



Choosing the best method for HAI surveillance in your institution while taking benchmarking issues and caveats into consideration

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National reference center for surveillance of nosocomial infections



Choosing the best method for HAI surveillance in your institution ?

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Most important objective:



FIGURE 1. Trends in ventilator-associated pneumonia (VAP) rates for all 283 intensive care units participating in the German nosocomial infection surveillance system (KISS) from January 1999 through June 2003.

Decrease of
HAI rates

How to start surveillance in your own institution?



Prevalence ? (Cross sectional)

Less workload,
for surveillance repeated
prevalence studies are
necessary (huge CI95)

To identify areas with special
problems

Surveillance strategy in hospital A (230 beds)

Repeated prevalence studies

Medical Department			Surgical Department			Gyn/Obstetrics	
ICU 1	Ward 1	Ward 2	ICU 2	Ward 1	Ward 2	Ward 1	Ward 2
1. May	1. May	1. May	2. May	2. May	2. May	3. May	3. May
1. June	1. June	1. June	2. June	2. June	2. June	3. June	3. June
1. July	1. July	1. July	2. July	2. July	2. July	3. July	3. July
1. Aug.	1. Aug.	1. Aug.	2. Aug.	2. Aug.	2. Aug.	3. Aug.	3. Aug.
Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ

Examples for 95 % confidence intervals for a prevalence of 4.0 %

Infections	Patients	Infection rate/ 100 Patientsn	CI95
8	200	4,0	1.7-7.7
16	400	4,0	2.3-6.4
24	600	4,0	2.6-6.0
32	800	4,0	2.7-5.6

Point Prevalence Study 2011/2



German Prevalence study 2011

HAI according to specialities

Speciality	Patients	Prevalence (%)
Surgery	14 405	5.6
Internal Medicine	15 070	4.9
Gynaecology/ Obstetrics	2 423	2.8
Intensive care	1 652	18.6

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How to start surveillance in your own institution?

Prevalence ? (Cross sectional)

Less workload,
for surveillance repeated
prevalence studies are
necessary

To identify areas with special
problems

Incidence ? (Cohort)

Much more workload,
more robust data

Considering risk factors is
possible

In general better for
surveillance: ongoing

How to start surveillance in your own institution?

Incidence



Concentrated on
a special
infection type?

Concentration on a special infection type?

Which infections should be selected?

- Infections which are frequent
- Infections which can be avoided
- Infections with high morbidity and mortality
- Infections causing relevant attributable costs

Examples : BSI, CDI, Infections by MDRO

Implementation in hospital A

Medical Department			Surgical Department			Gyn/Obstetrics	
ICU 1	Ward 1	Ward 2	ICU 2	Ward 1	Ward 2	Ward 1	Ward 2
BSI	BSI	BSI	BSI	BSI	BSI	BSI	BSI
CDI	CDI	CDI	CDI	CDI	CDI	CDI	CDI
MDRO	MDRO	MDRO	MDRO	MDRO	MDRO	MDRO	MDRO

Advantages

Overview about some relevant infection types

Activity in all wards of the hospital

Surveillance can be done laboratory based (workload)

Comparison between wards is possible;
(perhaps also comparison with reference data)

Disadvantages

No overview about other relevant infections

How to start surveillance in your own institution?

Incidence

```
graph TD; A[Incidence] --> B[Concentrated on a special infection type?]; A --> C[Concentrated on a special unit?];
```

Concentrated on a special infection type?

Concentrated on a special unit?

Concentration on a special unit type?

Which units/departments should be selected ?

- Units with high infection rates
- Units where infections can be avoided
- Units with infection types with high morbidity and mortality
- Units with infections causing relevant attributable costs

Examples : ICUs, Neonatal ICUs, BMT units

Implementation in hospital A

Medical Department			Surgical Department			Gyn/Obstetrics	
ICU 1	Ward 1	Ward 2	ICU 2	Ward 1	Ward 2	Ward 1	Ward 2
X (all HAI)			X (all HAI)				
				X (SSI)	X (SSI)	X (SSI)	X (SSI)

Advantages

All HAI in high risk areas are covered (complete picture)

Close cooperation with the HCW of this unit, surveillance activities can be combined with intervention activities

Hawthorne effect

Disadvantages

No overview about other units of the hospital

Higher workload for the selected units

How to start surveillance in your own institution?

