EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

STANDARDS AND PROTOCOLS

Protocol for the surveillance of surgical site infections and prevention indicators in European hospitals

Healthcare-Associated Infection surveillance Network (HAI-Net) surgical site infection (SSI) protocol, version 2.3

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This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Tommi Kärki.

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Contents

Abbreviations

ASA	American Society of Anesthesiologists
CARD	Cardiac surgery
CABG	Coronary artery bypass grafting
CBGB	Coronary artery bypass grafting with both chest and donor site incisions
CBGC	Coronary artery bypass grafting with chest incision only
CHOL	Cholecystectomy
COLO	Colon surgery
CSEC	Caesarean section
EC	European Commission
EU	European Union
GP	General practitioner
HAI	Healthcare-associated infection
HAI-Net	Healthcare-Associated Infection surveillance Network
HELICS	Hospitals in Europe Link for Infection Control through Surveillance project
HPRO	Hip prosthesis
IPC	Infection prevention and control
ICU	Intensive care unit
IPSE	Improving Patient Safety in Europe project
KPRO	Knee prosthesis
LAM	Laminectomy
LOS	Length of stay
NHSN	The US National Healthcare Safety Network (formerly NNIS System)
PAP	Perioperative antibiotic prophylaxis
REC	Rectum surgery
SPI	Structure and process indicator
SSI	Surgical site infection
TESSy	The European Surveillance System

Introduction and objectives

The European Council Recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare-associated infections (HAIs) (2009/C 151/01), recommends 'performing the surveillance of the incidence of targeted infection types', 'using surveillance methods and indicators as recommended by ECDC and case definitions as agreed upon at Community level in accordance with the provisions of Decision No 2119/98/EC' [1,2].

In 2000–2002, harmonised methods for the surveillance of two targeted infection types, surgical site infections (SSIs) and healthcare-associated infections in intensive care units (ICUs), were developed by the network HELICS (Hospitals in Europe Link for Infection Control through Surveillance), funded by the European Commission's Directorate-General for Health and Consumers (DG SANCO), and progressively implemented in Member States by HELICS and later as part of the Improving Patient Safety in Europe (IPSE) project. In July 2008, the coordination of the European surveillance of healthcare-associated infections was transferred from the IPSE network to the European Centre for Disease Prevention and Control (ECDC) in accordance with ECDC's mandate. ECDC continued HAI surveillance with protocols that were first updated during the annual meetings of the HAI surveillance network in 2009–2010, followed by network meetings in 2013, 2014 and 2016, with the last previous protocol update published in 2017 with version 2.2 of the protocol. Further possible changes to the protocol were discussed at an in-person meeting in 2018, as well as in online meetings in 2022 and 2024.

SSIs remain an important target for the surveillance of HAIs and an official priority for surveillance in several European countries. SSIs are among the most common HAIs [3]. They are associated with longer postoperative hospital stay, additional surgical procedures or stay at intensive care unit, and higher mortality. All patients undergoing surgery are at risk for complications, including SSIs.

The main objective of the European protocol for the surveillance of SSIs is to ensure standardisation of definitions, data collection and reporting procedures for hospitals participating in the national/regional surveillance of surgical site infections across Europe, in order to contribute to the EU surveillance of healthcare-associated infections and to improve the quality of care in a multicentre setting.

The specific objectives of the surveillance activities are:

At the level of the hospital:

- To lower the incidence of SSIs by encouraging the owners of the problem (primarily the surgical staff) to:
  - comply with existing guidelines and 'good surgical practice';
  - correct or improve specific practices; and
  - develop, implement and evaluate new preventive practices through follow-up and inter-hospital comparisons of adjusted SSI rates and of compliance with key preventive measures.
- Participation in the European network will also produce gains at local level from international comparisons that may provide insights that would not be revealed by surveillance limited at the regional or national level.

At the level of regional or national network coordination:

- To prevent SSIs through surveillance;
- To provide the units with the necessary reference data to make comparisons of risk-adjusted rates between units/hospitals:
  - to follow-up epidemiological trends in time;
  - to identify and follow-up risk factors of SSIs; and
  - to improve the quality of data collection;
- To compare and follow-up the implementation of key preventive measures of SSIs between hospitals and between EU/EEA countries.

At the European level:

- To prevent SSIs through surveillance by providing European reference data for adjusted SSI rates and compliance with key preventive measures;
- To monitor the burden of SSIs in European hospitals, in terms of incidence and attributable mortality;
- To monitor and describe the epidemiology of SSIs in selected surgical procedures in European hospitals;
- To identify regions or countries at higher need of EU support with regard to surveillance and control of SSIs;
- To facilitate the communication and the exchange of experience between national/regional networks for the surveillance of SSIs;
- To stimulate the creation of national/regional coordination centres for the surveillance of SSIs where these centres/networks do not exist;
- To provide methodological and technical support to the national/regional coordination centres;
- To improve surveillance methodology, data validation and utilisation;
- To explore the correlation between structure and process indicators and the incidence of SSIs throughout Europe in order to generate hypotheses and new insights in healthcare-associated infection prevention and control.

1. From HAI-Net SSI 2.2 to 2.3: summary of major changes

The first version of this document was produced in October 2003 as the protocol *Surveillance of Surgical Site Infections* (HELICS/IPSE protocol 9.1, 2004). Changes to the protocol were applied either based on agreements made during the annual meetings of the European network for the surveillance of healthcare-associated infections (HAI-Net) in 2009, 2010 and 2012, or because they were necessary for the integration of the HAI surveillance data into The European Surveillance System (TESSy) of ECDC. Further changes on the protocol were published in May 2017 in version 2.2, including the shortening of the follow-up period for deep and organ/space SSIs if an implant is in place, and including the structure and process indicators (SPIs) for SSI prevention. An in-person meeting in 2018 and online meetings in 2022 and 2024 included discussions about the SSI protocol, and the current update was drafted based on the input received in the latter two meetings.

The main changes include:

- Including isolated microorganism as a sub-criterion for deep incisional SSI, similarly to the already included criterion for superficial and organ/space SSIs.
- ICD-10-PCS coding and mapping to high-level procedure types is now included in the relevant annex and published with the protocol update. The ICD-10-PCS mapping is based on the NHSN mapping published in 2024, available at: https://www.cdc.gov/nhsn/opc/ssi/index.html
- A change for the protocol as well as a change in the EpiPulse Cases metadata definition in 2026 to allow high-level aggregated minimal surveillance option for the reporting of hospital/unit-specific SSIs with denominators, without inclusion of patient-based data. Minimal datasets for the different surveillance options are defined in Annex 3.
- The data collection option of ICD-9-CM or other coding for surgical procedures is removed from the unit-based ('light') surveillance to allow further simplification of the minimal unit-level metadata.
- Reporting adds emphasis on SSIs with microbiological findings (for the countries that report microorganism data).
- The percentile cut-off for the duration of operation, part of the NHSN risk index, is now calculated from the surveillance data instead of using pre-specified cut-offs.

2. Minimal datasets for the surveillance of surgical site infections

The SSI protocol contains a wide set of variables for manual SSI surveillance, which remains the gold standard in several EU/EEA countries as well as outside Europe. However, to encourage participation and accessibility of SSI surveillance from only partially compatible systems, this protocol specifies a minimal surveillance option that defines an explicit minimal dataset to aid data preparation from various systems with different data availability. The minimal dataset contains only the absolute minimum requirements for SSI surveillance participation for the generation of the key epidemiological indicators and is a simplified subset of the unit-based surveillance option. This minimal dataset will be introduced with the update of the HAI-SSI data collection from TESSy to EpiPulse Cases in 2026.This will include the updated metadata with rules on warnings and errors and the high-level aggregation minimal surveillance option.

The majority of participating countries have been providing data on all the recommended variables allowing risk adjustment of SSI rates through the use of the basic NNIS (now NHSN, The US National Healthcare Safety Network) risk index for inter-hospital comparisons [3,4,5], but the new minimal surveillance option provides a less labour-intensive solution, with no possibility for risk-adjusted comparisons.

Case definitions and included patients are the same for all surveillance options, but while in the patient-based surveillance option risk factors are collected for each patient (with or without an SSI), in the unit-based surveillance option denominator data are aggregated at the hospital (or optionally surgical unit) level, and in the minimal surveillance option both the denominator and SSI numbers are aggregated by unit/hospital.

Descriptions of the data items are provided in chapters 5–8. Minimal datasets are shown in Annex 3. As the minimal surveillance option is a subset of the unit-based option, no minimal dataset for the unit-based option is separately defined.

