

MANUAL NSIH-SSI INDIVIDUAL HOSPITAL FEEDBACK REPORTS

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ABBREVIATIONS

ASA	American Society of Anesthesiologists
BE	Belgium
CABG	Coronary artery bypass grafting
CARD	Cardiac surgery
CHOL	Cholecystectomy
CI	Confidence interval
COLO	Colon surgery
CSEC	Caesarean section
FU	Follow-up
HER	Herniorrhaphy
HPRO	Hip prothesis
HYST	Abdominal hysterectomy
KPRO	Knee prothesis
LAM	Laminectomy
MAST	Mastectomy
MRSA	Methicillin-resistant Staphylococcus aureus
NHSN	National Healthcare Safety Network
NNIS	National nosocomial infections surveillance
	system
NOS	Not specified
NSIH	National Surveillance of Infections in Hospitals
Р	Percentile
PACE	Pacemaker surgery
PRST	Prostatectomy
SSI	Surgical site infection
Unk.	Unknown
VS	Vascular surgery

INTRODUCTION

This manual describes the NSIH-SSI (surgical site infections) individual hospital feedback reports. The reports are created after the submission of surveillance data and are in Excel format. Each sheet of the report will be explained in this manual. An example feedback report can be found on the project webpage, an illustration of a new table and graphs not included in this example report is added in this manual.

More information on the NSIH-SSI project (including the protocol) can be found on the project page: https://www.sciensano.be/nl/projecten/nationale-surveillance-van-postoperatieve-wondinfecties (Dutch) and https://www.sciensano.be/fr/projets/surveillance-nationale-des-infections-du-site-operatoire (French).

Note: all examples in this manual are fictive and do not reflect the actual national database or hospital results.

REPORT MANUAL

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1. Cover

The cover includes the NSIH code of the individual hospital for which the report is created. "Data from DD/MM/YYYY to DD/MM/YYYY" describes the period of the included data in the report. This period is at least one trimester. "Reference data: BE" describes the period of the inclusion of the historical data. The reference population that is used in the report includes all data we received from this period.

2. Table 1 Demographic characteristics

This table includes the following:

- the total number of interventions,
 - the mean postoperative length of stay (in days),
 - the median age of the included patients (in years),
 - the ratio of male to female patients,
 - the mean duration of operation (in minutes)¹
- the percentage of interventions with an operation duration longer than a specific cut-off²,
- the percentage of interventions with an ASA score greater than or equal to 3,
- the percentage of interventions with a wound class greater than or equal to 3.

These characteristics are calculated for each operation category. The included characteristics depends on the registration of the optional variables.

N (1) - P(2)

N(1) (number) and P(2) (percentile) is the result for your hospital.

Example 1: N=1000 and P=P80 for total number of interventions.

Your hospital has submitted 1000 interventions and 20% of the hospitals in the reference population have submitted more interventions. This means that your hospital has submitted a rather large number of interventions.

Example 2: N=60 and P=P10 for median age (years)

The median age of the patients of the interventions submitted by your hospital was 60 and 10% of the hospitals in the reference population have a median age younger than 60. This means that the patient population of your submitted interventions was rather young.

Example 3: N=72 and P=P52 for mean duration of operation (minutes)

The mean duration of operation of the interventions submitted by your hospital was 72 minutes. 52% of the hospitals in the reference population had a mean duration lower than 72 minutes.

Example 4: N=10 and P=P40 for %ASA

¹ In feedback reports created before 08/02/2024 this indicator was described as "median duration of operation", however the mean and not the median was also calculated in these reports.

The cut-offs for each operation category can be found in the reference lists p5 https://www.sciensano.be/sites/default/files/project_nsih-ssi_protocol2017_referentielijsten_nl.pdf (Dutch) https://www.sciensano.be/sites/default/files/project_nsih-ssi_protocole2017_listesreferences_fr.pdf (French)

10% of the interventions submitted by your hospital had an ASA score ≥3. 40% of the hospitals in the reference population had a percentage of interventions with an ASA score ≥3 lower than 10% Example 5: N=0.6 and P=P75 for M:F ratio

The ratio of male to female patients is in your hospital 0.6. 75% of the hospitals in the reference data had a lower male to female ratio than 0.6.

