Protocol

Surgical site infection surveillance

© National Reference Center
for the Surveillance of Nosocomial Infections

at the

Institute for Hygiene and Environmental Medicine
Charité – University Medicine Berlin

www.nrz-hygiene.de

Last updated: December 2011
Valid from January 2012
Contact information:
Nationales Referenzzentrum (NRZ) für Surveillance von nosokomialen Infektionen
am Institut für Hygiene und Umweltmedizin
(Institute director: Petra Gastmeier, MD)
Charité - Universitätsmedizin Berlin
A joint institution of Free University Berlin
and Humboldt University
Hindenburgdamm 27
12203 Berlin, Germany

Tel.: 030/8445 3680
Fax: 030/8445 3682

and

Tel.: 049 30/ 450 570 022
Fax: 049 30/ 450 570 904
E-mail: nrz@charite.de
Homepage: www.nrz-hygiene.de
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**1 Introduction**

Surgical site infections (SSI) are the third most common kind of nosocomial infection and are a problem for all surgical fields. Infected surgical wounds often have serious consequences for effected patients and surgical departments and have therefore always been of special concern.

In order to make comparing the infection rates of various clinics possible, the infection rates for different kinds of surgery have to be analyzed separately. KISS concentrates on a series of indicator operative procedures that are either performed frequently or are especially relevant for SSIs. Departments participating in OP-KISS choose one or more indicator operative procedures from a catalogue that includes over twenty kinds of surgery from almost all surgical fields. The kinds of indicator operation are defined by their OPS-301 codes.

In order to determine the number of SSIs, every patient who has undergone a selected indicator operative procedure is tracked after the operation until he or she is released from the hospital. Uniform diagnosis is made possible by using CDC-definitions (available at [www.nrz-hygiene.de/surveillance/op-kiss.html](http://www.nrz-hygiene.de/surveillance/op-kiss.html)). SSIs are divided into superficial incisional, deep incisional and organ/space infections. The SSI rate for each kind of operation can be determined from the number of SSIs that appear after each kind of indicator operative procedure.

Risk stratification is undertaken in order to take into account the unique patient population of each clinic and each patient’s individual risk based on specific risk factors. NNIS risk scores that consider length of operation, patient ASA score and degree of wound contamination are used. An operation is put into a risk category based on the number of risk variables present. SSI rates are first calculated for each risk category separately. Risk categories are then summarized if they do not differ from one another significantly. Some kinds of operation (cholecystectomy, for example) are further differentiated into open surgery and laparoscopic procedures.

In order to simplify interpretation, the NRZ (National Reference Center = Nationale Referenzzentrum= NRZ) calculates a standardized SSI index for each participating department for each kind of selected indicator operation. This figure presents the relation between the number of actual SSIs and the number of infections expected based on a patient’s combination of risk factors (see 4.6.4, standardized SSI index).

Reference data are updated and published once per year and can be accessed under [www.nrz-hygiene.de/surveillance/op-kiss](http://www.nrz-hygiene.de/surveillance/op-kiss) > Reference data.
2 Goals of the surveillance protocol

This surveillance protocol has the primary function of providing departments participating in OP-KISS with necessary definitions and specifications. These definitions standardize data collection and analysis so that reference data for internal quality assurance can be made available.

Secondarily, it allows other, interested but non-participating hospitals to collect and evaluate data analogically. It is possible for hospitals to orient themselves with OP-KISS reference data in this manner.

The definitions of the National Nosocomial Infections Surveillance (NNIS) Systems of the Centers for Disease Control and Prevention (CDC)\(^1\)\(^-\)\(^4\) in the USA were used as a basis for this protocol. The experiences of the Institute for Hygiene at the Free University Berlin and the Institute for Environmental Medicine and Hospital Hygiene at the Albert-Ludwigs-University Freiburg gained by the NIDEP (“Nosocomial infections in Germany—Data collection and prevention”) study as well as those experiences with KISS since 1997 have been taken into account.\(^5\) An overview of OP-KISS was published in “Chirurg” in German in 2002.\(^6\)

The list of KISS indicator operative procedures is updated more often than this protocol and can also be found on the NRZ web site.

\(^{*}\) Continuous, systematic collection, analysis and interpretation of health-related data necessary for planning, introducing and evaluating medical procedures, as well as the regular transfer of these data to those who need them.
3 Requirements for hospital participation in KISS and duties of KISS institutions

Participating hospitals must fulfill the following requirements:

- Hospital status (Institutions for outpatient operative procedures can participate in AMBU-KISS)
- The head of the participating surgical department must agree to that department’s participation.
- Agreement to use the specifications found in this protocol and CDC definitions for diagnosis of SSIs. Attending physicians must be made aware of these definitions.
- Participation of at least one hospital representative responsible for surveillance in an introductory course by the NRZ before registration.
- Data collection and transfer via webKess and availability of necessary hardware
- Regular entry of surveillance data into webKess
- The head of the participating surgical department must agree to the publication of anonymous reference data.
- Participation of a department representative in regular NRZ events for experience exchange at least every two years
- Preparedness to implement quality assurance measures upon relevant surveillance results
- Preparedness to participate in validation procedures for data quality assurance (e.g. to assure appropriate nosocomial infection diagnosis)

The institutions supporting KISS promise the participating hospitals:

- To provide advice and expert support during surveillance
- To handle each unit’s data strictly confidentially
- To provide participating hospitals with standardized and stratified reference data annually
- To advise them on the implementation of surveillance results for quality management
4 SSI surveillance methods

The methods proposed by KISS primarily support internal quality assurance measures. Continuous, intense contact to physicians and nurses is very important for this reason.

