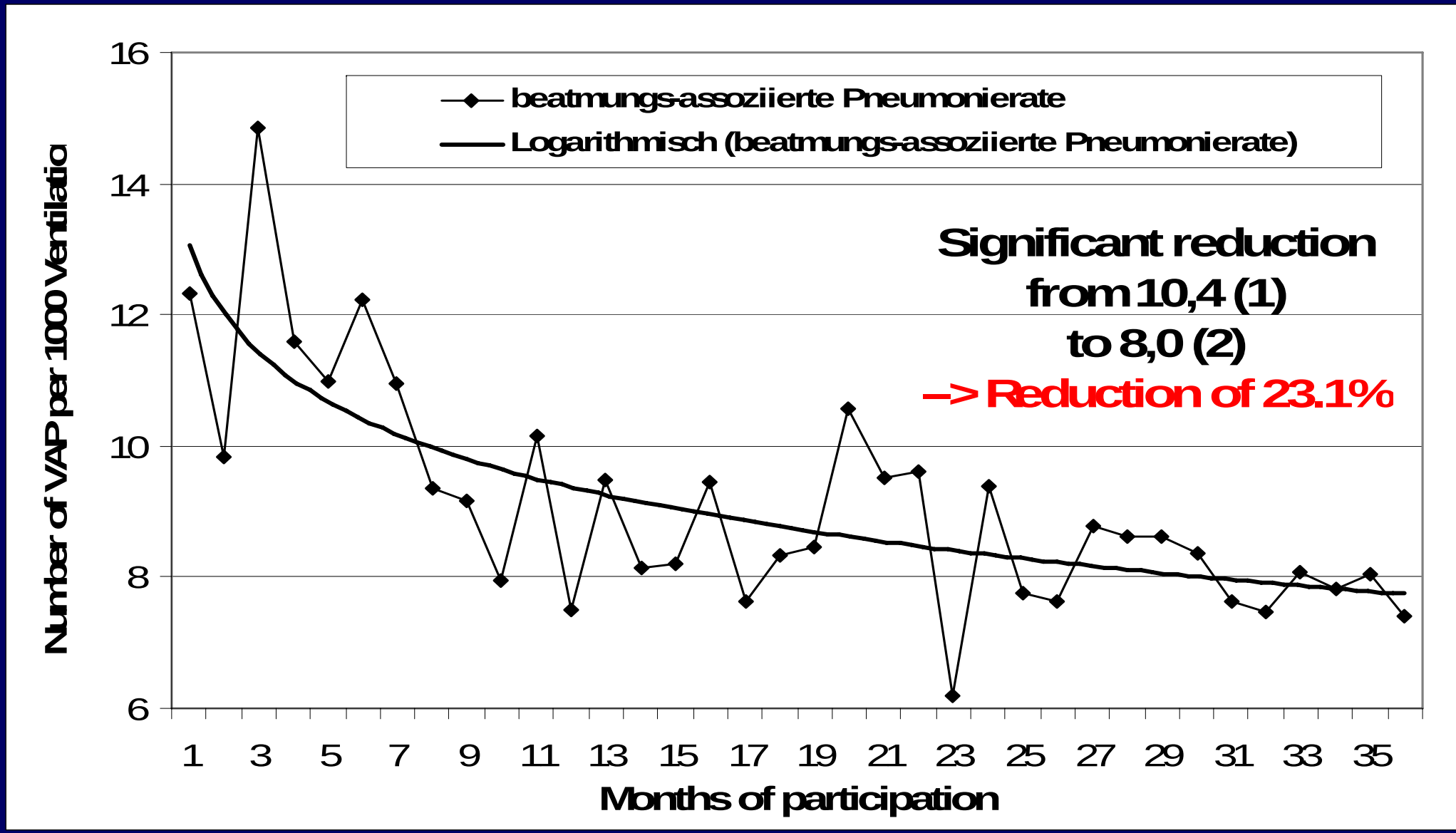


KISS–Daten 01/97–06/01, 84 Stationen mit mind. 24 Monate Teilnahme

Reduction of ventialtor associated pneumonia rates in KISS ICUs

Data from 71 ICUs participating for at least 3 years since 1999,

only the first 3 years were considered.


beatmungs-assoziierte Pneumonierate
Logarithmisch (beatmungs-assoziierte Pneumonierate)
Significant reduction
from 10,4 (1)
to 8,0 (2)
–> Reduction of 23.1%
Number of VAP per 1000 Ventilatio
16
14
12
10
8
6
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
Months of participation