BE, N hosp (3)

BE, N hosp (3) is the number of hospitals included in the reference population (the hospital of the feedback report is included in the reference population).

BE, n/mean (4) - BE, mean (5)

BE, n/mean (4) is for indicator "Total number of interventions" the overall number of interventions for all hospitals. For other indicators shown in this table, this is the global mean for each indicator result.

BE, mean (5) is the mean of means (equal weight for each hospital) of the reference population. The mean of means first calculates the mean for each individual hospital. Next all the individual means are summed up and divided by the number of hospitals. In case of a large hospital in the reference population in combination with several smaller hospitals, then the larger hospital will contribute more to the denominator in the calculation of the global mean which can lead to bias. In this case is the mean of means more correct to make comparisons.

In Table 1 the interpretation of BE, n/mean (4) and BE, mean (5) for all the included demographic characteristics is described.

Table 1 • Overview of interpretation of fourth and fifth column for each indicator in demographic characteristics

Indicator	BE, n/mean (4)	BE, mean (5)
Total number of interventions	Total number of interventions in the reference population	Mean of number of interventions. Total number of interventions divided by number of hospitals in the reference population
Mean postoperative length of stay	Sum of total number of postoperative days divided by the total number of interventions with known discharge date in the reference population	Sum of mean postoperative days for each hospital divided by the number of hospitals in the reference population
Median age	Not calculated	Sum of median age for each hospital divided by the number of hospitals in the reference population
M:F ratio	Total number of male patients divided by total number of female patients. Includes all the patients/interventions in the reference population	Sum of ratio of male to female patients for each hospital divided by the number of hospitals in the reference population
Mean duration of operation	Sum of operation duration of all interventions in the reference population divided by the total number of interventions in the reference population.	Sum of mean duration of operation for each hospital divided by the number of hospitals in the reference population
T-time %	Number of interventions with operation duration longer than the cut-off divided by the total number of interventions	Sum of percentages of interventions with operation duration longer than the cut-off divided by the number of

Indicator	BE, n/mean (4)	BE, mean (5)
	included in the reference population, multiplied by 100.	hospitals in the reference population.
ASA %	Number of interventions with ASA score higher than or equal to 3 divided by the total number of interventions included in the reference population, multiplied by 100.	Sum of percentages of interventions with ASA score higher than or equal to 3 divided by the number of hospitals in the reference population.
Wound class %	Number of interventions with wound class higher than or equal to 3 divided by the total number of interventions included in the reference population, multiplied by 100.	Sum of percentages of interventions with wound class higher than or equal to 3 divided by the number of hospitals in the reference population.

P10-P25-P50-P75-P90

These percentiles describe the distribution of a specific indicator in the national reference data. The 10th, 25th, 50th, 75th, 90th percentiles (*P10-P25-P50-P75-P90*) are the cut-off values of the 10%, 25%, 50%, 75% and 90% lowest value in the distribution. P50 is the median.

Example 6: total number of interventions P10=30 P25=40 P50=100 P75=150 P90=200 10% of the hospitals in the reference population have less than 30 interventions submitted 90% of the hospitals in the reference population have less than 200 interventions submitted

Example 7: median age (in years) P10=40 P25=50 P50=65 P75=72 P90=76 25% of the hospitals in the reference population have a median age of patients younger than 50 50% of the hospitals in the reference population have a median age of patients younger than 65

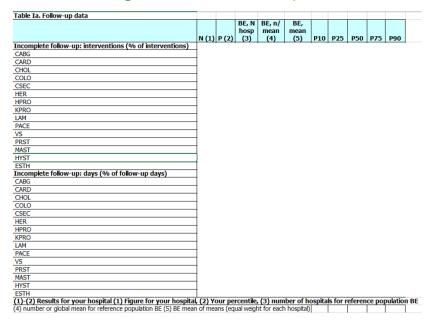
Example 8: ASA% P10=5 P25=20 P50=25 P75=30 P90=50

25% of the hospitals in the reference population have a percentage of interventions with ASA score ≥3 lower than 20%.