Incidence

Using the own method



Agreement about surveillance definitions and protocols

- If possible use international established surveillance definitions and protocols (e.g. CDC definitions, NHSN protocols, ECDC protocols)
- Under special circumstances it makes sense to create your own surveillance definitions (if the clinicians do not accept the international surveillance definitions)

(Example: NEO-KISS, our neonatologists did not except that CDC has no specific definitions for VLBW infants)

Advantages

You can create your own definitions
(according to the wishes of the physicians and the diagnostic procedures used in this hospital)

You can create your own surveillance protocol

Disadvantages

Often you have to defend your definitions and protocols

You have to calculate your infection rates alone.

You cannot compare with reference data

How to start surveillance in your own institution?

Incidence

```
graph TD; A[Incidence] --> B[Using the own method]; A --> C[Using a reference method]
```

Using the own method

Using a reference method

OP
KISS

NEO
KISS

ONKO
KISS

ITS
KISS

SARI

~~DEVICE
KISS~~

HAND
KISS

AMBU
KISS

MRSA
KISS

CDAD
KISS

KISS

Krankenhaus-
Infektions-
Surveillance-
System

STATIONS
KISS

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Implementation in hospital A

Medical Department			Surgical Department			Gyn/Obstetrics	
ICU 1	Ward 1	Ward 2	ICU 2	Ward 1	Ward 2	Ward 1	Ward 2
ITS KISS			ITS KISS				
SARI							
				OP KISS	OP KISS		OP KISS
MRSA KISS	MRSA KISS	MRSA KISS	MRSA KISS	MRSA KISS	MRSA KISS	MRSA KISS	MRSA KISS
HAND KISS	HAND KISS	HAND KISS	HAND KISS	HAND KISS	HAND KISS		HAND KISS

Active KISS participants September 2012

Component	Departments/ units	Hospitals
ITS-KISS	686	518
OP-KISS	753	441
DEVICE-KISS	152	70
NEO-KISS	225	222
ONKO-KISS	39	24
MRSA-KISS		338
CDAD-KISS		150
HAND-KISS		966
Total		1337*