Equally crucial for the identification of patients with nosocomial infections is the regular examination of laboratory findings and patient charts on each unit. The less often laboratory testing is performed in a hospital, the more closely patient clinical symptoms must be paid attention to. Regular visitations and close contact to unit personnel are appropriate methods.

4.1 Indicator operative procedures

KISS concentrates its surveillance on specific indicator operative procedures defined by OPS-301 procedure codes. Hip replacement surgery (HPRO) has been further specified by the ICD-10 definition code. Explanations and examples of indicator operative procedures can be found in chapter 7.

Participating surgical departments choose one or more indicator operative procedures. The frequency of an operation should be taken into account while choosing indicator operative procedures in order to assure the interpretability of the results over time. If indicator operative procedures are performed too infrequently, then a few SSIs will have great influence on the infection rate, making it impossible to determine in an infection rate is significantly high or not.

4.2 Risk stratification

The risk of a SSI depends on operation-related factors, such as the kind of operation, degree of wound contamination and duration, as well as patient-related factors, such as general condition and underlying illness.

In order to take the spectrum of illnesses between participating hospitals into account, the SSIs are stratified accorded to the NNIS risk index. The variables necessary for stratification must be recorded for every operation, with or without SSI.

In addition to NNIS risk index factors, some operative procedures are differentiated by whether they were emergency or elective. The indicator operative procedures “COLO” and “SECC” can optionally be differentiated in this way.

4.3 Surveillance processes

- Data collection and evaluation occurs on the basis of the surgical department, consisting of a head doctor, a physician/nursing operative team or a surgical wing. A hospital can have multiple surgical departments (e.g. emergency surgery, general surgery, or obstetrics).
- All patients who undergo an indicator operative procedure in a participating surgical department are tracked for signs of an SSI. The presence of an SSI is determined according to the CDC definitions for SSIs. Links to the current version
Tracking must also take place when the patient is not in the surgical department (on an intensive care unit or in an internal medicine wing, for example). For this reason, surgical departments should enter all patients with all necessary data into the operation list (see 5.2, Operation list).

- Infection control personnel should track patients.
- Based on the operation list, the following is recommended for those responsible for surveillance:
  - Participating in dressing examination
  - Examining of laboratory findings
  - Asking directly for signs of infection
  - Looking into patient charts upon signs of infection

- It must be certain that active surveillance is maintained for all patients on the operation list until they are released from the hospital. Waiting until the infections are registered by unit personnel or physicians tends to hinder infections from being recorded.
  Patients that had an indicator operation but who cannot be kept under surveillance (because the responsible person is absent, for example) may not be registered in NRZ or put on the operation list.

### 4.4 Length of patient surveillance

- According to CDC definitions, an infection of a wound or of the operational area is considered a SSI when this infection appears within 30 days (within 1 year for implants) of the surgery.

The following surveillance times are used:

- A1: 30 days
- A2: 30 days or 1 year
- A3: 30 days or 1 year

- If a further operation is performed in the same operational area, then surveillance for the first operation is ended.

**Example 1:**
- Jan. 1: hip prosthesis with diagnosis of fracture (operative procedure code HPRO_F)
- Jan. 14: subfascial hematoma removal
- Feb. 10: deep incisional SSI

**Information relevant for KISS**
- HPRO_F surveillance began on Jan. 1 and ended Jan. 14 (because of the revision operation)
- The SSI of Feb. 10 is not recorded (because it cannot be unequivocally attributed to the operation of Jan 1 or Jan 14)

Example 2:
- Jan. 1: Right aortofemoral bypass (operative procedure code GC_EXT)
- Jan. 12: Reoperation; intraoperative diagnosis of SSI
- Jan. 20: renewed SSI

Information relevant for KISS
- GC_EXT surveillance began on Jan. 1 and ended on Jan. 12 (because of operation in the same operational area)
- SSI of Jan. 12 is recorded and should be documented in webKess as an SSI related to the operation of Jan. 1.
- The revision operation of Jan. 12 is not an indicator operative procedure, even when it had an OPS-301 procedure code classifying it as GC_EXT because this operation was carried out within 30 days of an operation in the same operative area. The renewed SSI of Jan. 20. is not recorded because only SSI following indicator operative procedures are tracked.

- Surgical patients are tracked at least until their discharge from the hospital. A considerable percentage of SSI appears after release, making further observation or “post-discharge surveillance” worthwhile. There is not yet a simple and valid method for tracking patients in the period after release. “Post-discharge surveillance” is optional for this reason.