Reduction of surgical site infection rates in KISS

Inclusion criteria:

- Indicator operations with > 15 departments participating and with
  ≥ 30 procedures of this type
  and ≥ 3 years participation

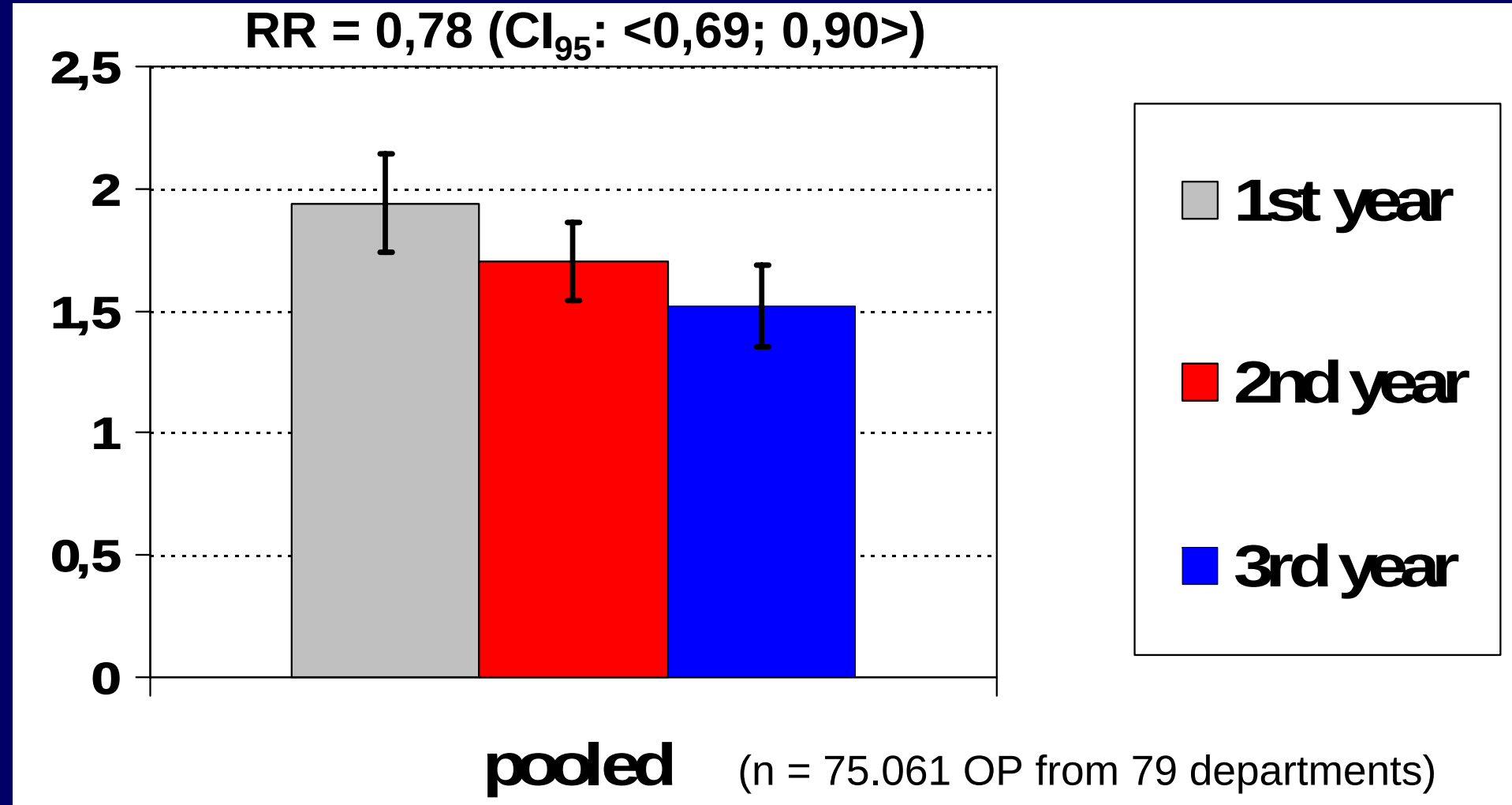
Calculation of SSI rates per year of participation

Stratification of departments according to the basic SSI rate (1st year)