* Total number of acute care hospitals in Germany 2008: 1780

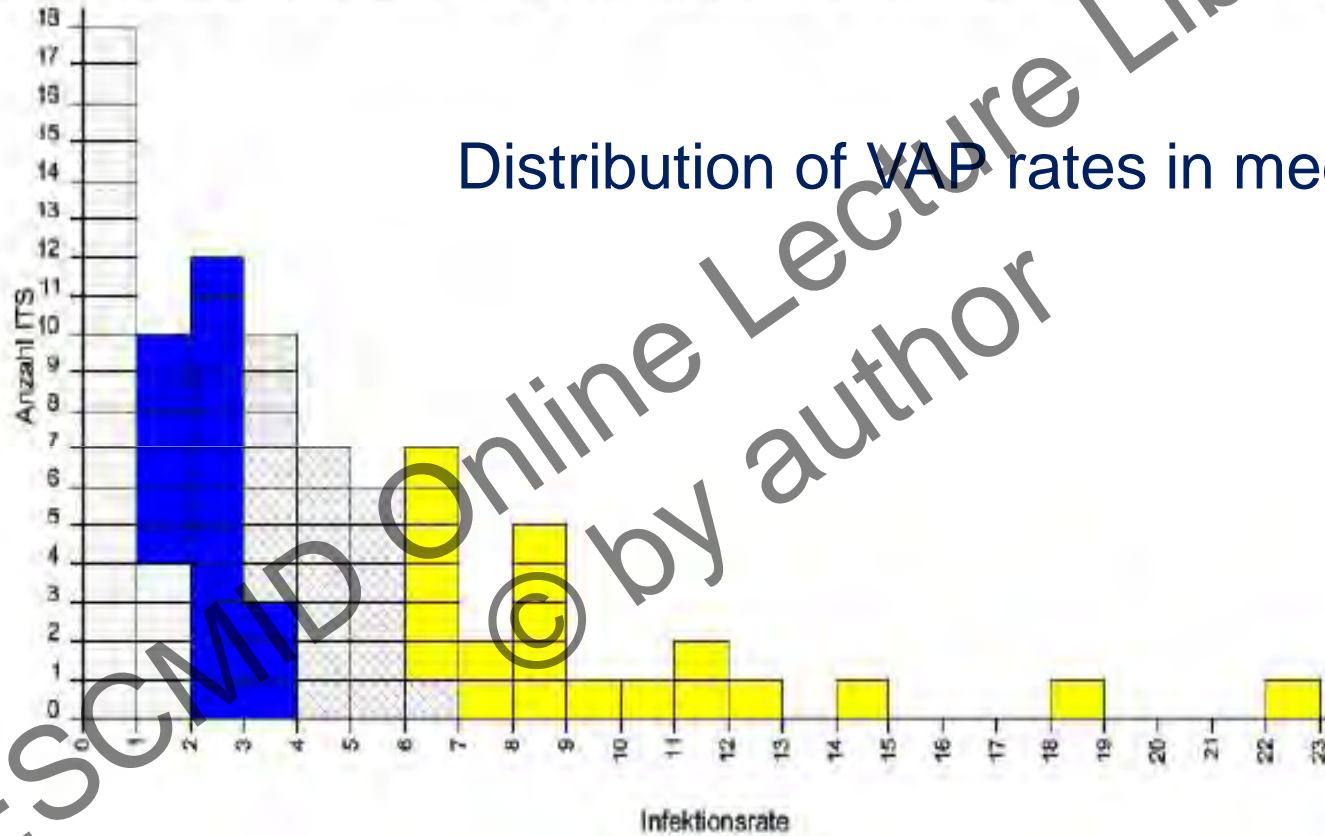
Active KISS participants September 2012

Number of components	Hospitals
1	641
2	245
3	182
4	143
5 or more	101



Referenzdaten - Verteilung der Device-Anwendungsraten und der Device-assoziierten-Infektionsraten

Abb. 49: Pneumonierate INV (pro 1000 Beatmung INV-Tage (ab 01.05)) - Stationsart: INTERNISTISCH