3. Table 1a FU

This table describes the completeness of the follow-up. "Incomplete follow-up: interventions (% interventions)" describes the percentage of interventions with an incomplete follow-up. The follow-up is considered complete if patients follow-up data is available 30 or 90 days depending on the operation category after the intervention. "Incomplete follow-up: days (% of follow-up days)" describes the percentage of incomplete follow-up days. Every intervention has a total number of follow-up days of 30 or 90 days depending on the operation category in case of complete follow-up. The calculation of these indicators depends on the registration of the following variables: the discharge date, the last post-discharge date when the patient was actually seen and the last post-discharge date when info about this patient was collected (the latest registered date is used). An example of the structure of this table can be found in Figure 1.

Figure 1 • Table 1a: Follow-up data



N(1)-P(2)

Column N(1) is the percentage of interventions with an incomplete follow-up (top) and the percentage of incomplete follow-up days (bottom) for each operation category for your hospital.

Column *P* (2) is the percentile of your hospital in the overall distribution of hospitals contributing results.

Example 9: Incomplete follow-up interventions N=60 P=P30

60% of the interventions submitted by your hospital had an incomplete follow-up. 30% of the hospitals in the reference population had a lower follow-up percentage.

Example 10: incomplete follow-up days N=10 P=P90

10% of the follow-up days were incomplete. On the total of follow-up days (30 or 90 days multiplied with the number of interventions), 10% was not completed.

90% of the hospitals in the reference population had a lower follow-up percentage. This means that your follow-up was rather complete compared to the hospitals in the reference data.

BE. N hosp (3)

BE, N hosp (3) is the number of hospitals included in the reference population (your hospital is included in the reference population).

BE, n/mean (4)

BE, n/mean (4) is the global mean.

- BE, n/mean (4) for "Incomplete follow-up: interventions (% interventions)" is the sum of all the
 interventions with an incomplete follow-up divided by the total number of interventions in the
 reference data multiplied by 100.
- BE, n/mean (4) for "Incomplete follow-up: days (% of follow-up days)" is the sum of all the follow-up days with an incomplete follow-up divided by the total number of follow-up days (for every intervention in the reference population) multiplied by 100.

BE, mean (5)

BE, mean (5) is the mean of means (equal weight for each hospital) of the reference population.

- BE, mean (5) for "Incomplete follow-up: interventions (% interventions)" is the sum of the percentages of incomplete follow-up of each hospital divided by the number of hospitals in the reference population.
- BE, mean (5) for "Incomplete follow-up: days (% of follow-up days)" is the sum of the
 percentages of incomplete follow-up days of each hospital divided by the number of hospitals
 in the reference population.

P10-P25-P50-P75-P90

These percentiles describe the distribution of a specific indicator in the national reference data. The 10th, 25th, 50th, 75th, 90th percentiles (*P10-P25-P50-P75-P90*) are the cut-off values of the 10%, 25%, 50%, 75% and 90% lowest value in the distribution. P50 is the median.

Example 11: incomplete follow-up interventions P10=10 P25=22 P50=40 P75=60 P90=95 90% of the hospitals in the reference population have a lower incomplete follow-up of interventions than 95%.

4. Table 2 Cumulative incidence (%SSI)

The cumulative incidence results are shown for each operation category globally and stratified by the NHSN risk index^{3,4}. "NNIS unk." means that the risk index is unknown, or that the index could not be calculated as not all required variables were registered.

N (1)

The first column is structured as follows: A|B. A is the number of infections and B is the number of interventions of your hospital. Only surgical site infections are included, which means only infections occurring within 30 days or 90 days after the intervention depending on the operation category.

Example 12: N= 5|150 for operation category CABG

Your hospital has submitted 150 CABG interventions and has detected 5 surgical site infections after these interventions.

6% (2)

'% (2) is the cumulative incidence of your hospital. This can be calculated as A divided by B (see first column) and multiplied by 100.