3. Definitions

3.1 Case definitions of SSIs

The same case definitions are used as in previous protocol versions, e.g. HELICS *Surveillance of Surgical Site Infections* – Version 9.1, September 2004 and HAISSI protocol – version 1.02 with the exception of the 90-day follow-up period for deep or organ/space infections if implant is in place.

3.1.1 Superficial incisional

Infection occurs within 30 days after the operation and involves only skin and subcutaneous tissue of the incision and at least one of the following:

- purulent drainage with or without laboratory confirmation, from the superficial incision;
- organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision;
- at least one of the following signs or symptoms of infection: pain or tenderness, localised swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative;
- diagnosis of superficial incisional SSI made by a surgeon or attending physician.

3.1.2 Deep incisional

Infection occurs within 30 days after the operation if no implant* is left in place or within 90 days if implant* is in place and the infection appears to be related to the operation and infection involves deep soft tissue (e.g. fascia, muscle) of the incision and at least one of the following:

- purulent drainage from the deep incision but not from the organ/space component of the surgical site;
- organisms isolated from an aseptically obtained culture of fluid or tissue from the deep incision (e.g. fascia, muscle);
- a deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (> 38°C), localised pain or tenderness, unless incision is culture-negative;
- an abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination;
- diagnosis of deep incisional SSI made by a surgeon or attending physician.

* The US National Nosocomial Infection Surveillance definition: a nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during surgery [6].

3.1.3 Organ/space

Infection occurs within 30 days after the operation if no implant* is left in place or within 90 days if implant* is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g. organs and spaces) other than the incision that was opened or manipulated during an operation and at least one of the following:

- purulent drainage from a drain that is placed through a stab wound into the organ/space;
- organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space;
- an abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination;
- diagnosis of organ/space SSI made by a surgeon or attending physician.

* The US National Nosocomial Infection Surveillance definition: a nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during surgery [6].

3.2 Other key definitions

3.2.1 Basic SSI risk index

The basic SSI risk index is the index used in the US National Healthcare Safety Network (NHSN) and assigns surgical patients into categories based on the presence of three major risk factors [4,5,6,7,8,9,10]:

- operation lasting more than the duration cut point hours, where the duration cut point is the approximate 75th percentile of the duration of surgery in minutes for the operative procedure;
- contaminated (class 3) or dirty/infected (class 4) wound class;
- ASA classification of 3, 4, or 5.

The patient's SSI risk category is the number of these factors present at the time of the operation.

Calculation of basic SSI risk index

Calculation	Score =0, if:	Score=1, if:
Wound contamination class	W1, W2	W3, W4
ASA classification	A1, A2	A3, A4, A5
Duration of operation	≤ T	> T
T (see table in chapter 3.2.4)		
Basic SSI risk index =	Sum of scores	

3.2.2 Wound contamination class

Wound contamination class as described by Altemeier *et al.* [9].

Wound contamination classification

Wound	Description
W1	A **clean wound** is 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 non-penetrating trauma should be included in this category.
W2	**Clean-contaminated wounds** are operative wounds in which the respiratory, alimentary, genital or uninfected urinary tracts are entered under controlled condition 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.
W3	**Contaminated wounds** include open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.
W4	**Dirty or infected wounds** include old traumatic wounds with retained devitalised tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

3.2.3 The ASA physical status classification (ASA score)

Physical status classification developed by the American Society of Anesthesiologists (ASA) [10].

ASA physical status classification

ASA score	Definition	Examples
A1	**A normal healthy patient**	Healthy, non-smoking, no or minimal alcohol use
A2	A patient with **mild systemic disease or condition**	Mild diseases or conditions only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30<body mass index<40), well-controlled diabetes mellitus or hypertension, mild lung disease
A3	A patient with **severe systemic disease**	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled diabetes mellitus or hypertension, chronic obstructive pulmonary disease, morbid obesity (body mass index ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, end stage renal disease undergoing regularly scheduled dialysis, premature infant postconceptional age < 60 weeks
A4	A patient with an **incapacitating systemic disease** that is a constant threat to life	Examples include (but not limited to): ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, disseminated intravascular coagulation or end stage renal disease not undergoing regularly scheduled dialysis
A5	A **Moribund** patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischaemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction

3.2.4 Duration of operation

The duration of operation is reported in minutes. The 75th percentile cut-off values for each selected NHSN procedure are dynamically calculated from the annual European surveillance data. In case of a reintervention within 72 hours after the primary procedure, the duration of the re-intervention needs to be added to the duration of the primary procedure.

3.3 Structure and process indicators for SSI prevention

Structure and process indicators (SPIs) of SSI prevention were selected based on the strength of available evidence and feasibility of their collection. Two of the SPIs are collected at the hospital/unit level. Other SPIs will be collected aggregated by operation type.

The collection of the SPI data is recommended for a minimum of three months and/or for 30 surgical procedures of a certain type per surveillance year (for example selecting the first 30 surgical procedures of a certain type from the start of the surveillance period). These data should be collected for at least one of the selected surgical procedure type(s), as agreed at the national/regional surveillance network level.

3.3.1 Hospital/unit-level SPIs

Two SPIs are collected at the hospital-level:

- **Alcohol handrub (AHR) consumption** during the previous year in surgical wards that participate to the SSI surveillance per 1 000 patients-days in surgical wards that participate to the SSI surveillance.
- NOTE: The AHR consumption and the patient-days should represent the same ward(s). Data are to be collected from the hospital pharmacy or ward records for the year prior to the surveillance year.
- Is there a **system for root cause analysis/review of SSIs** in place in the hospital, and if so, in which cases the root cause analysis/review is triggered? Root cause analysis/review is defined as the systematic analysis of all the factors which are predisposed to, or had the potential to prevent, an error; in this case SSI [11].

Both of these SPIs can be collected per each hospital or per unit/ward.

3.3.2 SPIs aggregated by operation type

Other structure and process indicators are collected only as aggregated by selected surgical procedure type(s). For each SPI, the number of all observations and the number of observations that are compliant with the SPI should be reported. In the case of observations where the information is not available, i.e. is non-measured or non-documented, the observations should be omitted for the SPI in question.

The selected SPIs can be categorised in three groups: 1) Perioperative antibiotic prophylaxis (PAP) indicators; 2) Preoperative skin preparation indicators; and 3) other SSI prevention indicators.

3.3.2.1 Perioperative antibiotic prophylaxis

Perioperative antibiotic prophylaxis (PAP) is defined as administration of systemic antibiotics before or during a surgical procedure [12]. It is not within scope of this protocol to assess which operations require PAP, nor the appropriateness of the administered PAP. In order to evaluate the compliance for the PAP indicators, auditing a selected number of surgical procedures in which PAP is indicated by the local protocol is recommended. In case of caesarean section, PAP means prophylaxis given after clamping of umbilical cord. Prophylaxis for premature rupture of membranes (PROM) is not considered as PAP.

Two PAP indicators have been added to the SSI protocol:

- **Administration of PAP within 60 minutes before incision** (except when administering vancomycin and fluoroquinolones).
- **Discontinuation of PAP within 24 hours after initiation of surgery.**

Both of these SPIs are based in the ECDC systematic review and evidence-based guidance on perioperative antibiotic prophylaxis [12]. Adhering to optimal timing for preoperative prophylaxis as well as avoiding the prolongation of prophylaxis are also strong recommendations in the WHO Global Guidelines for the Prevention of Surgical Site Infection supported by moderate quality of evidence [13]. They are also included in the WHO safe surgery checklist, and supported by the SHEA/IDSA practice recommendation for prevention of SSIs [14,15,16]. Data for both indicators should be collected from the review of the patient charts or checklists.

For the first PAP indicator the compliance with the administration within 60 minutes before incision will be assessed for all surgical procedures where PAP was indicated (according to the local protocol) and administered:

$$\frac{\text{Number of PAP administered within 60 minutes before incision}}{\text{Number of all surgical procedures where PAP was indicated and administered}}$$

For the second PAP indicator the compliance with the discontinuation of PAP within 24 hours after initiation of surgery will be assessed for all surgical procedures where PAP was indicated (according to the local protocol) and administered:

$$\frac{\text{Number of PAP discontinued within 24 hours after initiation of surgery}}{\text{Number of all surgical procedures where PAP was indicated and administered}}$$

3.3.2.2 Preoperative skin preparation

The following preoperative skin preparation indicators have been added to the protocol:

- **No hair removal,** or if hair removal was necessary, only clipping.
- **Use of alcohol-based antiseptic solutions based on Chlorhexidine gluconate (CHG) for surgical site skin preparation** in the operating room (OR) (if no patient contraindication exists).

