TECHNICAL DOCUMENT

European surveillance of healthcare-associated infections in intensive care units

HAI-Net ICU protocol
Protocol version 1.02

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HAI-Net ICU protocol, version 1.02

This technical document of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Carl Suetens.

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This is version 1.02 of the HAI-Net ICU protocol. Differences between versions 1.01 (December 2010) and 1.02 are purely editorial.

Suggested citation: European Centre for Disease Prevention and Control. European surveillance of healthcare-associated infections in intensive care units – HAI-Net ICU protocol, version 1.02. Stockholm: ECDC; 2015.

Stockholm, March 2015

ISBN 978-92-9193-627-4

doi 10.2900/371526

Catalogue number TQ-04-15-186-EN-N

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Abbreviations

AMR	Antimicrobial resistance
APACHE score	Acute physiology, age, chronic health evaluation score
BAL	Broncho-alveolar lavage
BSI	Bloodstream infection
CDC	Centers for Disease Control and Prevention (USA)
CFU	Colony-forming units
CRI	Catheter-related infection
CVC	Central vascular catheter
EU	European Union
HAI	Healthcare-associated infections
HAIICU	healthcare-associated infections in intensive care units
HAI-Net	European network for the surveillance of healthcare-associated infections
HELICS	Hospitals in Europe Link for Infection Control through Surveillance
ICU	Intensive care unit
IPSE	Improving Patient Safety in Europe
LRT	Lower respiratory tract
NHSN	National Healthcare Safety Network
NI	Nosocomial infection
PN	Pneumonia
SAPS	Simplified acute physiology score
SSI	Surgical site infections
UTI	Urinary tract infection
WBC	White blood cells

Introduction and objectives

The Council Recommendation of 9 June 2009 on patient safety (2009/C 151/01), which also addresses the prevention and control of healthcare-associated infections (HAI), 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 (SSI) and healthcare-associated infections in intensive care units (ICU), 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 as in HELICS in 2008 and 2009, while changes to the protocols were agreed during the annual meetings of the HAI surveillance network in Stockholm in June 2009 and June 2010. The current protocol describes the methods for the surveillance of healthcare-associated infections in intensive care units (hereafter referred to as ICU-acquired infections) as they were implemented in The European Surveillance System (TESSy) for communicable diseases covered under Decision No 2119/98/EC, in 2010.

Surveillance of healthcare-associated infections in intensive care units was previously chosen as a component for European surveillance based on the existence of such networks in several EU Member States, on the fact that patients admitted to intensive care are at 5 to 10 times higher risk of acquiring a nosocomial infection (NI) due to both intrinsic (e.g. immunodepression) and extrinsic (e.g. mechanical ventilation) risk factors, and because the ICU is often the epicentre of emerging problems of healthcare-associated infections and antimicrobial resistance in the hospital.

The main objective of this protocol is to ensure standardisation of definitions, data collection and reporting procedures for hospitals participating in the national/regional surveillance of healthcare-associated infections in ICUs across Europe, in order to contribute to the EU surveillance of healthcare-associated infections and to improve the quality of care in the ICU in a multicentre setting. The protocol aims at describing methods for the participating ICUs and the national coordinating centres for the surveillance of healthcare-associated infections.

Specific objectives at the level of the intensive care unit and the hospital are:

- to monitor the size of the NI problem in a unit and identify the areas where prevention activities are needed;
- to compare the results of the unit with its previous ones, and for inter-unit comparison, and to compare groups of patients stratified for infection risk, in order to be able to identify areas where the quality of care can be improved;
- to sensitise personnel to infection problems (microorganisms, antibiotic resistance, etc.) and set local targets for prevention; and
- to provide relevant information to monitor and target infection control policies:
  - compliance with existing guidelines and good practices
  - correction or improvement of specific practices
  - development, implementation and evaluation of new practices.

Participation in the European network will also produce gains at the local level from international comparisons that may provide insights that would not be revealed by regional or national-level surveillance.

Specific objectives at the level of regional or national network coordination are:

- to provide to the units with the necessary reference data to make comparisons of risk-adjusted rates between units/hospitals;
- to follow-up epidemiological trends in time:
  - identification of important healthcare-associated pathogens
  - epidemiology of emerging infections, antimicrobial resistance
- to identify and follow-up risk factors of healthcare-associated infections; and
- to improve the quality of data collection.

Specific objectives at the European level are:

- to monitor and describe the epidemiology of nosocomial infections in intensive care units in the EU in view of responding to the objectives of Decision 2119/98 EC of the European Parliament and the Council [1];
- to identify emerging nosocomial pathogens in the ICU;
  - to follow-up the incidence and the geographical spread of nosocomial infections by type and pathogen in the ICU;
  - to assess the risk and the occurrence of international spread of nosocomial pathogens in the ICU;
  - to identify regions or countries at higher need of EU support with regard to surveillance and control of nosocomial infections;
  - to ensure communication of relevant data on nosocomial infections to the European Commission as a complement to data transmissions by national health authorities;
- to facilitate the communication and exchange of experience between national/regional networks for the surveillance of nosocomial infections;
- to stimulate the creation of national/regional coordination centres for the surveillance of nosocomial infections in the ICU 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; and
- to validate risk factors of nosocomial infections in the ICU at the EU level.