Example 12 continued: N=5|150 for operation category CABG

$$\% = \frac{5}{150} \times 100 = 3.3$$

The cumulative incidence for your hospital for CABG is 3.3%

95% CI (3)

95% CI (3) is the 95% confidence interval. The cumulative incidence that is calculated in column '% (2) can be considered as an estimate of the true infection cumulative incidence. An estimation involves a certain degree of uncertainty. The 95% confidence interval indicates if we would repeat the estimate

³ National Healthcare Safety Network (NHSN, formerly known as National Nosocomial Infection Surveillance or NNIS). In the feedback reports NNIS is still used as abbreviation.

NHSN More information on the risk index can be found in the protocol p14 https://www.sciensano.be/sites/default/files/ssi_protocol_2010_nl.pdf (Dutch) and https://www.sciensano.be/sites/default/files/ssi_protocol_2010_fr.pdf (French)

100 times, 95 times the true cumulative incidence will be in the interval. If more interventions are included, the estimation will be more precise and the 95% interval will be more narrow.

P (4)

P (4) is the percentile of your hospital.

Example 13: P=P75

25% of the hospitals in the reference population have a higher cumulative incidence than your hospital.

BE. N (5)

BE, N (5) is structured as follows: C|D. C is the number of infections and D is the number of interventions in the reference population. The infections and interventions of your hospital are already included in the reference population.

Example 14: BE,N= 20|700 for operation category CABG

20 infections and 700 interventions are included in the reference population.

BE, mean (6)

BE,mean (6) is the global cumulative incidence (%). This is calculated as C divided by D and multiplied by 100.

Example 14 continued: BE,N= 20|700 for operation category CABG

BE, mean=
$$\frac{20}{700} \times 100 = 2.9$$

The cumulative incidence for CABG in the reference population is 2.9%.

BE, mean (7)

BE, mean (7) is the mean of means (equal weight for each hospital) of the reference population.

<u>Example 15</u> illustrates the difference between the global mean and the mean of means in the context of the SSI cumulative incidence:

In this example 3 hospitals are included in the reference population.

Hospital 1: 3 infections 50 interventions (cumulative incidence of 6%)

Hospital 2: 2 infections 70 interventions (cumulative incidence of 3%)

Hospital 3: 5 infections 30 interventions (cumulative incidence of 17%)

Global cumulative incidence =
$$\frac{3+2+5}{50+70+30} \times 100 = \frac{10}{150} \times 100 = 6.7\%$$

Mean of means =
$$\frac{\frac{3}{50} + \frac{2}{70} + \frac{5}{30}}{3} \times 100 = 8.5\%$$

P10-P25-P50-P75-P90

These percentiles describe the distribution of a specific indicator in the national reference data. The 10th, 25th, 50th, 75th, 90th percentiles (*P10-P25-P50-P75-P90*) are the cut-off values of the 10%, 25%, 50%, 75% and 90% lowest value in the distribution. P50 is the median.

Example 16: P10=0.5 P25=1.2 P50=4 P75=6 P90=12

10% of the hospitals in the reference population have a SSI cumulative incidence lower than 0.5%.

5. Table 3 Incidence density (number of inhospital SSI/1,000 postoperative patientdays)

The incidence density results are shown for each operation category globally and stratified by the NHSN risk index^{5,6}. "NNIS unk." means that the risk index is unknown, or that the index could not be calculated as not all required variables were registered.

The calculation of the incidence density can only be included in case the hospital discharge date for each intervention is registered, as this is required to calculate the number of patient-days in the hospital.

N days (1)

The first column is structured as follows: A|B. A is the number of in-hospital surgical site infections (infection date must be before discharge date) of your hospital. Surgical site infections detected post-discharge are not included. B is the number of postoperative patient-days of your hospital (number of days between intervention date and discharge date).

Example 17: 3|500 for HPRO.

3 infections were detected before hospital discharge and in total 500 postoperative patient days were registered for your hospital for hip prothesis interventions.

Inc Dens (2)

Inc Dens (2) is the incidence density of your hospital. This is calculated as A divided by B (see first column) and multiplied by 1,000.

Example 17 continued: 3|500 for HPRO

Inc dens= $\frac{3}{500} \times 1000 = 6$

The incidence density for your hospital is 6 per 1,000 patient-days.