Example 3:
- April 1: Inguinal hernia surgery
- April 3: Discharge with no signs of wound irritation or inflammation
- April 8: Patient admitted outpatient to hospital with clinical signs of superficial SSI. Outpatient care physician diagnoses superficial SSI according to CDC definitions. Anamnestic appearance of first symptoms on April 6. This information is given to the person responsible for KISS data entry and recorded as follows in the database: date of infection April 6, “SSI determined after discharge.”

4.5 End of surveillance

The end of surveillance is usually recorded in the field “end of surveillance” as “date of discharge” from the hospital. Surveillance, however, can also be ended earlier during a hospital stay for the following reasons:

- Operative procedure in the same operational area
- Death of patient during hospital stay
- End of surveillance period (>30 d or >1 year)

In these cases, enter the date of the end of surveillance (date of operation in the same area; date of death; or date of the end of the surveillance period).

4.5.1 Reoperation
Reoperations are repeat invasive surgical procedures in the same operational area as a recent indicator operative procedure. These are usually performed in the surgical theater. Lesser procedures like draining hematomas or seromas are not considered reoperations. Surveillance is not ended after these lesser procedures.

### 4.6 SSI rate calculation

#### 4.6.1 Surgical site infection rate (total)

The surgical site infection rate (SSI rate) is the quotient of the total number of SSIs within the appropriate observation period in patients after an indicator operative procedure of type X and the total number of indicator operative procedures of type X, multiplied by 100.

\[
\text{SSI rate} = \frac{\text{Total SSI in patients after operative procedure type X within the time period}}{\text{Total operative procedures of type X in time period}} \times 100
\]

“Operative procedures of type X” refers to any one group of indicator operative procedures.

**Example:**

\[
\text{SSI rate} = \frac{\text{Total SSI in patients after cholecystectomy within the time period}}{\text{Total cholecystectomies performed in time period}} \times 100
\]

#### 4.6.2 Stratified SSI rate by risk category

KISS stratifies SSI rates according to the NNIS risk index.\(^7\)\(^8\)

For these calculations a risk point is assigned to an operation when the following criteria are fulfilled:

- The operation lasted longer than 75% of operations of the same type. This value in minutes is calculated yearly by the NRZ.
- The wound class is 3 (contaminated) or 4 (dirty-infected).
- The patient’s ASA score is 3 or higher.

The risk category of an operation reflects the number of risk points (Risk category = 0, 1, 2, or 3).

Stratified SSI rates are calculated according to the following formula:

\[
\text{Stratified SSI rate} = \frac{\text{Total SSI after procedures of risk category Z after procedure of type X}}{\text{Total procedures of risk category Z after procedure type X}} \times 100
\]
Example calculation

Within one year in one surgical department, 400 indicator operative procedures of the type “hip prosthesis” were performed. 200 operations had no risk points, after 10 of which SSIs developed. One risk point was assigned to 100 operations, after 10 of which SSIs developed. Two risk points were assigned to 70 operations, after 7 of which SSI developed. All three risk points were assigned to 30 operations and SSI appeared following 5 of these operations.

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Total operations in this category</th>
<th>Total SSI</th>
<th>SSI rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
<td>10</td>
<td>10/200 x 100 = 5.0</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>10</td>
<td>10/100 x 100 = 10.0</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>7</td>
<td>7/70 x 100 = 10.0</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>5</td>
<td>5/30 x 100 = 16.7</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>32</td>
<td>32/400 x 100 = 8.0</td>
</tr>
</tbody>
</table>

4.6.3 In-house SSI rate

The in-house SSI rate of a department is calculated entirely on the basis of SSIs diagnosed during primary in-patient care. It is also given analogically to the total SSI rate stratified by risk category (see 4.6.2).

\[
\text{In-house-SSI rate} = \frac{\text{Total in-house SSI in patients after an operative procedure of type X within the observational period}}{\text{Total operative procedures of type X in the observational period}} \times 100
\]

“Indicator operative procedure of type X” refers to a single group of indicator operative procedures.

4.6.4 Standardized SSI index

If reference data are available for a type of indicator operative procedure, then a standardized SSI index can be calculated.

\[
\text{Standardized SSI index} = \frac{\text{Total observed in-house SSI}}{\text{Total expected in-house SSI}}
\]

The total number of expected in-house SSI is calculated by summing the expected number of in-house SSI of each risk group.
Expected SSI for risk category A = Known in-house SSI rate (reference value) \times \frac{\text{Total operations in this risk category}}{100}

Because the percentage of SSI diagnosed after discharge can vary considerably from department to department, the standardized SSI index is calculated entirely on the basis of “in-house” SSI, that is, infections diagnosed during the primary in-patient hospital stay. In addition, the standardized SSI index takes the distribution of patients by risk category into account. This provides for a risk-adjusted relation between one department’s SSI rates and that of the reference data, allowing that department to benchmark its SSI frequency.

The SSI index is equal to 1 when the number of observed SSI and expected SSI are equal. SSI index values greater than 1 show that a higher number of SSI appeared than was expected. SSI index values less than 1 show that fewer SSI appeared than expected.

**Example calculation of standardized SSI index**

For this example, the NRZ databank provided the following fictitious mid-range stratified in-house SSI rates for hip prosthesis that should serve as reference values.