Moderate evidence is presented both in the WHO Global Guidelines for the Prevention of Surgical Site Infection and in the SHEA/IDSA practice recommendation for prevention of SSIs for no hair removal, with a strong recommendation in the WHO Guidelines [13,14,15]. Furthermore, moderate or moderate to low evidence is also backing the alcohol-based antiseptic solutions based on CHG preoperative skin antisepsis in the SHEA/IDSA practice recommendation as well as the WHO Guidelines [13, 14, 15]. The abovementioned indicator for alcohol-based skin antisepsis includes all alcohol-based skin antisepsis solutions based on CHG used in the OR prior to the incision but does not include other skin antisepsis performed before the entry to the OR. Data for both SPIs should be collected by observation or from the review of the patient charts, not only if included in the local protocol or standard operating procedure. In case of hair removal, patient's possible self-shaving performed at home is recommended to be recorded as a non-compliant observation.

For the compliance with no hair removal (or if hair removal was necessary, only clipping) will be assessed for all surgeries in the selected operation type:

$$\frac{\text{Number of surgical procedures with no hair removal, or only clipping}}{\text{Number of all surgical procedures in the procedure type}}$$

For the compliance with the use of alcohol-based antiseptic solutions based on CHG for surgical skin preparation in the OR will be assessed for all surgeries where no contraindication:

$$\frac{\text{Number of surgical procedures with surgical site preparation with alcohol and CHG-based solution}}{\text{Number of all surgical procedures in the procedure type where no contraindication}}$$

3.3.2.3 Other prevention indicators

The last group of SPIs that are collected aggregated per operation type include two indicators:

- Ensuring the patient's **normothermia** in the perioperative period (within one hour of the end of operation) (36-38°C (rectal measurement) or 35,5-37,5 °C (non-rectal measurement)), if no contraindication.
- Using a **protocol for intensive perioperative blood glucose control and blood glucose levels monitored** for adult patients undergoing surgical procedures.

Both the monitoring and ensuring patient's normothermia and glucose monitoring and control in the perioperative period have been presented in the WHO Global Guidelines for the Prevention of Surgical Site Infection as well as in the SHEA/IDSA practice recommendation for prevention of SSIs. In the SHEA/IDSA practice recommendation high evidence was presented for maintaining normothermia during the perioperative period and for glucose control in cardiac surgery patients, and moderate evidence for glucose control in noncardiac surgery patients, whereas in the WHO Guidelines evidence for maintaining normothermia was deemed moderate and evidence for glucose control low [13,15,16]. The WHO Guidelines found smaller effect in studies concentrating on intraoperative intensive blood glucose control compared to those with intensive postoperative protocol, whilst for the normothermia the WHO Guidelines recommend the use of warming devices in the operating room and during the surgical procedure [13].

The SPI on the compliance with normothermia in the perioperative period should be collected as either direct observation or from the review of patient charts. The temperature should be measured in the recovery room within one hour after the end of the surgical procedure. Normothermia should NOT be assessed for surgical procedures where normothermia is contraindicated, as for example in the case of induced hypothermia for CABG. Normothermia is defined as the patient's temperature within one hour of the end of operation (36-38°C (rectal measurement) or 35,5-37,5 °C (non-rectal measurement)), if no contraindication:

$$\frac{\text{Number of surgical procedures where patient normothermic within one hour after surgery}}{\text{Number of all surgical procedures in the procedure type where no contraindication}}$$

The SPI on the use of protocols for intensive perioperative blood glucose control for adult patients undergoing surgical procedures refers to blood glucose control intra- and postoperatively (24 hours after initiation of surgical procedure). It should be collected from the review of the patient charts or checklists [15]. The SPI will focus on whether protocol for intensive perioperative blood glucose control is used and the blood glucose levels are monitored rather that the exact blood glucose levels, and will be assessed for all surgical procedures in the selected procedure type:

$$\frac{\text{Number of surgical procedures where a protocol for intensive blood glucose control is used and the blood glucose levels monitored}}{\text{Number of all surgical procedures in the procedure type}}$$

4. Indicators to be produced at the European level on the occurrence and characteristics of surgical site infections

For each procedure under surveillance and for each level of the NHSN risk index, the EU database will produce the rates of SSIs (in total and for superficial, deep, organ-space, separately), as a percentage of the number of interventions and as an incidence density (number of SSI with onset before hospital discharge per 1 000 patient days in the hospital).

4.1 Percentage of SSIs by category

The first indicator (% SSIs) gives the most complete picture for a given operative procedure but is highly dependent on the intensity of post-discharge surveillance, which varies considerably between hospitals and between countries. The indicator may be presented separately for all SSIs and only for a subset of deep and organ/space SSIs, as well as separately for SSIs with microbiological findings (for the countries that report microorganism data).

$$\text{Percentage of SSIs (by category)} = \frac{\text{all first SSIs* in that category} \times 100}{\text{all operations in that category}}$$

** DateOfOnset-DateOfOperation ≤30 or ≤90 days if implant is in place (if calculating the date of operation as day 1: DateOfOnset-DateOfOperation+1 ≤31 or ≤91)*

4.2 Incidence density of in-hospital SSIs

The second indicator (number of in-hospital SSIs/1 000 patient-days in the hospital) only considers infections detected in the hospital and therefore it does not reflect the complete epidemiological picture, e.g. in procedures with short post-operative hospital stay. However, it is independent of post-discharge surveillance and corrects for differences in post-operative hospital stay. Therefore, this indicator may be more reliable for inter-hospital or inter-network comparisons. The indicator may be presented separately for all SSIs and only for a subset of deep and organ/space SSIs, as well as separately for SSIs with microbiological findings (for the countries that report microorganism data).

$$\text{Incidence density in-hospital SSIs (by category)} = \frac{\text{all } \textbf{in-hospital} \text{ SSIs in that category} \times 1000}{\text{in-hospital postoperative patient days with known discharge date in that category}}$$

** DateOfOnset-DateOfOperation ≤30 or ≤90 days if implant is in place (if calculating the date of operation as day 1: DateOfOnset-DateOfOperation+1 ≤31 or ≤91)*

Step 1. Delete/exclude all operations (with or without SSI) where DateOfHospitalDischarge is unknown.

Step 2. Calculate in-hospital postoperative patient days as sum of (DateOfHospitalDischarge-DateOfOperation+1).

Step 3. Apply 30/90-day rule on (in-hospital) SSIs.

5. Data collection

5.1 Population under surveillance

All data from participating hospitals (or specific wards within a hospital) that perform procedures included in the European protocol are eligible for inclusion. A minimum period of three months or continuous collection of data on SSIs in the participating hospitals is recommended for all surveillance options.

5.2 Type of surgery under surveillance

To obtain sufficient numbers of records allowing statistically valid conclusions, the diversity of operations to be recorded is limited and focuses on relatively frequently registered procedures that are likely to be interpreted similarly in different settings. The code definitions and mappings for ICD-10-PCS are included in the annexes of this protocol, based on mappings from NHSN, available at: https://www.cdc.gov/nhsn/opc/ssi/index.html

ICD-10-PCS coding is more detailed than the previously used ICD-9-CM coding and may be reported separately in the patient-based surveillance option, similarly as the previous ICD-9-CM or other internationally used surgical procedure coding. For the historic ICD-9-CM coding, please refer to the HAISSI protocol version 2.2 Annex 1, available at: https://www.ecdc.europa.eu/sites/default/files/documents/HAI-Net-SSI-protocol-v2.2.pdf

Selected type of surgical procedures for surveillance with high-level description

NHSN	High-level description
category	
COLO	Colon surgery Incision, resection or anastomosis of the large bowel; includes large-to-small and small-to-large bowel anastomosis Laparoscopic excision of large intestine Enterotomy Intestinal anastomosis
REC	Rectum surgery
CHOL	Cholecystectomy
	Removal of gallbladder, includes procedures performed using the laparascope
HPRO	Arthroplasty of hip
KPRO	Arthroplasty of knee
LAM	Laminectomy Exploration or decompression of spinal cord through excision or incision into vertebral structures
CSEC	Caesarean section
CARD	Cardiac surgery
CABG	Coronary artery bypass, unspecified
CBGB	Coronary artery bypass grafting with both chest and donor site incisions Chest procedure to perform direct revascularisation of the heart; includes obtaining suitable vein from donor site for grafting
CBGC	Coronary artery bypass grafting with chest incision only Chest procedure to perform direct vascularisation of the heart using, for example, the internal mammary artery

5.3 Levels of data requirement

In 2026, ECDC plans a transition from TESSy to the EpiPulse Cases system, where the requirements of the variables will be updated. The specifications will be made available with the launch of EpiPulse Cases.