Data used for this analysis

Type of procedure	departments	operations
CHOLECYSTECTOMY	25	14,500
COLON OPERATION	37	4,924
HERNIA REPAIR	25	12,092
HIP PROTHESIS	37	23,953
KNEE PROTHESIS	17	7,842
SECTIO CAESAREA	16	11,750
total	**79**	**75,061**

SSI rates


SSI (%))
RR = 0,78 (CI95: <0,69; 0,90>)
2,5
2
1,5
1
0,5
0
1st year
2nd year
3rd year
pooled
(n = 75.061 OP from 79 departments)

1. Steps of the development of the surveillance system
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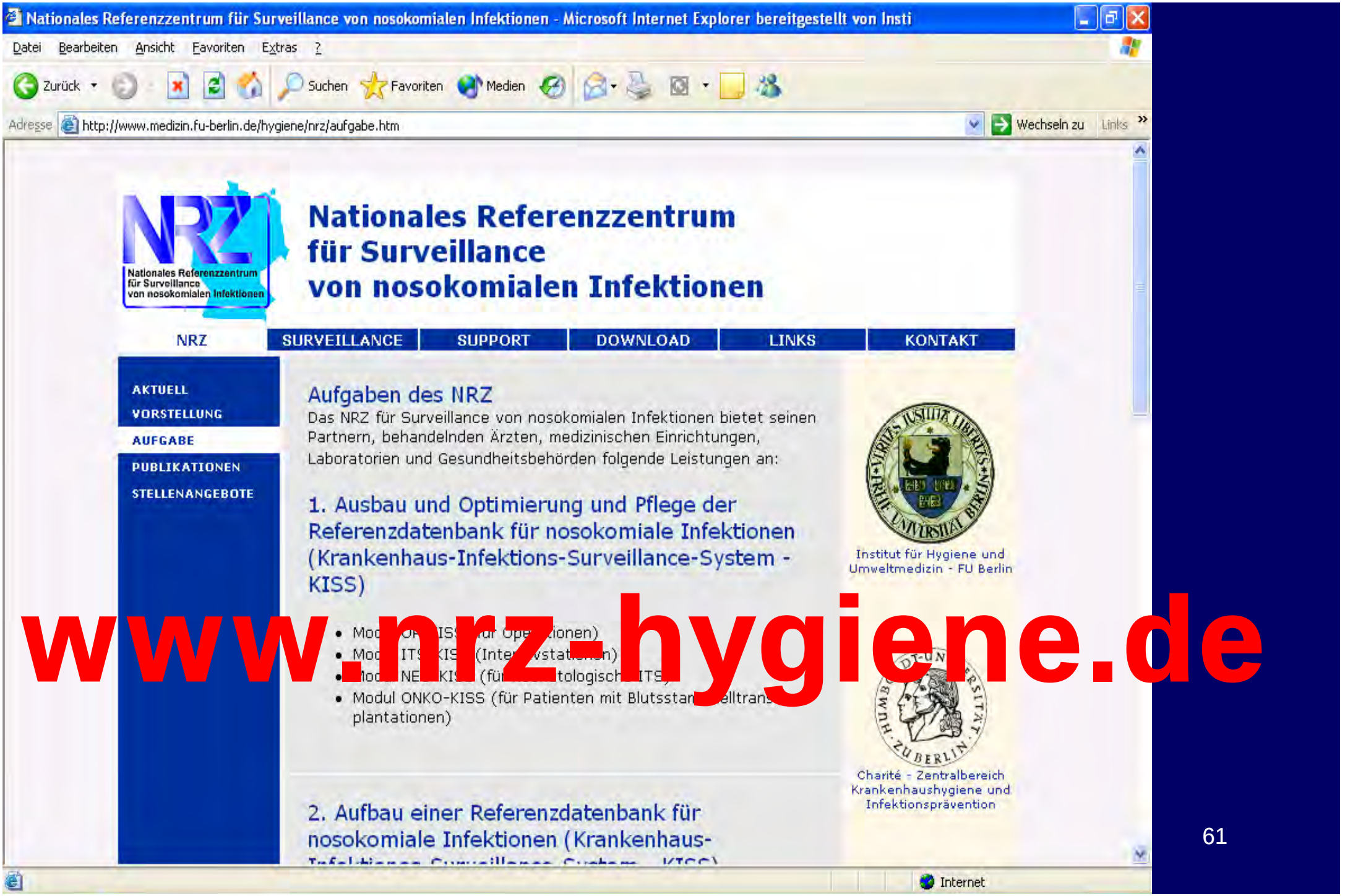
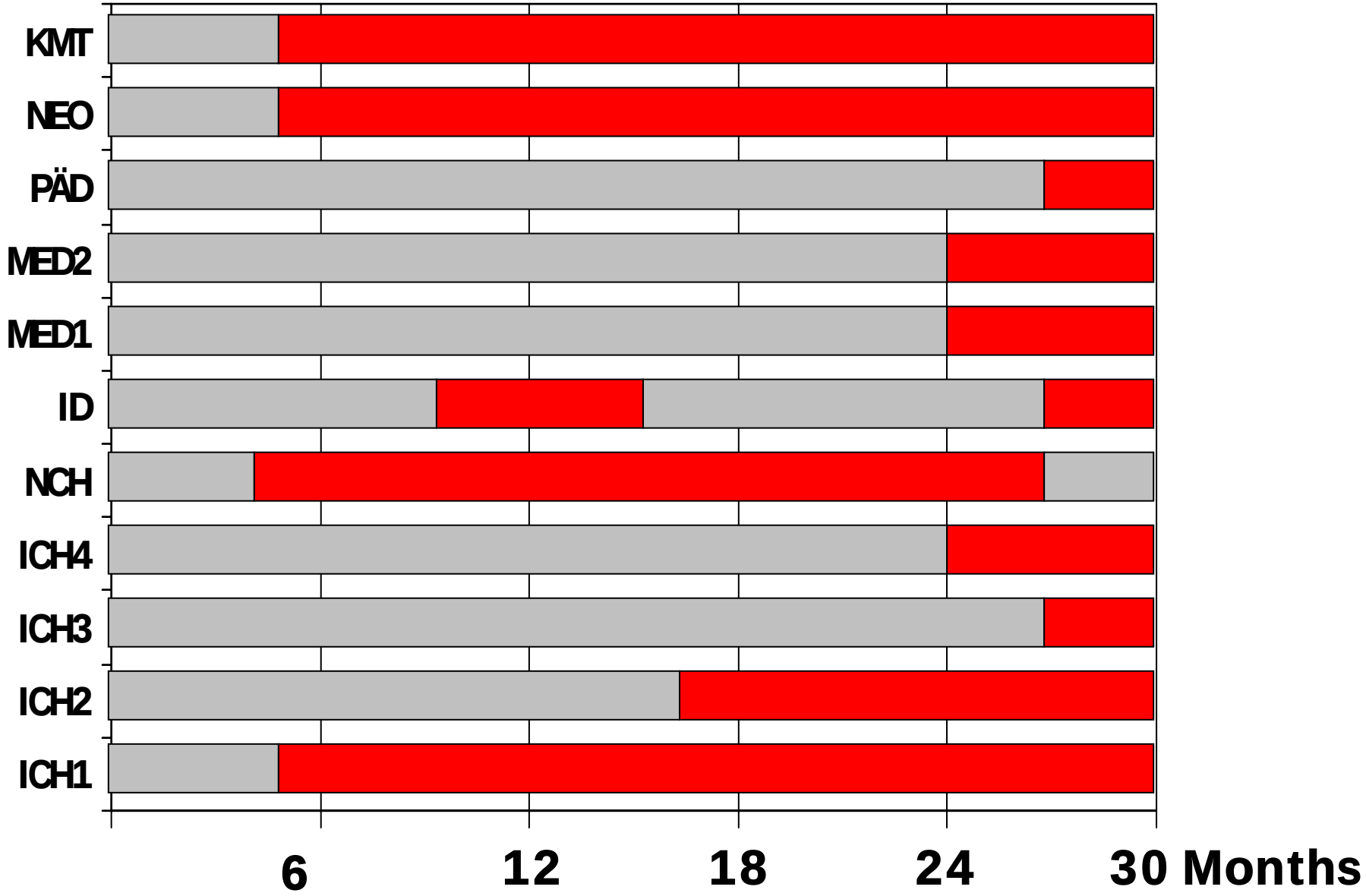