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Total operations in this category</th>
<th>Total observed SSI</th>
<th>Total in-house observed SSI</th>
<th>In-house SSI rate (observed)</th>
<th>In-house SSI rate (reference data)</th>
<th>Total in-house SSI (expected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
<td>2</td>
<td>1</td>
<td>0.5</td>
<td>1.0</td>
<td>( \frac{1.0}{100} \times 200 = 2.0 )</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>8</td>
<td>7</td>
<td>7.0</td>
<td>3.0</td>
<td>( \frac{3.0}{100} \times 100 = 3.0 )</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>7</td>
<td>7</td>
<td>10.0</td>
<td>5.0</td>
<td>( \frac{5.0}{100} \times (70+30) = 5.0 )</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>3</td>
<td>1</td>
<td>3.3</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>400</strong></td>
<td><strong>20</strong></td>
<td><strong>16</strong></td>
<td><strong>4.0</strong></td>
<td><strong>-</strong></td>
<td><strong>10.0</strong></td>
</tr>
</tbody>
</table>

In this example, 6 more SSI appeared (16 instead of 10) than were expected based on patient risk group distribution.

**Standardized SSI index = 16 (observed SSI) divided by 10 (expected SSI) = 1.6**

SSI appeared 1.6 times more often than would have been expected based on the reference data for patient risk category distribution.

4.6.5 Comparison of one department’s infection rates with reference data
The SSI rates described in chapters 4.6.1 to 4.6.3 are calculated for each participating surgical department.

In order to classify these data, the following statistical values for the reference data are given:

- Median (the SSI rate of half of all departments lies above or below this figure)
- 75% quartile (75% of all departments have a SSI rate below this figure)

The “pooled SSI rate” is calculated from the total number of all operative procedures and all SSI registered on KISS of one indicator operative procedure type.

In addition to the reference data, graphs and funnel plots are available under “KISS Intern” on webKess for OP-KISS. These illustrate one department’s position in relation to all other departments taking part in KISS and can be used for the further examination of unusual infection rates.

4.6.6 Descriptive overview of the particular risk factors

A distribution of risk factors taken into account during risk adjustment (duration, wound contamination class, ASA score) is provided for each indicator operative procedure for each participating department.

The following parameters are calculated:

- Duration: average operation duration in minutes
- Wound contamination class: Percent of all operations per wound class
- ASA score: Percentage of patients with each score (1-5)

For the comparison with other departments, the operation duration (average duration, 25% quartile, median and 75% quartile) for each indicator operative procedure on participating departments is determined. The distribution of wound contamination classes and ASA scores for all operations of a type recorded in KISS can be compared in the form of percentages to a single department’s data.

This evaluation makes risk factor distribution on each department clearer. The risk-adjustment of SSI infection rates by risk category and the standardized SSI index take these factors and their influence into account (see 4.2).
5 Documentation specifications

5.1 Electronic surveillance data collection

The NRZ has made an electronic system for data entry available for all KISS participants. webKess (www.webkess.de) enables users to document and transfer the surveillance data collected on site. Any participant can evaluate their own department’s data at any time.

In order to make sure that the reference data include the most recent surveillance data, KISS participants are required to complete their data for one calendar year within four weeks of its end.

In the event that webKess is not available for technical reasons, then the data collection forms found in this protocol should be used. These data must be entered into webKess as soon as it is available.

The data input forms in webKess can differ by operative procedure. Some fields are required for some or all types of operative procedure. KISS participants can use the fields open for commentary for their own purposes. These comments will not be evaluated by the NRZ.

5.2 Operation list

A list with patients to be included in KISS should be prepared by the surgical department. This list should be prepared regularly (e.g., daily) so that infection control professionals can use it to target and track KISS-relevant patients.

If possible, the documentation systems already in place in a hospital should be used. Most of the data required for KISS are available from the hospital information network, with the notable exception of the ASA score and wound contamination class. It is, however, possible to add these fields to software documenting the surgery. While coding an operation, a surgeon can also fill in the ASA score and wound contamination class, thus ensuring that this information is available to KISS and other quality assurance systems.

To include an operative procedure on the operation list, apply the following criteria:

- The primary procedure (by OPS-301 code) is decisive for the definition of the indicator operative procedure. In a few exceptions, certain secondary procedures (e.g., COBY_L or COBY_T) or the diagnosis (e.g., HPRO_A and HPRO_F) are important for determining the type of indicator operative procedure.
  - See the current field-specific lists of operations under http://www.nrz-hygiene.de/surveillance/kiss/op-kiss/indikator-op/
- Only those operations with primary wound closure can be included. Wound assessment according to CDC definitions is otherwise not possible.
- Operations are not included when a patient had an operation in the same operative area within the previous 30 days. It does not matter if the first operation was an indicator operative procedure or not. (For example, a hip prosthesis
surgery two weeks after a gamma nail osteosynthesis is not included. Similarly, a cholecystectomy three weeks after a laparotomy is not included).

- The patient may not have died (e.g., post-mortem nephrectomy for transplant is not included in the operation list).

Further information and examples for the inclusion or exclusion of operations are in chapter 7.1, “General Information about Indicator Operative Procedures.”