Distribution of VAP rates in medical ICUs

Q1: 1,26 Median: 3,38 Q3: 6,05

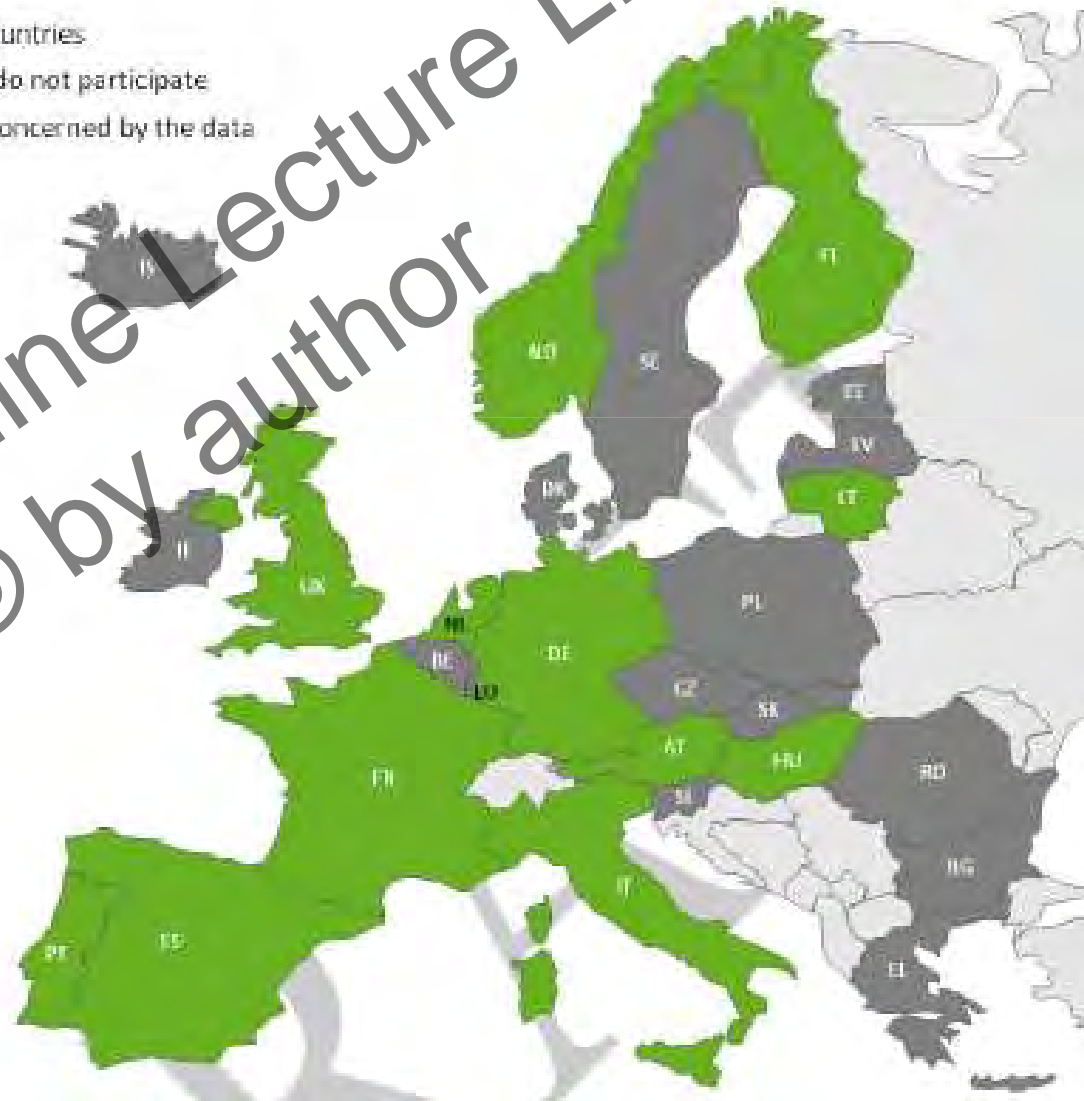
Legende

□ bedeutet Abteilung mit einer Inf. Rate \leq Q1, ■ \leq Median, ▨ \leq Q3 und ■ $>$ Q3.

Country participation, 2008-2009

Figure 1: Countries participating in surveillance of surgical site infections, HAI-Net, 2008-2009

- Participating countries
- Countries that do not participate
- Countries not concerned by the data



Countries with a surveillance System for SSI in place

Advantages

Definitions and protocols are available

It is not necessary to defend your surveillance definitions and protocols

You can compare with reference data

You can use data entry and data analysis tools of the surveillance system

Disadvantages

This may cause a problem (e.g. if the frequency of taking blood cultures is very low in your institution you can not identify BSI, despite they occur)

Perhaps you have problems in your institutions which are not addressed by the surveillance system

How to start surveillance in your own institution?

Incidence

```
graph TD; Incidence --> Patient-based; Incidence --> Unit-based;
```

Patient-based

Denominator data individual for each patient:
Example: SSI component of NHSN

Unit-based

Summarized information for all patients together:
Example: ICU component of NHSN, risk factor analysis not possible

EXAMPLE Charité 2013



- Surveillance of HAI in all neonatal ICUs (NEO-KISS)
- Surveillance of HAI in BMT and hematology units (ONKO-KISS)
- Surveillance of SSI (only in selected departments: Cardiosurgery, orthopaedics)
- Surveillance of HAI in all ICUs (ICU-KISS)
Surveillance of antibiotic usage in all ICUs
- Surveillance of MDRO in all units
- Surveillance of CDI in all units
- Surveillance of alcoholic hand rub consumption in all units (HAND-KISS)

Patient
based

Unit-
based

SUMMARY: Choosing the best method for HAI surveillance in your institution

- Analysis of the baseline situation (prevalence data, earlier results, outbreaks etc.)
- Characteristics of the hospital (famous for a specific operation type?)
- Which resources are available (man power)?
- Which data resources are available?
- Formulation of clear objectives (to decrease SSI rates following hip prothesis)

Taking benchmarking issues into consideration...