5.4 Hierarchy of datasets

The set of variables for **HAI-Net SSI reporting** consists of nine technical variables and a set of epidemiological variables. The dataset definition is expected to remain similar between TESSy and EpiPulse Cases, but the naming of the files/levels and some variables might change. Technical variables are only relevant for the surveillance network coordination.

HAI-Net SSI patient-based surveillance option *(RecordType 'HAISSI')* contains five datasets in four hierarchical levels:

1. **First level** 'HAISSI' includes data referring to the hospital/unit that are repeated in all records reporting the operation data, infection data and microorganisms and resistance data.
   The level is required.
2. **Second level** 'HAISSI$IND' includes variables about structure and process indicators for SSI prevention. The level is optional.
2. **Second level** 'HAISSI$OP' includes variables about patient, operation and risk factors.
   The level is required.
3. **Third level** 'HAISSIOPINF' includes variables about SSIs.
   The level is required.
4. **Fourth level** 'HAISSIOPINF$RES' includes variables about pathogens and their resistance.
   The level is optional.

HAI-Net SSI unit-based and minimal surveillance option data *(RecordType 'HAISSILIGHT')* contains three possible datasets in two to four hierarchical levels:

1. **First level** 'HAISSILIGHT' includes data referring to the hospital/unit that are repeated in all records reporting the operation data, infection data and microorganisms and resistance data.
   The level is required.
2. **Second level** 'HAISSILIGHT$OPCAT' includes variables about operations and number of SSIs.
   The level is required.
2. **Second level** 'HAISSILIGHT$IND' includes variables about structure and process indicators for SSI prevention.
   The level is optional.
3. **Third level** 'HAISSILIGHT$OPCAT$INF' includes variables about SSIs and operations.
   The level is optional.
4. **Fourth level** 'HAISSILIGHT$OPCAT$INF$RES' includes variables about pathogens and their resistance.
   The level is optional.

5.5 Technical variables

Reporting country: ISO codes (International Organization for Standardization ISO 3166-1 -alpha-2-code elements): AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, ES = Spain, FI = Finland, FR = France, GB = Great Britain, GR = Greece, HR = Croatia, HU = Hungary, IE = Ireland, IT = Italy, IS = Iceland, LI = Liechtenstein, LV = Latvia, LT = Lithuania, LU = Luxembourg, MT = Malta, NL = Netherlands, NO = Norway, PL = Poland, PT = Portugal, RO = Romania, SK = Slovakia, SI = Slovenia, SE = Sweden.

Network id: Unique identifier for each network – Member State selected and generated. Code can be omitted, if the hospital identifiers are unique within the reporting country, but should be combined with HospitalId if same codes are used across different subnetworks that are reported through by single DataSource (e.g. data from five regional CCLIN networks reported as one database by France).

Subject: HAISSI

The rest of the technical variables are shown in the current TESSy metadata and are expected to remain similar in EpiPulse Cases. However, some variables will change name or be removed (e.g. RecordTypeVersion will not be used in EpiPulse Cases), and unknown ('UNK') or NA values will in general not be accepted.

6. Hospital/unit data (patient-, unit-based and minimal surveillance option)

Hospital/unit data are the same for patient-/unit-based and minimal surveillance option and use the same form A1 to collect hospital/unit data. The first level (RecordType 'HAISSI' or 'HAISSILIGHT') is required.

6.1 Hospital and unit characteristics – Form A1

Hospital code (required): Unique identifier for each hospital – Member State selected and generated, should remain identical in different surveillance periods/years. Required.

Hospital surveillance period start (required): The start date of the surveillance period or the surveillance year.

Hospital Type: PRIM = Primary level, SEC = Secondary level, TERT = Tertiary level, SPEC = Specialized/Other

Primary:
- often referred to as 'district hospital' or 'first-level referral';
- often corresponds to a general hospital without teaching function;
- few specialities (mainly internal medicine, obstetrics-gynaecology, paediatrics, general surgery or only general practice);
- limited laboratory services are available for general, but not for specialised pathological analysis.

Secondary:
- often referred to as 'provincial hospital';
- often corresponds to general hospital with teaching function;
- highly differentiated hospital by function with five to 10 clinical specialities, such as haematology, oncology, nephrology, ICU;
- takes some referrals from other (primary) hospitals.

Tertiary:
- often referred to as 'central', 'regional' or 'tertiary-level' hospital;
- often corresponds to University hospital;
- highly specialised staff and technical equipment (ICU, haematology, transplantation, cardio-thoracic surgery, neurosurgery);
- clinical services are highly differentiated by function;
- specialised imaging units;
- provides regional services and regularly takes referrals from other (primary and secondary) hospitals.

Specialised hospital:
- single clinical specialty, possibly with sub-specialties;
- highly specialised staff and technical equipment;
- e.g. paediatric hospital, infectious diseases hospital.

Hospital size: Total number of beds in the hospital or rounded to the closest 100 beds.

Hospital location: Region as NUTS-1 code where hospital is located. See: http://ec.europa.eu/eurostat/web/nuts/overview

Method used for post-discharge surveillance: Method used for post-discharge surveillance of surgical site infections:

READM = Detection at readmission (=passive post-discharge surveillance): patient is readmitted with SSI, often because of the SSI;

REPSURG = Reporting on surgeon's initiative: surgeon actively reports post-discharge infections detected at outpatient clinic or private clinic follow-up to the hospital surveillance staff, e.g. using standardised forms, web-based system, e-mail or telephone;

REPGP = Reporting on GP's initiative: general practitioner (GP) reports post-discharge infections detected at follow-up consultation to the hospital surveillance staff, e.g. using standardised forms, web-based system, e-mail or telephone;

REPPAT = Reporting on patient's initiative: e.g. form send to hospital surveillance staff;

ICSURG = Obtained by IC staff from surgeon: the hospital surveillance staff – usually infection control (IC) staff – obtains information from surgeon using telephone, additional questionnaire, visit to surgeon or patient chart review;

ICGP = Obtained by IC staff from GP: hospital surveillance staff obtains information from general practitioner using telephone, additional questionnaire or visit;

CPAT = Obtained by IC staff from patient: hospital surveillance staff obtains information from patient using telephone or additional questionnaire;

NONE = No post-discharge surveillance done.

Alcohol handrub (AHR) consumption per year in surgical wards/units: AHR consumption per year in all surgical wards/units participating in SSI surveillance in the hospital.

Patient-days per year in surgical wards/units: Patient-days per year in all surgical wards/units participating in SSI surveillance in the hospital. Note: should be the denominator data for the AHR consumption, thus from the same wards as the AHR consumption in litres.

Do you have a system for root cause analysis/review in place: Does the hospital have a system for root cause analysis/review in place. Y = Yes; N = No.

Root cause analysis specification: If there is a system for root cause analysis in place, specify in which cases.

Unit ID: Unique identifier for each surgical unit – Member State selected and generated.

European Surveillance of Surgical Site Infections
Form A1. Patient-/unit-based and minimal surveillance: Hospital/ward/unit data

Hospital data

Hospital code: ☐

Hospital surveillance period start: ___/___/___

Hospital Type : O primary O secondary O tertiary O specialized

Hospital size: ☐

Hospital location (NUTS-1): ☐

Post-discharge surveillance method: O READM O REPSURG O REPGP O REPPAT O ICSURG O ICGP O ICPAT O NONE

Alcohol handrub (AHR) consumption per year in surgical wards/units: ☐ liters

Patient-days per year in surgical wards/units (same wards/units as for the AHR): ☐ patient-days

Do you have a system for root cause analysis/review in place: O Yes O No

If Yes, please specify in which cases:_____

_____

_____

Ward/unit identifier (optional)

Surgical ward/unit ID: ☐

6.2 Structure and process indicators – Form A2

The second level (RecordType 'HAISSI$IND' and 'HAISSILIGHT$IND') includes variables about structure and process indicators for SSI prevention. The collection of structure and process indicator data is recommended, but the data level is optional for patient-/unit-based and minimal surveillance options. In case data for structure and process indicators are reported, several variables on the level are required.