The following factors must be recorded for each operation on the list:

<table>
<thead>
<tr>
<th>Type of operation</th>
<th>See KISS indicator operative procedure list <a href="http://www.nrz-hygiene.de/surveillance/kiss/op-kiss/indikator-op/">http://www.nrz-hygiene.de/surveillance/kiss/op-kiss/indikator-op/</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of operation</td>
<td>DD/MM/YYYY</td>
</tr>
<tr>
<td>End of surveillance - Date (=end of surveillance during postoperative, ambulant stay)</td>
<td>The date of the end of surveillance may be entered here. This date is usually that of discharge, but can also be the date of death, the date of a second operation carried out in the same operative area, or the end of the surveillance period after 30 days or 1 year.</td>
</tr>
<tr>
<td>End of surveillance - Reason</td>
<td>Optionally select the reason for ending surveillance: • Discharge • Reoperation • Death • End of surveillance period</td>
</tr>
<tr>
<td>Birth year</td>
<td>YYYY</td>
</tr>
<tr>
<td>Sex</td>
<td>Male or female.</td>
</tr>
<tr>
<td>Operation duration</td>
<td>Time in minutes between incision and closure.</td>
</tr>
<tr>
<td>Wound contamination class</td>
<td>Please consider the specifications for each type of operative procedure found under <a href="http://www.nrz-hygiene.de/surveillance/kiss/op-kiss/indikator-op/">http://www.nrz-hygiene.de/surveillance/kiss/op-kiss/indikator-op/</a></td>
</tr>
<tr>
<td>1 = Clean:</td>
<td>An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.</td>
</tr>
<tr>
<td>2 = Clean-Contaminated:</td>
<td>Operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.</td>
</tr>
</tbody>
</table>
3 = Contaminated:

Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.

4 = Dirty or Infected:

Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing SSI were present in the operative field before the operation.

ASA score

Assessment by the anesthesiologist of the patient’s preoperative physical condition using the American Society of Anesthesiologist’s (ASA) Classification of Physical Status. Patient is assigned one of the following which is used as one element of the SSI Risk index:

1 = Normally healthy patient
2 = Patient with mild systemic disease
3 = Patient with severe systemic disease that is not incapacitating
4 = Patient with an incapacitating systemic disease that is a constant threat to life
5 = Moribund patient who is not expected to survive for 24 hours with or without the operation

Endoscopic operation

YES ► the operation was performed entirely endoscopically (minimally invasive)
NO ► the operation was performed openly, combined with minimally invasive and open surgical techniques, or a minimally invasive procedure was changed to an open surgical procedure.

Implants

For certain procedures, select either:
YES ► An implant† was put in. For example: hip prosthesis, vascular prosthesis, screws, wires, artificial omentum.
NO ► No implant according to CDC definitions was put in with this procedure.

Necessity of procedure

For certain procedures, select either:
Elective: the procedure was planned at least 24 h in

† A nonhuman-derived object, material or tissue that is permanently placed in a patient during an operative procedure and is not routinely manipulated for diagnostic or therapeutic procedures (CDC definitions, 2008).
Emergency: the procedure had to be performed immediately or within 24h of planning.

5.3 SSI data collection

The following data must be collected when an SSI appears in a patient under surveillance. The data can be initially recorded on an SSI data collection form, but must be added online to the previously collected data about the operation.

**Date of infection**

Day, on which the first clinical signs appeared, or the day on which the sample was taken on the basis of which the diagnosis was made, whichever came first.

**Surgical site infection (SSI)**

See CDC definitions. (www.nrz-hygiene/surveillance/kiss/op-kiss)

A1: superficial incisional SSI
A2: deep incisional SSI
A3: organ/space SSI

**When determined**

Select where appropriate:
- During initial hospital stay
- After discharge
- Upon re-admission

**Pathogen responsible for SSI**

- Give only when the pathogen appears responsible for the SSI
- Do not enter colonizations
- See chapter 6.1 for pathogen codes
- If no etiologically relevant pathogen is proven responsible, select “Proof of pathogen: None.”

**Complications**

**Secondary BSI**

Select yes or no.
Secondary BSI is a laboratory (blood culture) confirmed BSI that is related to a nosocomial infection at another body site. The proven pathogen must have an identical antibiogram as the primary source of infection, namely the SSI.

**Death**

Select yes, if the patient died during surveillance, independent of the cause of death.

5.3.1 Procedures for infections already present in the operative area/ Treatment of wound contamination class 4
All indicator operative procedures that fulfill the inclusion criteria described in this protocol are to be included in the operation list. If the characteristics of class four wound contamination are present, then this should be noted on the operation list during an appropriate operation under “wound class.” A new infection can only be diagnosed when

- The old infection in the operative area has completely healed
- A new infection in a clearly different operative area has appeared

If there is already an organ or space infection at the time of operation, then it is possible for the patient to develop a superficial or deep incisional SSI independent of the original infection. These infections must be recorded as SSI in OP-KISS.

**Example:**
A patient with pains in the lower right abdomen and abdominal guarding is admitted to the surgical ER. A perforated appendicitis with surrounding peritonitis is discovered intraoperatively. IV antibiotics are given and the wound is closed during the operation. Five days later, redness develops at the surgical site that is painful to the touch, and the treating physician removes two sutures.