95% CI (3)

95% CI (3) is the 95% confidence interval. The incidence density that is calculated in column *Inc Dens* (2) can be considered as an estimate of the true infection incidence density. An estimation involves a certain degree of uncertainty. The 95% confidence interval indicates if we would repeat the estimate 100 times, 95 times the true incidence density will be in the interval. If more patient-days are included, the estimate will be more precise and the 95% interval will be more narrow.

P (4)

P (4) is the percentile of your hospital.

Example 18: P=P75

25% of the hospitals in the reference population have a higher incidence density than your hospital.

⁵ National HealthcareSafety Network (NHSN, formerly known as National Nosocomial Infection Surveillance or NNIS). In the feedback reports NNIS is still used as abbreviation.

NHSN in More information on the risk index can be found protocol p14 https://www.sciensano.be/sites/default/files/ssi_protocol_2010_nl.pdf (Dutch) and https://www.sciensano.be/sites/default/files/ssi_protocol_2010_fr.pdf (French)

BE, N (5)

BE, N (5) is structured as follows: C|D. C is the number of in-hospital infections and D is the number of postoperative patient-days in the reference population. The infections and patient-days of your hospital are already included.

Example 19: 15|1400 for HPRO

15 in-hospital infections and 1,400 postoperative patient-days are included in the reference population.

BE. mean (6)

BE, mean (6) is the global incidence density. This is calculated as C divided by D and multiplied by 1,000.

Example 19 continued: 15|1400 for HPRO

BE,mean =
$$\frac{15}{1400} \times 1000 = 10.7$$

The incidence density for HPRO in the reference population is 10.7 per 1,000 post-operative patient days.

BE, mean (7)

BE, mean (7) is the mean of means (equal weight for each hospital) of the reference population.

Example 20 illustrates the difference between the global mean and the mean of means in the context of the SSI incidence density:

In this example 3 hospitals are included in the reference population.

Hospital 1: 3 infections 500 patient-days

Hospital 2: 2 infections 700 patient-days

Hospital 3: 5 infections 300 patient-days

Global incidence density =
$$\frac{3+2+5}{500+700+300} \times 1000 = \frac{10}{1500} \times 1000 = 6.7 \ per \ 1,000 \ patient - days$$

Mean of means = $\frac{\frac{3}{500}+\frac{2}{700}+\frac{5}{300}}{3} \times 1000 = 8.5 \ per \ 1,000 \ patient - days$

P10-P25-P50-P75-P90

These percentiles describe the distribution of a specific indicator in the national reference data. The 10th, 25th, 50th, 75th, 90th percentiles (*P10-P25-P50-P75-P90*) are the cut-off values of the 10%, 25%, 50%, 75% and 90% lowest value in the distribution. P50 is the median.

Example 21: P10=0.5 P25=2 P50=3 P75=7 P90=10

75% of the hospitals in the reference population have an incidence density lower than 7 per 1,000 post-operative patient-days.

6. Table 4 Distribution of micro-organisms

This sheet includes a table of the distribution of micro-organisms for each operation category.

The first column shows the result for your hospital. *n* is the number of a isolates of a specific microorganism or family that was identified for your hospital. '% (1) is the percentage of a specific microorganism or family that was identified for your hospital. The total used to calculate the percentage is "N of identified micro-organisms (b)" except for the last 3 rows of each table (micro-organism not identified, examination not done, sterile examination). These last 3 rows use "Total N (a)" as total to calculate the percentage. The calculation of these indicators depends on the registration of the optional antimicrobial resistance data variables.

"All hospitals BE" describes the data in the reference population, which includes the results of your hospital. n is the number of isolates of a specific micro-organism or family that was identified in the reference population. '% is the percentage of a specific micro-organism or family that was identified in the reference population. N hosp is the is the number of hospitals included in the reference population. This includes your hospital.

Total N(a) is the total number of micro-organisms which includes unidentified, not examined or sterile N of identified micro-organisms (b) is the total number of identified micro-organisms (this does not include unidentified, not examined or sterile).