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Example NEO-KISS: Standardized infection ratio (SIR)

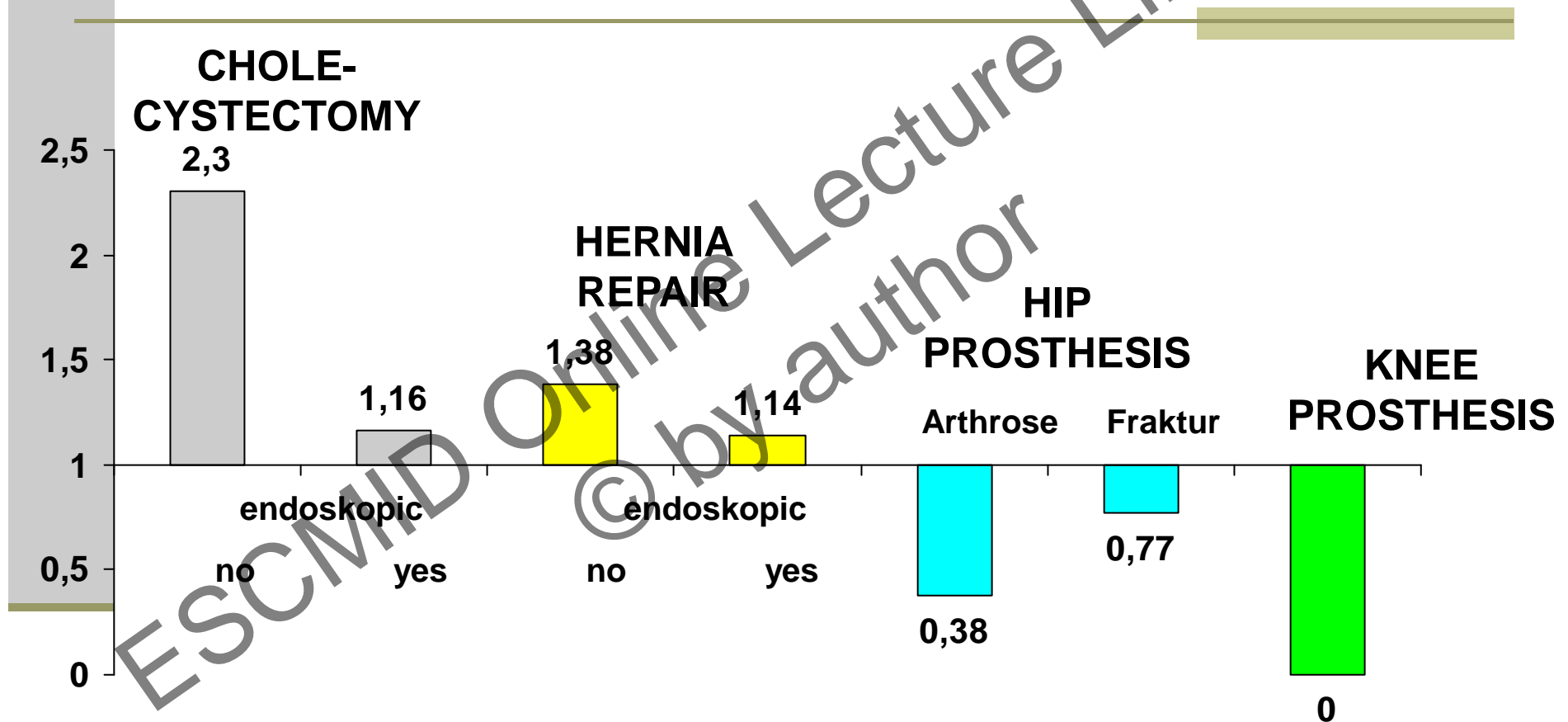
It takes a department's patient population composition into account and evaluates that department's infection frequency in comparison to other departments. According to NEO-KISS analyses, birth weight has been identified as the most relevant risk factor and is therefore used for standardization

$$\text{SIR} = \frac{\text{Total number infections observed}}{\text{Total number infections expected}}$$

If SIR is < 1, then fewer infections were observed than expected.
This is a sign of a good situation in a department.

EXAMPLE: SSI surveillance

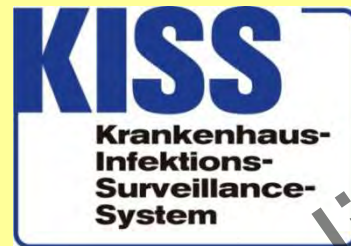
Standardized infection ratios (SIR)



Comparisons are only valid

- If all have the same intensity of surveillance
- Uniform definitions (CDC)
- Similar data collection methods
- Risk adjustment according the most important risk factors