The following must be recorded:
- Indicator operative procedure APPE with wound contamination class 4
- A1 grade SSI on the 5th postoperative day
# Data collection form for surgical site infections

## OP-KISS

### PROCEDURE DATA

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of operation:</td>
<td></td>
</tr>
<tr>
<td>Type of operation:</td>
<td></td>
</tr>
</tbody>
</table>

### SURGICAL SITE INFECTION

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of infection:</td>
<td></td>
</tr>
<tr>
<td>Infection code (per CDC definition):</td>
<td></td>
</tr>
<tr>
<td>superficial (A1)</td>
<td></td>
</tr>
<tr>
<td>deep (A2)</td>
<td></td>
</tr>
<tr>
<td>organ / space (A3)</td>
<td></td>
</tr>
<tr>
<td>Determined:</td>
<td></td>
</tr>
<tr>
<td>during hospital stay</td>
<td></td>
</tr>
<tr>
<td>after discharge</td>
<td></td>
</tr>
<tr>
<td>upon re-admission</td>
<td></td>
</tr>
<tr>
<td>Laboratory-confirmed diagnosis (Pathogens – max 4)</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

### COMPLICATIONS

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary BSI:</td>
<td>yes</td>
</tr>
<tr>
<td>Pathogen found in blood culture:</td>
<td>no</td>
</tr>
<tr>
<td>Death (after SSI during hospital stay):</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>no</td>
</tr>
</tbody>
</table>

### COMMENTS (not evaluated by NRZ)

This form can be used for internal data collection. Data must be transferred electronically to the NRZ.
### 6 Pathogen codes

Up to four pathogens can be documented for a single infection. Pathogens and pathogen groups are coded as follows. The abbreviations were not translated because of technical reasons and therefore may not be similar to the pathogen they represent.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus</td>
<td>SAU</td>
</tr>
<tr>
<td>Coagulase-negative staphylococci</td>
<td>KNS</td>
</tr>
<tr>
<td>Streptococcus pyogenes (A-streptococci)</td>
<td>STR_A</td>
</tr>
<tr>
<td>Streptococcus pneumoniae (pneumococci)</td>
<td>STR_P</td>
</tr>
<tr>
<td>Enterococcus spp.</td>
<td>ENT</td>
</tr>
<tr>
<td>Haemophilus spp.</td>
<td>HAE</td>
</tr>
<tr>
<td>Corynebacterium spp.</td>
<td>COR</td>
</tr>
<tr>
<td>E. coli</td>
<td>ECO</td>
</tr>
<tr>
<td>Klebsiella spp.</td>
<td>KLE</td>
</tr>
<tr>
<td>Enterobacter spp.</td>
<td>ENB</td>
</tr>
<tr>
<td>Citrobacter spp.</td>
<td>CIT</td>
</tr>
<tr>
<td>Proteus spp.</td>
<td>PRO</td>
</tr>
<tr>
<td>Serratia spp.</td>
<td>SER</td>
</tr>
<tr>
<td>Other enterobacteria</td>
<td>AEN</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>PAE</td>
</tr>
<tr>
<td>Burkholderia cepacia</td>
<td>BCE</td>
</tr>
<tr>
<td>Stenotrophomonas maltophilia</td>
<td>STM</td>
</tr>
<tr>
<td>Acinetobacter spp.</td>
<td>ACI</td>
</tr>
<tr>
<td>Bacteroides spp.</td>
<td>BAC</td>
</tr>
<tr>
<td>Legionella spp.</td>
<td>LEG</td>
</tr>
<tr>
<td>Other bacteria</td>
<td>ANB</td>
</tr>
<tr>
<td>C. albicans</td>
<td>CAN</td>
</tr>
<tr>
<td>Other Candida spp.</td>
<td>ANC</td>
</tr>
<tr>
<td>Aspergillus spp.</td>
<td>ASP</td>
</tr>
<tr>
<td>Other fungi</td>
<td>ANP</td>
</tr>
<tr>
<td>Viruses</td>
<td>VIR</td>
</tr>
<tr>
<td>Unclassified growth</td>
<td>WOD</td>
</tr>
</tbody>
</table>
If SAU, ENT, ECO, KLE, ENB, PAE, STM or ACI meets the definitions below for multidrug resistance or special resistance, choose one of the following related abbreviations. Coding MDR pathogens must follow these specifications:

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Resistant to the following antibiotic:</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus</td>
<td>Methicillin/Oxacillin</td>
<td>MRSA</td>
</tr>
<tr>
<td>E. faecium/E. faecalis</td>
<td>Vancomycin</td>
<td>VRE</td>
</tr>
<tr>
<td>E. coli*</td>
<td>See below for ESBL definition</td>
<td>ESBL_ECO</td>
</tr>
<tr>
<td>K. pneumoniae**</td>
<td>See below for ESBL definition</td>
<td>ESBL_KLE</td>
</tr>
</tbody>
</table>

**Resistance to > 3 of the following antibiotics**

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Antibiotics</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. cloacae</td>
<td>Broad-spectrum penicillins, imipenem, chinolone, aminoglycoside, cotrimoxazol</td>
<td>MENB</td>
</tr>
<tr>
<td>E. coli*</td>
<td>Third-generation cephalosporine, chinolone, imipenem</td>
<td>MECO</td>
</tr>
<tr>
<td>K. pneumoniae**</td>
<td>Third-generation cephalosporine, chinolone, imipenem</td>
<td>MKLE</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>Piperacillin, ceftazidim, chinolone, aminoglycoside, imipenem</td>
<td>MPAE</td>
</tr>
<tr>
<td>S. maltophilia</td>
<td>Cotrimoxazol, chinolone (resistance to two antibiotics is meaningful in this case)</td>
<td>MSTM</td>
</tr>
</tbody>
</table>

*If E. coli is both ESBL-producing and multidrug-resistant, code it as ESBL_ECO.