Operation code (required): NHSN code of the primary operative procedure under surveillance according to SSI surveillance protocol for which the structure and process indicator data is collected: CARD = cardiac surgery; CBGB = coronary artery bypass grafting with both chest and donor site incisions; CBGC = coronary artery bypass grafting with chest incision only; CABG = coronary artery bypass grafting, not specified; COLO = colon surgery; CHOL = cholecystectomy; CSEC = caesarean section; HPRO = hip prosthesis; KPRO = knee prosthesis; LAM = laminectomy; REC = rectum surgery.

Indicator period start (required): Start date of the structure and process indicator data collection.

Indicator period end: End date of the structure and process indicator data collection.

Indicator code (required): Code of the structure and prevention indicator:

ASTPAP60MIN = Administration of PAP within 60 minutes before incision (except when administering vancomycin and fluoroquinolones);

ASTPAP24HRS = Discontinuation of PAP within 24 hours after initiation of surgery;

NOHAIRREM = No hair removal, or if hair removal was necessary, only clipping;

ALCSKINANT = Use of alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in the OR;

NORMTHERM = Ensuring the patient's normothermia within one hour of the end of operation (36-38°C (rectal measurement) or 35,5-37,5 °C (non-rectal measurement));

GLUCMONIT = Protocol for intensive perioperative blood glucose control used and blood glucose levels monitored.

Number of observations (required): Number of observations for each indicator code.

Number of compliant observations (required): Number of compliant observations for each indicator code.

Comments: Comments on the SPI data. Free text.

European Surveillance of Surgical Site Infections
Form A2. Patient-/unit-based surveillance: Indicator data

Hospital/ward, surveillance year and operation type for which the indicators are observed

Hospital code: _____ *as in form A1*

Operation code:
O CARD O CBGB O CBGC O CABG O CHOL O COLO O CSEC O HPRO O KPRO O LAM O REC

Indicator period start: __/__/__ *Period in which the indicators have*
Indicator period end: __/__/__ *been assessed*

Indicator data

	N of observations	N of compliant observations
Preoperative Antibiotic Prophylaxis (PAP)		
Administration of PAP within 60 minutes before incision (except when administering vancomycin and fluoroquinolones):		
Discontinuation of PAP within 24 hours after initiation of surgery:		
Preoperative skin preparation		
No hair removal, or if hair removal was necessary, only clipping:		
Use of alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in the OR:		
Other indicators		
Ensuring the patient's normothermia within one hour of the end of operation (36-38°C (rectal measurement) or 35,5-37,5 °C (non-rectal measurement)):		
Protocol for intensive perioperative blood glucose control used and blood glucose levels monitored:		

Comments:_____

6.3 Unit-based and minimal surveillance option denominator and SSI data – Form AL3

The second level in the unit-based and minimal surveillance options (RecordType 'HAISSILIGHT$OPCAT') includes denominator data and variables about each operation category. The level is required in the unit-based and minimal surveillance options. Since protocol version 2.3, it also includes variables for minimal surveillance option for SSIs.

Operation code (required): NHSN (National Healthcare Safety Network) code of the primary operative procedure under surveillance according to SSI surveillance protocol for which the aggregated denominator data and SSI data are collected: CARD = cardiac surgery; CBGB = coronary artery bypass grafting with both chest and donor site incisions; CBGC = coronary artery bypass grafting with chest incision only; CABG = coronary artery bypass grafting, not specified;COLO = colon surgery; CHOL = cholecystectomy; CSEC = caesarean section; HPRO = hip prosthesis; KPRO = knee prosthesis; LAM = laminectomy; REC = rectum surgery

Endoscopic procedure: Denominator data entry is for endoscopic/laparoscopic operations or open operations.

Note that endoscopic/laparoscopic requires that the entire operation was performed using endoscopic/laparoscopic approach.

Surveillance period started (required): Start date of the time period covered by this denominator entry.

Surveillance period ended (required): End date of the time period covered by this denominator entry.

Number of operations: Number of surgical procedures in the category of operations according to operation code, endoscopic/laparoscopic (if given) during the survey period.

Number of operations with known discharge date: Number of surgical procedures in the category of operations with known discharge date according to operation code, endoscopic/laparoscopic (if given) during the survey period.

Number of postoperative patient days: Number of post-operation hospital patient days. Definition: the sum of patient days in the hospital following the operation (discharge date – operation date + 1) according to operation code, endoscopic/laparoscopic (if given) during the survey period.

Number of superficial SSIs: Number of superficial surgical site infections in the category of operations according to operation code, endoscopic/laparoscopic (if given) during the survey period.

Number of deep SSIs: Number of deep surgical site infections in the category of operations according to operation code, endoscopic/laparoscopic (if given) during the survey period.

Number of organ/space SSIs: Number of organ/space surgical site infections in the category of operations according to operation code, endoscopic/laparoscopic (if given) during the survey period.

European Surveillance of Surgical Site Infections
Form AL3. Unit-based and minimal surveillance: Aggregated data

Aggregated operation category denominator and aggregated SSI data

Operation code:
O CARD O CBGB O CBGC O CABG O CHOL O COLO O CSEC O HPRO O KPRO O LAM O REC

Endoscopic operation: O Yes O No

Start date of the denominator entry	___/___/___
End date of the denominator entry	___/___/ ____
Number of operations:	
Number of operations with known discharge date	
Number of post-operation hospital patient-days	
Number of superficial SSIs	
Number of deep SSIs	
Number of organ/space SSIs	

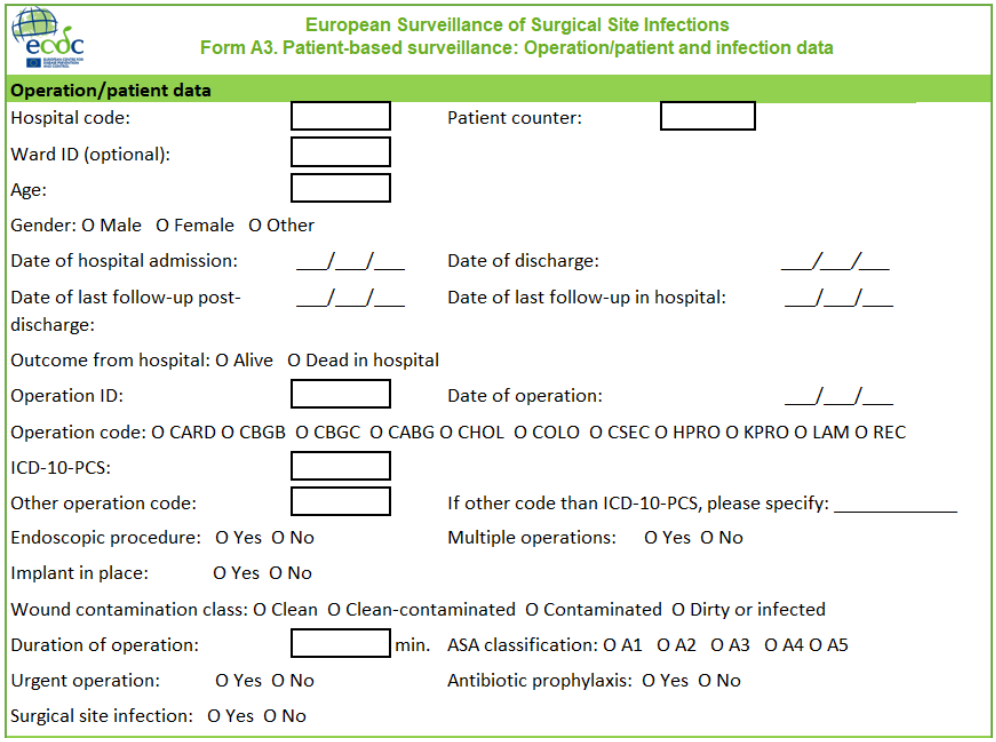
7. Patient/operation data (required in patient-based surveillance option)

7.1 Patient-based surveillance option patient/operation data – Form A3

The second level of the patient-based surveillance option (RecordType 'HAISSI$OP') includes variables about patient, operation and risk factors and are collected for each patient/operation. The level is required in patient-based surveillance option.