Voluntary
participation+
Confidential data



Mandatory
participation+
Confidential data



Mandatory
participation+
Mandatory
reporting



Taking caveats into consideration

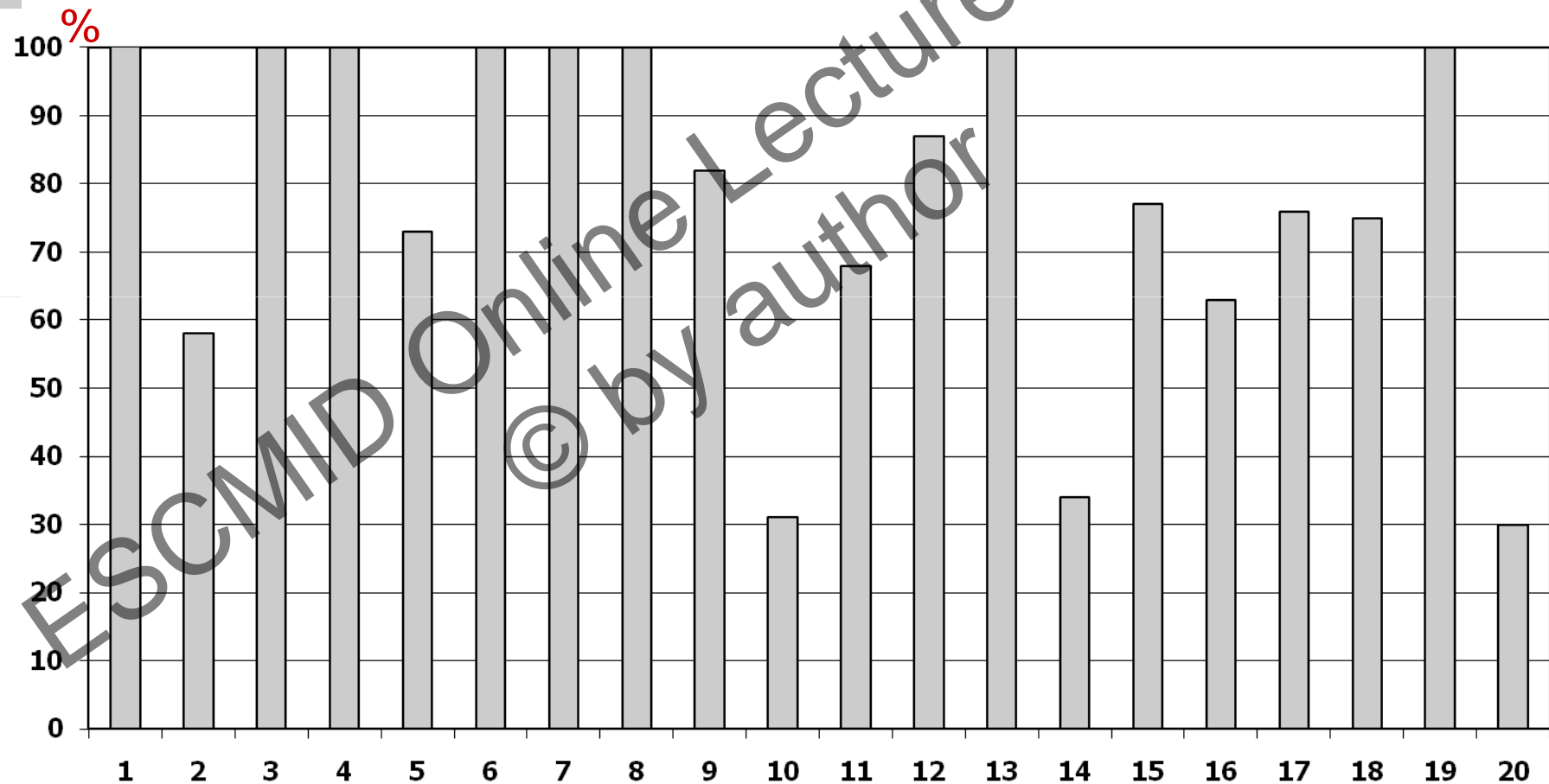
...