**If K. pneumoniae is ESBL-producing and multidrug-resistant, code it as ESBL_KLE.

**ESBL definition**

ESBL stands for a resistance mechanism based on the production of extended-spectrum beta-lactamase.

ESBL production is most common among *E. coli*, *Klebsiella pneumoniae* and *Klebsiella oxytoca* as well as other enterbacteria such as *Proteus spp.*, *Citrobacter spp.*, and *Enterobacter spp.*

Phenotypically, resistance to third-generation cephalosporine and monobactame varies greatly among the different ESBLs. Some or many substances may appear intermediary or even sensitive during resistance testing.
Laboratories must take special care to recognize ESBL-producing pathogens because it is not possible for clinicians to determine the presence of ESBL based on antibiograms.

Only *E. coli* and *K. pneumoniae* are considered ESBL-producing in KISS.

### 7 KISS indicator operative procedures

Last updated December 2011

The most current list of procedures, a more detailed description of the types of procedure, and instructions for applying CDC definitions and wound contamination classification can be found on the NRZ web site under ► Surveillance ► OP-Kiss ► Indicator OP.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
<th>Surgical field</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPE</td>
<td>Appendectomy</td>
<td>General surgery</td>
</tr>
<tr>
<td>ART</td>
<td>Arthroscopy on the knee</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>CHOL</td>
<td>Cholecystectomy</td>
<td>General surgery</td>
</tr>
<tr>
<td>COBY_L</td>
<td>Coronary bypass with autologous removal of blood vessels from extremities</td>
<td>Heart surgery</td>
</tr>
<tr>
<td>COBY_T</td>
<td>Coronary bypass without autologous removal of blood vessels from extremities</td>
<td>Heart surgery</td>
</tr>
<tr>
<td>COLO</td>
<td>Colon operations</td>
<td>General surgery</td>
</tr>
<tr>
<td>FPF_O</td>
<td>Open reduction of fractured proximal femur</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>FPF_G</td>
<td>Closed reduction of fractured proximal femur</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>GC_CAR</td>
<td>Carotid artery reconstruction</td>
<td>Vascular surgery</td>
</tr>
<tr>
<td>GC_ABD</td>
<td>Surgery on aorta abdominalis</td>
<td>Vascular surgery</td>
</tr>
<tr>
<td>GC_EXT</td>
<td>Arterial reconstruction-lower extremities</td>
<td>Vascular surgery</td>
</tr>
<tr>
<td>HALLUX</td>
<td>Correction of deformity or malposition of the hallux</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>HERN</td>
<td>Inguinal hernia</td>
<td>General surgery</td>
</tr>
<tr>
<td>HPRO_F</td>
<td>Hip prosthesis for fracture</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>HPRO_A</td>
<td>Hip prosthesis for arthrose</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>HYST_A</td>
<td>Abdominal hysterectomy</td>
<td>Gynecology</td>
</tr>
<tr>
<td>HYST_V</td>
<td>Vaginal hysterectomy</td>
<td>Gynecology</td>
</tr>
<tr>
<td>KPRO</td>
<td>Knee prosthesis</td>
<td>Traumatology/Orthopedics</td>
</tr>
<tr>
<td>KRN</td>
<td>Craniotomy</td>
<td>Neurosurgery</td>
</tr>
<tr>
<td>LOBE</td>
<td>Lobectomy of lung</td>
<td>Thoracic surgery</td>
</tr>
<tr>
<td>LUMB</td>
<td>Lumbar spinal surgery</td>
<td>Neurosurgery/Orthopedics</td>
</tr>
<tr>
<td>MAST</td>
<td>Breast surgery</td>
<td>Gynecology</td>
</tr>
<tr>
<td>NECK</td>
<td>Neck dissection</td>
<td>ENT</td>
</tr>
<tr>
<td>NEPH</td>
<td>Nephrectomy</td>
<td>Urology</td>
</tr>
</tbody>
</table>
7.1 General instructions about indicator operative procedures

(1) Type of indicator operative procedure

All procedures entered into KISS must belong to a type of indicator operative procedure. When an indicator operative procedure type has been selected (NEPH, for example), then all procedures must be recorded that have a OPS 301 code belonging to that type. (For example, 5-553—partial kidney resection and 5-554—nephrectomy)

Data collection may not be restricted to a single number or procedure. Comparison between hospitals is otherwise not possible.