Patient/operation variables:
Patient counter: Numeric code for each patient, unique within hospital. Anonymous code assigned by hospital to specify patient.
Age: Age of the patient at date of operation.
Gender: The gender of the patient who undergoes the operation. F = Female; M=Male; OTH = Other.
Date of hospital admission: Date patient was admitted to hospital in order to undergo the operation under surveillance.
Date of hospital discharge: Date the patient was discharged from hospital where they underwent the operation under surveillance or date of in-hospital death or date of last follow-up in hospital if discharge date is unknown. This date is used to calculate the number of post-operative in-hospital patient days.
Date of last follow-up post-discharge: Date last information on the patient was obtained after discharge from hospital, for example from surgeon (out-patient department or private practice) or general practitioner. This date is used to calculate the total amount of follow-up days (in-hospital and post-discharge). (DateOfLastFollowup)
Date of last follow-up in hospital: Date last information on the patient was obtained during the hospitalisation, for example from surgeon. Can be used when different from date of hospital discharge, e.g. if hospital stay is longer than 30 days, or follow-up of surveillance was discontinued for other reasons while patient was still in hospital to calculate the total amount of follow-up days (in-hospital).
Outcome from hospital: Patient status at the last reported hospital discharge or at end of follow-up in hospital.
Operation ID (required): Unique identifier for each operation – Hospital selected and generated.
Date of operation (required): Date operation under surveillance was carried out.
Operation code (required): NHSN (National Healthcare Safety Network) code of the primary operative procedure under surveillance according to SSI surveillance protocol.
ICD-10-PCS code: ICD-10-PCS code of the primary operative procedure under surveillance according to SSI surveillance protocol. See Annex 4. Recommended coding system.
Other operation code: Other code of the primary operative procedure under surveillance according to SSI surveillance protocol, for example ICD-9-CM. Please also specify the other coding system in a separate field (see below). Alternative coding system may be used if ICD-10-PCS code cannot be reported.
Name of the non ICD-10-PCS code: Name of the other code used for the primary operative procedure under surveillance: ICD-9-CM = International classification of diseases-9 coding, as in the previous protocol versions; ICD-10-AM = International classification of diseases-10-AM; ICD-11 = International classification of diseases 11 (2022 onwards); CCAM = Classification des Actes Médicaux; CVV = Classificatie van verrichtingen; GOA = Gebührenordnung für Ärzte; ICPM = International Classification of Procedures in Medicine; NCSP = Nomesco Classification of Surgical Procedures; NPS = Nomenclature des prestations de santé; OPS-301 = Operationen- und Prozedurenschlüssel; OPCS-4 = OPCS Classification of Interventions and Procedures version 4. Alternative coding system may be used if ICD-10-PCS code cannot be reported.
Endoscopic procedure: Enter 'Yes' only if the entire operation was performed using an endoscopic/laparoscopic approach.
Multiple operations: Enter 'Yes' if multiple procedures were performed through the same incision within the same session in the operating room. Duration of operation should be calculated for the combined duration of all procedures. If more than one NHSN operative procedure category was performed through the same incision, attribute the SSI to the procedure that is thought to be associated with the infection [17].
Implant in place: Enter 'Yes' if there is an implant in place. The follow-up period if an implant in place should be extended to 90 days after the operation for deep or organ/space infections. Implant is defined according to the US National Nosocomial Infection Surveillance definition: a nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during surgery [6].
Wound contamination class: The wound contamination class as described in the section 3.2.2: W1 = Clean; W2 = Clean-contaminated; W3 = Contaminated; W4 = Dirty or infected.
Duration of operation: Duration of operation (in minutes) from skin incision to skin closure. In case of reintervention within 72 hours after the primary procedure, the duration of the reintervention needs to be added to the duration of the primary procedure.
Urgent operation: Planning time of the operation. 'Yes' means urgent operation that was not planned at least 24 hours in advance. 'No' means elective operation that was planned at least 24 hours in advance.

ASA classification: Physical status classification developed by the American Society of Anesthesiology. Status at the time of the operation: A1 = Normally healthy patient; A2 = Patient with mild systemic disease or condition; A3 = Patient with severe systemic disease that is not incapacitating; A4 = Patient with an incapacitating systemic disease that is a constant threat to life; A5 = Moribund patient who is not expected to survive for 24 hours with or without operation.
Patient received surgical prophylaxis: Perioperative systemic administration of antimicrobial agent(s) at or within two hours prior to primary skin incision with the aim of preventing sepsis in the operative site. In case of caesarean section, after clamping of umbilical cord.
Surgical site infection (required): Presence of a SSI for this operation. For CBGB, only chest wound infections are to be reported.



European Surveillance of Surgical Site Infections
Form A3. Patient-based surveillance: Operation/patient and infection data

Operation/patient data

Hospital code: ☐ Patient counter: ☐
Ward ID (optional): ☐
Age: ☐
Gender: O Male O Female O Other
Date of hospital admission: ___/___/___ Date of discharge: ___/___/___
Date of last follow-up post-discharge: ___/___/___ Date of last follow-up in hospital: ___/___/___
Outcome from hospital: O Alive O Dead in hospital
Operation ID: ☐ Date of operation: ___/___/___
Operation code: O CARD O CBGB O CBGC O CABG O CHOL O COLO O CSEC O HPRO O KPRO O LAM O REC
ICD-10-PCS: ☐
Other operation code: ☐ If other code than ICD-10-PCS, please specify: _____
Endoscopic procedure: O Yes O No Multiple operations: O Yes O No
Implant in place: O Yes O No
Wound contamination class: O Clean O Clean-contaminated O Contaminated O Dirty or infected
Duration of operation: ☐ min. ASA classification: O A1 O A2 O A3 O A4 O A5
Urgent operation: O Yes O No Antibiotic prophylaxis: O Yes O No
Surgical site infection: O Yes O No

7.2 Unit-based surveillance option patient/operation data – Form AL4

The third level of the unit-based surveillance option (RecordType 'HAISSILIGHT$OPCAT$INF') includes variables about patients and operations that are only collected for patients and operations with a SSI. The level is not reported in the minimal surveillance option.

Demographic/operation variables (unit-based reporting surveillance):

Patient counter: Numeric code for each patient, unique within hospital. Anonymous code assigned by hospital to specify patient.
Age: Age of the patient at date of operation.
Gender: The gender of the patient who undergoes the operation. F = Female; M=Male; OTH = Other.
Date of hospital discharge: Date the patient was discharged from hospital where they underwent the operation under surveillance or date of in-hospital death or date of last follow-up in hospital if discharge date is unknown. This date is used to calculate the number of post-operative in-hospital patient days.
Outcome from hospital: Patient status at the last reported hospital discharge or at end of follow-up in hospital.
Operation ID (required): Unique identifier for each operation – Hospital selected and generated.
Date of operation (required): Date of operation under surveillance.
Operation code (required): NHSN (National Healthcare Safety Network) code of the primary operative procedure under surveillance according to SSI surveillance protocol.
Endoscopic procedure: Enter 'Yes' only if the entire operation was performed using an endoscopic/laparoscopic approach.
Implant in place: Enter 'Yes' if there is an implant in place. The follow-up period if an implant in place should be extended to 90 days after the operation for deep or organ/space infections.

European Surveillance of Surgical Site Infections
Form AL4. Unit-based surveillance: Operation/patient and infection data

Operation/patient data

Hospital code: ☐ Patient counter: ☐

Ward ID (optional): ☐

Operation ID: ☐

Age: ☐

Gender: O Male O Female O Other

Date of hospital discharge: ___/___/___ *If readmission, record the first discharge*

Outcome from hospital: O Alive O Dead in hospital

Operation ID: ☐

Date of operation: ___/___/___

Operation code:
O CARD O CBGB O CBGC O CABG O CHOL O COLO O CSEC O HPRO O KPRO O LAM O REC

Endoscopic procedure: O Yes O No

Implant in place: O Yes O No *If implant in place -> 90-day follow-up for D/O SSI*

8. Surgical site infection data and microorganism/resistance data (patient-/unit-based surveillance option)

8.1 SSI data – Form A3/AL4

The SSI data (RecordTypes HAISSIOPINF and HAISSILIGHT$OPCAT$INF) collected are collected on the third level in both patient-/unit-based surveillance option. These data are collected for each infection episode, by type of infection. The level is required for patient-/unit-based surveillance option.

Date of infection onset (required): Date when the first clinical evidence of SSI appeared or the date the specimen used to make or confirm the diagnosis was collected, whichever comes first.
Type of infection (required): Type of infection (see section 3.1): S=Superficial incisional; D = Deep incisional; O = Organ/space.
SSI diagnosis: SSI diagnosis in-hospital or post-discharge.
SSI Post-discharge surveillance Method: Method used for post-discharge surveillance of SSIs (see also section 6.1): READM = Detection at readmission; REPSURG = Reporting on surgeon's initiative; REPGP = Reporting on GP's initiative; REPPAT = Reporting on patient's initiative; ICSURG = Obtained by IC staff from surgeon; ICGP = Obtained by IC staff from GP; ICPAT = Obtained by IC staff from patient.