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TABLE 2. Comparison of the Results of the National Nosocomial Infections Surveillance Systems (NNIS) Validation Study With Results of an Evaluation of the Krankenhaus Infektions Surveillance System (KISS)

Nosocomial infection	No. of medical records evaluated	Diagnostic accuracy	
		Sensitivity, %	Specificity, %
Pneumonia			
NNIS	185	68	97.8
KISS	181	69	99.8
Bloodstream infection			
NNIS	132	85	98.3
KISS	51	83	99.8
Other (including bronchitis)			
NNIS	66	30	98.8
KISS (only bronchitis)	54	47	99.9

Distribution of the sensitivity during the KISS validation study in 20 ICUs: LRTI + BSI



Annual validation with case histories

Table 2

Example of a case history with a nosocomially acquired pneumonia and an asymptomatic bacteriuria used for the validation study in 2006

A 46 years old patient was admitted to the emergency room following resuscitation due to fire in his house. At the time of admission he was unconscious. His medical history was unknown.

Day 1 Admission to the ICU, intubated and mechanical ventilated; first and second degree burn on hands, forearms and chest. He got a urinary catheter and a central line. The chest radiographic examination showed congestion signs, left-sided rib fractures and no infiltrate in the ventilated areas.

Day 2 The patient was continuously mechanical ventilated, no awakening reaction was observed. The computerized axial tomography of the head showed no fracture, haemorrhage or infarction. Temperature 37.5°C. Dimness of the sparse catheter urine. Ultrasound examination of the kidneys, urether, bladder and urethra: no abnormality detected.

Day 4 Without sedation no awakening reaction, no pain reaction, no pupil reaction. Laboratory: CRP 3.5 mg/dl. Increased suctioning requirements of the respiratory tract. Growth in culture of *Pseudomonas aeruginosa* from lower respiratory tract specimen. The chest radiographic examination shows incipient new infiltrate in both lungs. Patient had a positive urine culture with 10^6 CFU *Candida albicans* per cc of urine, physician instituted antimicrobial therapy.

Day 5 Condition unchanged. CT scan of the chest showed progressive infiltrates on both sides. Fever (39°C). Proof of *P. aeruginosa* from one of three blood cultures. Replacement of the central line. Laboratory: CRP 9.8 mg/dl. Physician changed antibiotic therapy according to the antibiogram.

?

1. No infection
2. A community acquired infection
3. A nosocomial infection

ITS
KISS

OP
KISS

NEO
KISS

Gastmeier et al. *J Hosp Infect*
2008; 70: S11-16



Benutzerauswertung der Umfrage:
ITS-KISS Kasuistiken 2010
Auswertungsdatum: 14.09.2010



Tabelle 2: Ihre Sensitivität und Spezifität

	Ihr Ergebnis (%) bezogen auf Infektionsgruppen
Sensitivität	80
Spezifität	93,8

Tabelle 3: Verteilung der Sensitivität und Spezifität aller Teilnehmer (in % bei 365 Teilnehmern)

	min.	q10*	q25*	q50*	q75*	q90*	max.
Sensitivität	30	50	70	80	90	100	100
Spezifität	76,9	83,3	83,3	90,9	93,8	96,8	100

Questionnaire to KISS ICUs 2008

How many blood cultures do you take ?