(2) Primary procedure

Any operation may have more than one procedure code, that is, one primary procedure and several secondary procedures. The operating surgeon determines the primary procedure for each operation. Only those primary procedures that are also KISS indicator operative procedures may be recorded in KISS. However, certain secondary procedures may be important for some indicator operative procedures (COBY, for example).

(3) Reoperations

Reoperations or second surgical procedures in the same operational area within 30 days of a previous operation are not counted as indicator operations. Reoperations usually have different procedure codes as the initial operation. However, a revision surgery may have the same code as a primary procedure in some indicator operative procedure types (e.g., COLO, GC). These revisions should not be counted again in the operation list as long as the previous operation took place less than 30 days prior. A renewed procedure in an area in which an operation already took place is counted 31 days after that procedure at the very earliest, and only when the second procedure is identified as an indicator operative procedure.

If a second surgical procedure is carried out in the same operative area as a previous indicator operative procedure within 30 days of that procedure, then surveillance on the first indicator operative procedure ends on the day of the second procedure. (See 4.3 Surveillance process and 4.4 Length of patient surveillance)

(4) Double-sided operations

Double-sided procedures are only counted as one operation because there is always only one primary procedure in KISS, and because KISS only takes primary procedures into account.
(5) Multiple procedure operations
Very extensive surgery can require many procedures that might all be indicator operative procedures (for example, extensive abdominal surgery including colon surgery and cholecystectomy and appendectomy). Only the primary procedure is relevant for determining the type of indicator operative procedure.

(6) An explanation of OPS-301 procedure codes
An operation’s code is given to as many places as necessary as to identify it clearly.

The entries include codes with figures in more places.
For example, the entry 5-820 includes the codes 5-820.02, 5-820.20 and 5-820.04, but not 5-821.

The placeholder _ represents any sign at this position in the code.
The entry 5-811._h includes the codes 5-811.0h, 5-811.9h and 5.811.ah, but not 5.811x (because it is not followed by an “h” in this sixth position).

7.2 Example definition of indicator operative procedures
In one surgical department, the indicator operative procedures APPE, COBY and HERN should be tracked. The following operations were performed:

<table>
<thead>
<tr>
<th>No.</th>
<th>Birth year /sex</th>
<th>Description*</th>
<th>Primary procedure</th>
<th>Secondary procedure</th>
<th>endoscopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1924, m</td>
<td>Incisional hernia</td>
<td>5-536</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>1933, m</td>
<td>Triple coronary bypass</td>
<td>5-361.21</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>3</td>
<td>1932, w</td>
<td>Double coronary bypass, removal of radial artery for transplant</td>
<td>5-361.13</td>
<td>5-386.24</td>
<td>N</td>
</tr>
<tr>
<td>4</td>
<td>1940, m</td>
<td>Double coronary bypass with mammary artery</td>
<td>5-361.13</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>5</td>
<td>1960, w</td>
<td>Exploratory laparotomy, appendectomy</td>
<td>5-541.0</td>
<td>5-470</td>
<td>N</td>
</tr>
</tbody>
</table>

*A verbal description of the operation is not crucial for KISS, but rather the procedures coded by the surgeon after the operation.

The following indicator operations are to be included in surveillance:
1.) Not an indicator operation (currently, only inguinal hernias are included in the indicator operative procedure HERN)
2.) Indicator operative procedure “COBY_L
3.) Indicator operative procedure “COBY_L” (the removal of radial artery is a secondary procedure and coded as 5-386.24)
4.) Indicator operative procedure “COBY_T” (same primary procedure as No. 3, but a different indicator operative procedure code because the transplant removal did not occur at the extremities)
5.) Not an indicator operative procedure, because the appendectomy (5-470) is not coded as the primary procedure

More importantly, all of the following must be applied for an operation to be included:

- A primary wound closure was completed (otherwise wound classification is not possible)
- The patient did not have an operation in the same operative area within the last 30 days
8 References


9 Legal Notice

Nationales Referenzzentrum (NRZ) für Surveillance von nosokomialen Infektionen
am Institut für Hygiene und Umweltmedizin
(Director: Petra Gastmeier, MD),
Charité-Universitätsmedizin Berlin
gemeinsame Einrichtung von Freier Universität Berlin und
Humboldt-Universität Berlin
Hindenburgdamm 27
12203 Berlin, Germany
Tel.: 049 30/8445 3680
Fax: 049 30/8445 3682

Partners:
Prof. Markus Dettenkofer, MD
am Institut für Umweltmedizin und Krankenhaushygiene
(Director: Prof. V. Mersch-Sundermann, MD)
Albert Ludwigs-Universität Freiburg
Breisacher Straße 115 B
79106 Freiburg, Germany
Tel.: 049 761/270 5470/71
Fax: 049 761/270 5485

Robert Koch-Institut (RKI)
Abteilung für Infektionskrankheiten, FG 14: Angewandte Infektions- und Krankenhaushygiene
(Prof. Martin Mielke, MD)
Nordufer 20
13353 Berlin, Germany
Tel.: 049 30/4547 2233
Fax: 049 30/4547 2612

To contact OP-KISS:
Contact persons and their addresses are listed on the NRZ homepage
(www.nrz-hygiene.de).

Last update: December 2011