SSI outcome (relationship to HAI): the relationship of an SSI to the outcome in patients with an SSI can be assessed with either one of the following two scales [van der Kooi T et al. Eurosurveill 202, 26(23). https://doi.org/10.2807/1560-7917.ES.2021.26.23.2000052]

1. **3-CAT:** (three-category scale)

Discharged alive: patient was discharged alive; OR patient was still in the hospital and alive at end of follow-up during this hospital stay.
Death, HAI definitely contributed to death: use this category if a causal link between SSI and death can be demonstrated.
Death, HAI possibly contributed to death: use this category if no causal link between SSI and this case's death can be demonstrated, but it is still plausible that SSI was at least a contributory factor.
Death, unrelated to HAI: use this category if the cause of death can be demonstrated not to be related to SSI.
Death, relationship to HAI unknown: use this category if no evidence of contributory factors to the cause of death is available.

2. **WHOCAT**: a scale based on the WHO death certification methodology:

- Discharged alive: patient was discharged alive; OR patient was still in the hospital and alive at the end of follow up during the hospital stay.
- Death, no contribution of HAI: HAI did not contribute to the death or the contribution was redundant, i.e. the patient would have died anyway;
- Death, HAI contributory cause: HAI was a contributory cause but not related to the disease or condition causing the death;
- Death, HAI part of the causal sequence: HAI was part of the causal sequence of events that led to death but not sufficient on its own;
- Death, HAI sole cause: HAI was the sole cause of death – no other disease or condition causing the death was present (sufficient condition).
- Death, relationship to HAI unknown or not verified: Contribution of HAI to death of the patient unknown or not verified

Infection data
Date of onset: ___/___/___ Type of infection: O Superficial O Deep O Organ/Space
SSI diagnosis: O HOSP O PD
SSI postdischarge surveillance method: O READM O REPSURG O REPGP O REPPAT O ICSURG O ICGP O ICPAT O OTHER
Infection outcome (ECDC 3CAT): O alive O death, infection was sole cause O death, HAI definitely contributed to death O death, HAI possibly contributed to death O death, no relation to HAI O death, relationship to HAI unknown
Infection outcome (WHOCAT): O alive O death, infection was part of causal sequence leading to death O death, infection contributed, but was not the cause O death, not related to infection O death, relationship to HAI unknown

8.2 Microorganism and antimicrobial resistance data – Form A3/AL4

The fourth level (RecordTypes 'HAISSIOPINF$RES' or 'HAISSILIGHT$OPCATINFRES') includes variables about isolated microorganisms and antimicrobial resistance. The level is optional but recommended to identify SSIs with reported pathogen(s).

Isolate result (required): Microorganism or reason why not available. See Annex 1.
Antibiotic code: Antibiotic code tested for susceptibility. See Annex 3.
SIR: Final interpretation result of all different susceptibility tests performed. See Annex 2. Report S (susceptible, standard dosing regimen), I (susceptible, increased exposure) or R (resistant) for the antimicrobial group (preferred) or for tested antimicrobials within the group. Reporting group susceptibility requires that at least one antimicrobial belonging to the group is tested. If several antibiotics within the group were tested (e.g. carbapenems (CAR)), report the least susceptible result for the group (e.g. meropenem R + imipenem I = CAR R).
Pandrug-resistant (PDR): Microorganism is pandrug resistant. Not PDR = N (susceptible to at least one antimicrobial), possible PDR = P (I/R to all antimicrobials tested in hospital), confirmed PDR = C (I/R to all antimicrobials confirmed by reference laboratory) [18].

Microorganism and antimicrobial resistance data (repeatable per infection/microorganisms)							
Microorganism code	AM	S/I/R	PDR	Microorganism code 2	AM	S/I/R	PDR

9. Confidentiality

9.1 Patient confidentiality

It will not be possible to identify individual patients in the European database on SSI by coding patient information only at the hospital level or at the level of the official networks in the countries. However, for validation purposes, the hospitals should be able to trace back patients based on the anonymous unique operative procedure ID.

9.2 Hospital and unit confidentiality

Individual hospitals will not be identifiable in the European database on SSI by coding hospital information at the hospital level or at the level of the official networks in the countries. When presenting the results of the European SSI surveillance, it has to be secured that no individual hospital can be recognised.

9.3 Publication policy

Data will be published in ECDC's Annual Epidemiological Reports and in disease-specific reports on HAI surveillance, in online reports and scientific publications. Data can only be published if the official surveillance networks in the countries give written consent for publication. If requested by a network, publications have to acknowledge the data source (i.e. the networks) and provide contact information.

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Annex 1. Microorganisms code list

The code list is adapted from the original WHOCARE coding system. The current list is a selection of microorganisms based on their frequency of occurrence in healthcare-associated infections in different EU networks and infection types and/or on their public health importance. The minimal list represents the minimal level of detail that should be provided by every network.

Microorganism selection and minimal list

	Microorganism	Code	Minimal list
Gram-positive cocci	*Staphylococcus aureus*	STAAUR	**STAAUR**
	Staphylococcus epidermidis	STAEPI	
	Staphylococcus haemolyticus	STAHAE	**STACNS**
	Coag-neg. staphylococci, not specified	STACNS	
	Other coagulase-negative staphylococci (CNS)	STAOTH	
	Staphylococcus sp., not specified	STANSP	**GPCTOT**
	Streptococcus pneumoniae	STRPNE	
	Streptococcus agalactiae (B)	STRAGA	
	Streptococcus pyogenes (A)	STRPYO	**STRSPP**
	Other haemol. Streptococcae (C, G)	STRHCG	
	Streptococcus sp., other	STROTH	
	Streptococcus sp., not specified	STRNSP	
	Enterococcus faecalis	ENCFAE	
	Enterococcus faecium	ENCFAI	**ENCSPP**
	Enterococcus sp., other	ENCOTH	
	Enterococcus sp., not specified	ENCNSP	
	Gram-positive cocci, not specified	GPCNSP	**GPCTOT**
	Other Gram-positive cocci	GPCOTH	
Gram-negative cocci	*Moraxella catharralis*	MORCAT	
	Moraxella sp., *other*	MOROTH	
	Moraxella sp., *not specified*	MORNSP	
	Neisseria meningitidis	NEIMEN	**GNCTOT**
	Neisseria sp., other	NEIOTH	
	Neisseria sp., not specified	NEINSP	
	Gram-negative cocci, not specified	GNCNSP	
	Other Gram-negative cocci	GNCOTH	
Gram-positive bacilli	*Corynebacterium* sp.	CORSPP	
	Bacillus sp.	BACSPP	
	Lactobacillus sp.	LACSPP	**GPBTOT**
	Listeria monocytogenes	LISMON	
	Gram-positive bacilli, not specified	GPBNSP	
	Other Gram-positive bacilli	GPBOTH	
Enterobacterales	*Citrobacter freundii*	CITFRE	
	Citrobacter koseri (e.g. *diversus*)	CITDIV	**CITSPP**
	Citrobacter sp., other	CITOTH	
	Citrobacter sp., not specified	CITNSP	
	Enterobacter cloacae	ENBCLO	**ENBSPP**
	Enterobacter aerogenes – renamed to *Klebsiella aerogenes**	ENBAER	
	Enterobacter agglomerans	ENBAGG	
	Enterobacter sakazakii	ENBSAK	
	Enterobacter gergoviae	ENBGER	
	Enterobacter sp., other	ENBOTH	
	Enterobacter sp., not specified	ENBNSP	

	Microorganism	Code	Minimal list
	Escherichia coli	ESCCOL	**ESCCOL**
	Klebsiella aerogenes	KLEAER	**KLESPP**
	Klebsiella pneumoniae	KLEPNE	
	Klebsiella oxytoca	KLEOXY	
	Klebsiella sp., other	KLEOTH	
	Klebsiella sp., not specified	KLENSP	
	Proteus mirabilis	PRTMIR	**PRTSPP**
	Proteus vulgaris	PRTVUL	
	Proteus sp., other	PRTOTH	
	Proteus sp., not specified	PRTNSP	
	Serratia marcescens	SERMAR	**SERSPP**
	Serratia liquefaciens	SERLIQ	
	Serratia sp., other	SEROTH	
	Serratia sp., not specified	SERNSP	
	Hafnia sp.	HAFSPP	**ETBTOT**