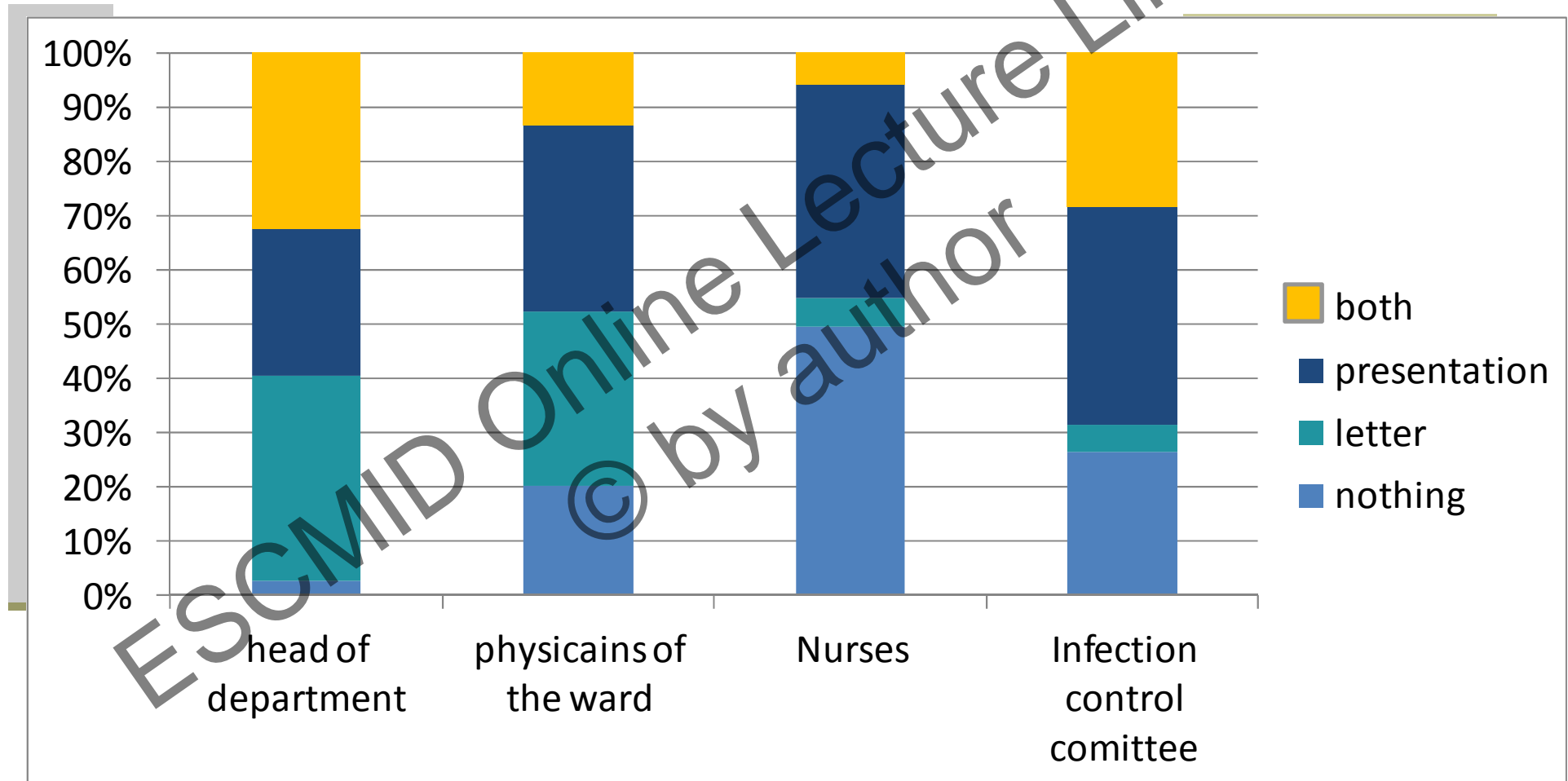
Number of ICUs =223	Blood cultures per 1000 patient days	
Minimum	3	
25.Percentile	33	1st Quartil
Median	60	2nd Quartil
75.Percentile	108	3rd Quartil
Maximum	680	4th Quartil
Mean	86	

How to start surveillance?

- Ask the head of the department
- Explain and train the definitions
- Explain the protocol
- Explain data entry and data management
- Explain and train the interpretation of surveillance data
- Explain the use of reference data for improvement in the own institution
- Present the data stimulating further IC activities

Questionnaire to surgical departments participating in KISS 2009

How do you present the data?



www.nrz-hygiene.de



The screenshot shows the homepage of the National Reference Center for Nosocomial Infections (NRZ). The header features the NRZ logo and the title 'Nationales Referenzzentrum für Surveillance von nosokomialen Infektionen'. A navigation bar includes links for 'NRZ', 'SURVEILLANCE', 'SUPPORT', 'DOWNLOAD', 'LINKS', and 'KONTAKT'. A left sidebar lists various sections such as 'AKTUELL', 'VERANSTALTUNGEN', 'VORSTELLUNG', 'AUFGABE', 'EXPERTENRAT', 'PUBLIKATIONEN', 'NEWSLETTER', 'STELLENANGEBOTE', 'ARCHIV-AKTUELL', 'IMPRESSUM', 'ÜBUNGSKASUSSTIKEN', and 'KISS-ZERTIFIKAT'. The main content area displays two news items: 'MRSA-KISS(-REHA) Anmeldebogen und Erfassungsbögen sind online' and 'Newsletter'. Both items include a date '(Meldung vom 05.02.2009)'. On the right side, there are logos for 'Charité - Universitätsmedizin Berlin' and 'Humboldt-Universität zu Berlin'.

all definitions,
all methods,
all reference data