7. Graphs 1

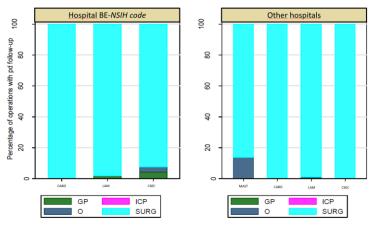
Graphs with as title "Hospital BE-*NSIH* code" include the information for your hospital. Graphs with as title "Other hospitals" include the information on the reference population excluding the data of your hospital described in this report. Data of a previous surveillance year of your hospital will be included.

Example 22: the feedback report is created based on the follow-up of HPRO interventions in the first trimester of 2022. In 2021 your hospital also submitted HPRO data. "Other hospitals" will include the 2021 HPRO data of your hospital but not the data of 2022.

The following graphs are included in the report:

- Graph 1: Distribution of NNIS risk index by operation category
 This graph shows the distribution of the NHSN risk index by operation category. If your hospital didn't collect the variables required to calculate the NHSN risk index, the graph will be empty.
 Only interventions for which an NHSN risk index can be calculated are included.
- Graph 2: Mean number of interventions by operation category
- Graph 3: Mean length of post-operative stay (in days) by operation category
- Graph 4: Mean duration of operation (in minutes) by operation category
- Graph 5: Percentage of SSI detected in the hospital (in-hos), post-discharge (PD) or unknown (missing discharge date)
- Graph 6: Number of operations per month, by category, all hospitals
- Graph 7: N of operations per month, by category, your hospital
- Graph 8: Mean SSI cumulative incidence (number of SSI/100 interventions)
- Graph 9: Mean SSI incidence density (number in-hospital SSI/1000 patient-days)
- Graph 10: Data quality check I, percentage of missing values for required variables
- Graph 11: Data quality check II, percentage of missing values for optional variables
- Graph 12: Data quality check III, percentage of missing values for infection data
- Graph 13: Distribution of post discharge data provider by operation category.
 An example of graph 13 can be found in Figure 2. Graph 14 -16 have a similar structure.

Figure 2 • Example of graph 13: distribution of post discharge data provider by operation category



GRAPH 13: Distribution of post discharge data providor by operation category

GP= general practitioner

O= other

ICP= Infection control practitioner

SURG= Surgeon

Graph 14: Distribution of post discharge data contact by operation category

GP= general practitioner

R= hospital readmission

OPD = outpatient department

SP= surgeon private consultation

 Graph 15: Distribution of post-discharge data provider by operation category, infections only GP= general practitioner

O= other

ICP= Infection control practitioner

SURG= Surgeon

Only post-discharge detected infections are included in this graph.

• Graph 16: Distribution of post-discharge data contact by operation category, infections only GP= general practitioner

R= hospital readmission

OPD = outpatient department

SP= surgeon private consultation

Only post-discharge detected infections are included in this graph.

8. Graphs 2

For each operation category 4 graphs are created:

- Graph A gives the SSI cumulative incidence by type of infection (superficial incisional or deep incisional/organ-space infections). The result is shown for your hospital (left) and for the other hospitals in the reference population, which excludes the data of your hospital of the current feedback report (right).
- Graph B gives the percentage of SSI detected in the hospital (IH-SSI), post-discharge (PD-SSI)
 or with an unknown discharge date. The result is shown for your hospital (left) and for the other
 hospitals in the reference population, which excludes the data of your hospital of the current
 feedback report (right).

- Graph C gives the cumulative incidence per month for your hospital and percentile p25-p50-p75 of the reference population. This includes your hospital.
- Graph D gives the cumulative incidence by NHSN risk index. The result is shown for your hospital (left) and for the other hospitals in the reference population, which excludes the data of your hospital of the current feedback report (right).

9. ICD9

For each operation category 2 graphs are created:

- Graph E gives the mean number of interventions by ICD-9-CM code. NOS is used if the ICD-9-CM code is not specified. The result is shown for your hospital (left) and for the other hospitals in the reference population, which excludes the data of your hospital of the current feedback report (right).
- Graph F gives the surgical site infection cumulative incidence (percentage) by ICD-9-CM code.
 NOS is used if the ICD-9-CM code is not specified. The result is shown for your hospital (left) and for the other hospitals in the reference population, which excludes the data of your hospital of the current feedback report (right).