	Microorganism	Code	Minimal list
Gram-negative bacilli, *Enterobacteriaceae* (continued)	*Morganella* sp.	MOGSPP	
	Providencia sp.	PRVSPP	
	Salmonella Enteritidis	SALENT	
	Salmonella Typhi or Paratyphi	SALTYP	
	Salmonella Typhimurium	SALTYM	
	Salmonella sp., not specified	SALNSP	
	Salmonella sp., other	SALOTH	
	Shigella sp.	SHISPP	
	Yersinia sp.	YERSPP	
	Other enterobacterales	ETBOTH	
	Enterobacterales, not specified	ETBNSP	
Gram-negative bacilli, other	*Acinetobacter baumannii*	ACIBAU	**ACISPP**
	Acinetobacter calcoaceticus	ACICAL	
	Acinetobacter haemolyticus	ACIHAE	
	Acinetobacter lwoffii	ACILWO	
	Acinetobacter sp., other	ACIOTH	
	Acinetobacter sp., not specified	ACINSP	
	Pseudomonas aeruginosa	PSEAER	**PSEAER**
	Stenotrophomonas maltophilia	STEMAL	**STEMAL**
	Burkholderia cepacia	BURCEP	
	Pseudomonadaceae family, other	PSEOTH	**PSETOT**
	Pseudomonadaceae family, not specified	PSENSP	
	Haemophilus influenzae	HAEINF	
	Haemophilus parainfluenzae	HAEPAI	**HAESPP**
	Haemophilus sp., other	HAEOTH	
	Haemophilus sp., not specified	HAENSP	
	Legionella sp.	LEGSPP	**LEGSPP**
	Achromobacter sp.	ACHSPP	
	Aeromonas sp.	AEMSPP	
	Agrobacterium sp.	AGRSPP	
	Alcaligenes sp.	ALCSPP	
	Campylobacter sp.	CAMSPP	
	Flavobacterium sp.	FLASPP	**GNBTOT**
	Gardnerella sp.	GARSPP	
	Helicobacter pylori	HELPYL	
	Pasteurella sp.	PASSPP	
	Gram-neg bacilli, not specified	GNBNSP	
	Other Gram-neg bacilli, non enterobacterales	GNBOTH	
Anaerobes	*Bacteroides fragilis*	BATFRA	**BATSPP**
	Bacteroides other	BATOTH	
	Clostridioides difficile	CLODIF	
	Clostridioides other	CLOOTH	
	Propionibacterium sp.	PROSPP	**ANATOT**
	Prevotella sp.	PRESPP	
	Anaerobes, not specified	ANANSP	
	Other anaerobes	ANAOTH	
Other bacteria	Mycobacterium, atypical	MYCATY	**BCTTOT**
	Mycobacterium tuberculosis complex	MYCTUB	
	Chlamydia sp.	CHLSPP	
	Mycoplasma sp.	MYPSPP	
	Actinomyces sp.	ACTSPP	

	Nocardia sp.	NOCSPP	
	Other bacteria	BCTOTH	
	Other bacteria, not specified	BCTNSP	
Fungi	*Candida albicans*	CANALB	**CANSPP**
	Candida auris	CANAUR	
	Candida glabrata	CANGLA	
	Candida krusei	CANKRU	
	Candida tropicalis	CANTRO	
	Candida parapsilosis	CANPAR	
	Candida sp., other	CANOTH	
	Candida sp., not specified	CANNSP	
	Aspergillus fumigatus	ASPFUM	**ASPSPP**
	Aspergillus niger	ASPNIG	
	Aspergillus sp., other	ASPOTH	
	Aspergillus sp., not specified	ASPNSP	
	Other yeasts	YEAOTH	**PARTOT**
	Fungi other	FUNOTH	
	Filaments other	FILOTH	

	Microorganism	Code	Minimal list
	Other parasites	PAROTH	
Viruses	Adenovirus	VIRADV	
	Cytomegalovirus (CMV)	VIRCMV	
	Enterovirus (polio, coxsackie, echo)	VIRENT	
	Hepatitis A virus	VIRHAV	
	Hepatitis B virus	VIRHBV	
	Hepatitis C virus	VIRHCV	
	Herpes simplex virus	VIRHSV	
	Human immunodeficiency virus (HIV)	VIRHIV	
	Influenza A virus	VIRINA	
	Influenza B virus	VIRINB	**VIRTOT**
	Influenza C virus	VIRINC	
	Norovirus	VIRNOR	
	Parainfluenzavirus	VIRPIV	
	Respiratory syncytial virus (RSV)	VIRRSV	
	Rhinovirus	VIRRHI	
	Rotavirus	VIRROT	
	SARS virus	VIRSAR	
	SARS-CoV-2	VIRCOV	
	Varicella-zoster virus	VIRVZV	
	Virus, not specified	VIRNSP	
	Other virus	VIROTH	
Microorganism not identified or not found		_NONID	**_NONID**
Examination not done		_NOEXA	**_NOEXA**
Sterile examination		_STERI	**_STERI**
Result not (yet) available or missing		_NA	**_NA**

*_NONID: evidence exists that a microbiological examination has been done, but the microorganism cannot be correctly classified or the result of the examination cannot be found; _NOEXA: no diagnostic sample taken, no microbiological examination done; _STERI: a microbiological examination has been done, but the result was negative (e.g. negative culture), _NA Result not (yet) available or missing. *Klebsiella aerogenes: both KLEAER and the old code ENBAER (Enterobacter aerogenes) are accepted.*

Annex 2. Antimicrobial resistance (AMR) markers and codes

Recommended method to collect AMR markers:

For each AMR marker, indicate whether the microorganism was S (susceptible, standard dosing regimen), I (susceptible, increased exposure) or R (resistant), for the following antimicrobials:

Staphylococcus aureus:

- Meticillin-resistant *S. aureus* (MRSA): Susceptibility to oxacillin (OXA) or other marker of MRSA such as cefoxitin (FOX), cloxacillin (CLO), dicloxacillin (DIC), flucloxacillin (FLC), meticillin (MET)
- Vancomycin-intermediate or vancomycin-resistant *S. aureus* (VISA, VRSA): Susceptibility to glycopeptides (GLY): vancomycin (VAN) or teicoplanin (TEC)

Enterococcus spp.:

- Vancomycin-resistant *Enterococcus* spp. (VRE): Susceptibility to glycopeptides (GLY): vancomycin (VAN) or teicoplanin (TEC)

Enterobacteriaceae (*Escherichia coli*, *Klebsiella* spp., *Enterobacter* spp., *Proteus* spp., *Citrobacter* spp., *Serratia* spp., *Morganella* spp.)

- Susceptibility to third-generation cephalosporins (C3G): cefotaxime (CTX), ceftriaxone (CRO), ceftazidime (CAZ)
- Susceptibility to carbapenems (CAR): imipenem (IPM), meropenem (MEM), doripenem (DOR)

Pseudomonas aeruginosa:

- Susceptibility to carbapenems (CAR): imipenem (IPM), meropenem (MEM), doripenem (DOR)

Acinetobacter spp.:

- Susceptibility to carbapenems (CAR): imipenem (IPM), meropenem (MEM), doripenem (DOR)

Annex 3. Minimal dataset description

	Unit-based 'light' surveillance	Patient-based 'standard' surveillance	Form
Collected information	• **Hospital data for each hospital** ○ HospitalId ○ DateUsedForStatistics (year) ○ TESSy/EpiPulse Cases technical variables	• **Hospital data for each hospital** ○ HospitalId ○ DateUsedForStatistics (year) ○ TESSy/EpiPulse Cases technical variables	• **Form A1**
	• **Aggregated denominator and numerator data for each hospital** ○ PeriodStart and PeriodEnd ○ OPCode ○ NumOperations ○ NumPostOpDays ○ NumSuperficialSSI ○ NumDeepSSI ○ NumOrganSpaceSSI ○ NumUnknownSSI	**N/A**	• **Form AL3**
		• **Patient/operation-based data** ○ DateOfOperation ○ DateOfHospitalDischarge ○ OPCode ○ OperationId • **Surgical site infection data** ○ DateOfOnset ○ SSIType	• **Form A3**

Annex 4. ICD-10-PCS code lists for surgical procedures

See the MS Excel tables, based on the National Healthcare Safety Network (NHSN) ICD-10 Operative Procedure Code Mappings, updated in 2024, available on the protocol download site.

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