Nationales Referenzzentrum für Surveillance von nosokomialen Infektionen - Microsoft Internet Explorer bereitgestellt von Insti
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Medien
Adresse http://www.medizin.fu-berlin.de/hygiene/nrz/aufgabe.htm
Wechseln zu Links
Nationales Referenzzentrum für Surveillance von nosokomialen Infektionen
NRZ
SURVEILLANCE
SUPPORT
DOWNLOAD
LINKS
KONTAKT
AKTUELL
VORSTELLUNG
AUFGABE
PUBLIKATIONEN
STELLENANGEBOTE
Aufgaben des NRZ
Das NRZ für Surveillance von nosokomialen Infektionen bietet seinen Partnern, behandelnden Ärzten, medizinischen Einrichtungen, Laboratorien und Gesundheitsbehörden folgende Leistungen an:
1. Ausbau und Optimierung und Pflege der Referenzdatenbank für nosokomiale Infektionen (Krankenhaus-Infektions-Surveillance-System - KISS)
Modul ONKO-KISS (für Patienten mit Blutsstam elltrans plantationen)
2. Aufbau einer Referenzdatenbank für nosokomiale Infektionen (Krankenhaus-
Institut für Hygiene und Umweltmedizin - FU Berlin
Charité - Zentralbereich Krankenhaushygiene und Infektionsprävention
www.nrz-hygiene.de
Internet

Hanover Medical School


KMT
NEO
PÄD
MED2
MED1
ID
NCH
ICH4
ICH3
ICH2
ICH1
6
12
18
24
30 Months

ANALYSIS FOR OUR HOSPITAL DIRECTOR

Four ICUs were included in the analysis

1. Trauma ICU (T)
2. Neurosurgical ICU (NS)
3. Neonatal ICU (N)
4. Bone marrow transplant ICU (BMT)

For every ICU:
Comparison of the first and the second 12 surveillance months

Basic situation for VAP rates

ICU	VAP rate/1000 ventilator days	Median of the corresponding KISS component	KISS: 75th perzentile
T	11.8	8.2	13.7
NS	5.0	9.1	12.9
N (< 1000g)	0	3.9	6.1
N (< 1500g)	0	0.1	0.7
BMT	4.8	6.3	8.2

Basic situation for CVC-BSI rates

ICU	CVC-BSI rate / 1000 CVC days	Median of the corresponding KISS component	KISS: 75th perzentile
T	6.6	1.5	2.4
NS	0	0.7	1.9
N (< 1000g)	6.6	8.1	10.7
N (< 1500g)	3.1	3.9	6.1
BMT	21.0	14.3	20.8

CVC BSI

VAP

	Cases 1st period	Cases 2nd period	Reduction	Cases 1st period	Cases 2nd period	Reduction
T	15	4	-11	20	19	-1
NS	0	1	+1	10	5	-5
N	7	6	-1	0	0	0
BMT	35	22	-13	8	8	0

-24 BSI cases

- 6 VAP cases

Prolongation of ICU stay due to NI according to the data of the SIR 3 study (Multistate model)

In comparison to patients without NI:	Attributable length of stay	p value
First NI	5.2 d	< 0.0001
Pneumonia	6.1 d	< 0.0001
Urinary tract infections	-0.2 d	0.52
Primary sepsis	2.8 d	0.118
Surgical site infections	13.3 d	0.0933

Beyersmann et al. 2004, in press

Success

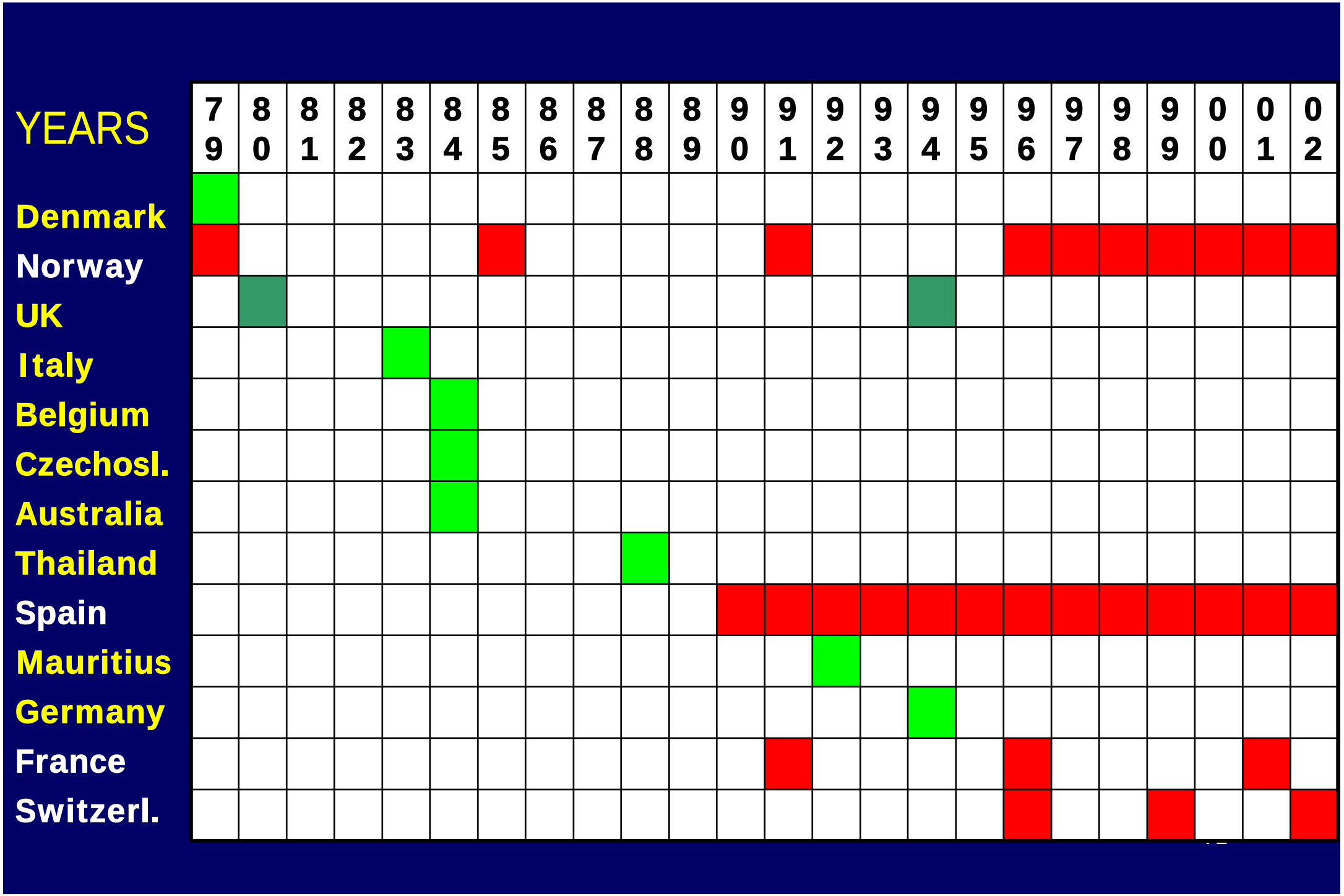
Reduction	n	Prolongation of stay per case in days	Total days
BSI cases	24	3	72
Pneumonia cases	6	6	36
total			108

One ICU day: 1,200 €
108 ICU days: 130,000 €
Hospital charges for one infection control nurse per year: 30, 000 € -35,000 €

http:/helics.univ.lyon1.fr

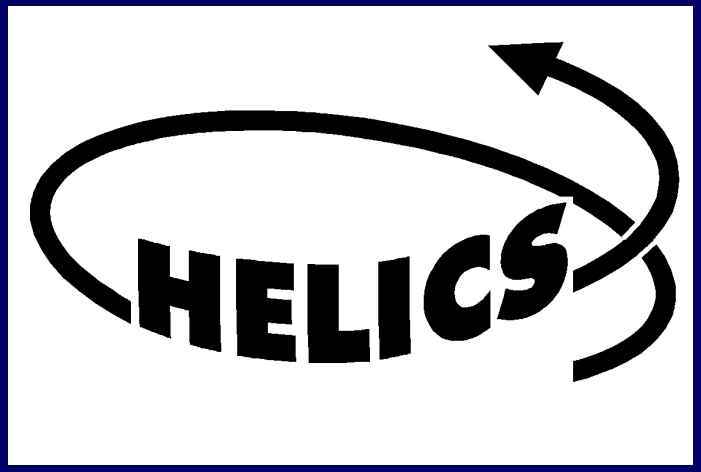
= Hospitals in Europe Link for Infection Control through Surveillance

1994-96	1998-99	2000-2002	2003-2004
Development of surveillance protocols	Inventory in Europe	Harmonisation, Protocols for ICUs, SSI, prevalence	Establishment of 2 surveillance systems


YEARS
79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02
Denmark
Norway
UK
Italy
Belgium
Czechosl.
Australia
Thailand
Spain
Mauritius
Germany
France
Switzerl.

Uniform protocol for prevalence surveys

Hospitals in Europe Link for Infection Control through Surveillance



A harmonised European protocol for prevalence surveys (Rossello J)