1 From IPSE/HELICS-ICU to HAI-Net ICU: summary of main changes

This document is based on version 6.1 of the HELICS-ICU protocol issued in September 2004. Changes to the protocol have been applied, either based on agreements made during the annual meetings of the European network for the surveillance of healthcare-associated infections (HAI-Net) in June 2009 and June 2010, or because they were necessary for the integration of the HAI surveillance data into TESSy.

- Some of the optional variables in the HELICS-ICU patient-based protocol have been removed: the entire central vascular catheter risk factor option and the optional variables Glasgow score, invasive mechanical ventilation (in addition to intubation), non-invasive mechanical ventilation, and nasogastric tube exposure (with or without feeding).
- Minimal antimicrobial resistance markers were changed to those of the protocol for the European Point Prevalence Survey of healthcare-associated infections and antimicrobial use in acute care hospitals. In addition, a new 'target' antimicrobial resistance list was defined for ICU-acquired infections. Some micro-organisms were corrected or added (_NA = result is not yet available or missing; ENCFAI instead of ENCFAC for *Enterococcus faecium*; CANKRU = *Candida krusei*).
- HAI-Net ICU standard and light protocol datasets both contain four levels: hospital-unit (first level), one record per patient admitted to the ICU (standard) or aggregated denominator for the entire ICU (light) at the second level, infection data at the third level, and finally microorganism-antimicrobial resistance (bug-drug) data at the fourth level. In the patient-based protocol there is also exposure episode data and (optionally) antimicrobial use data at the third level. Countries can submit data to ECDC as separate CSV files or as a single XML file.
- The format of the day-by-day exposure data was changed from one day per exposure and exposure type to episodes of exposure, with a start date and an end date. In order to know when exposure data for a given patient are missing, variables have been added at the patient/ICU admission level to assess the presence of any exposure (per type) during the ICU stay. This assessment of missing exposure data was not possible in the previous HELICS-ICU protocol.

2 Unit-based (light) versus patient-based (standard) surveillance of ICU-acquired infections

Since 2001–2002, the protocol for the surveillance of ICU-acquired infections has two versions, a unit-based and a patient-based version. This dual-version approach has now also been implemented for the other components of the European surveillance of healthcare-associated infections. The patient-based protocol version, also referred to as the 'standard' protocol, allows advanced risk adjustment of healthcare-associated infection rates for inter-hospital comparisons. The unit-based, or 'light' protocol, provides a less labour-intensive solution, producing partially the same indicators as the patient-based version for follow-up of trends as well as the same descriptive results about infections and antimicrobial resistance, but with less possibility for risk-adjusted comparisons.

Case definitions and included patients are the same for both versions, but in the patient-based protocol, risk factors are collected for each patient (infected or not); in the light protocol, denominator data are aggregated at the unit (ICU) level.

3 Case definitions of ICU-acquired infections

The minimal requirement for HAI-Net surveillance of ICU-acquired infections is to include bloodstream infection (BSI) or pneumonia (PN). Urinary tract infections and catheter-related infections may be added optionally.

3.1 Definition of key terms

3.1.1 ICU-acquired

An infection is considered as ICU-acquired if it occurs in the ICU after more than 48 hours. In practice, all infections with onset from day 3 onwards in the ICU should be reported. (The day of admission to the ICU is counted as day 1.)

3.1.2 Second infection episode

To consider an infection as a new infection episode, the combination of a) new signs and symptoms and b) radiographic evidence (for pneumonia) or other diagnostic testing is required.

3.1.3 Device-associated HAI

A device-associated, healthcare-associated infection is an HAI in a patient with a (relevant) device that was used within the 48-hour period before onset of infection (even if it was used only intermittently). The term 'device-associated' is only used for pneumonia, bloodstream infections, and urinary tract infections. 'Relevant devices' refers to intubation, central vascular catheters, and urinary catheters. If the interval is longer than 48 hours, there must be compelling evidence that the infection was associated with device use. For catheter-associated UTI, an indwelling urinary catheter must have been in place seven days before positive laboratory results or signs and symptoms meeting the criteria for UTI were evident[1].

Example: Pneumonia is defined as intubation-associated (IAP) if an invasive respiratory device was present (even intermittently) in the 48 hours preceding the onset of infection.

3.2 Bloodstream infection

- Patient has at least one positive blood culture for a recognised pathogen
  – or –
- Patient has at least one of the following signs or symptoms: fever (> 38 °C), chills, or hypotension
  and
  two positive blood cultures for a common skin contaminant (from two separate blood samples, usually within 48 hours).

Skin contaminants = coagulase-negative staphylococci*, Micrococcus spp., Propionibacterium acnes, Bacillus spp., Corynebacterium spp.*

This definition corresponds to the former HELICS BSI-A definition; BSI-B (single blood culture for skin contaminants in patients with central vascular catheter and adapted treatment) was deleted after the recommendation of an ECDC expert meeting in January 2009 and confirmation during the annual meeting in June 2009. BSI-B were also excluded from the US Centers for Disease Control and Prevention (CDC) definition of laboratory-confirmed bloodstream infections. The inclusion of this subcategory for the purpose of comparison with CDC/NHSN surveillance results is no longer needed.

[1] Also see Horan TC, Emori TG. Definitions of key terms used in the NNIS system. Am J Infect Control 1997; 25:112-6.

3.2.1 Origin of BSI

Both primary (bloodstream infection of unknown origin or catheter-related) and secondary BSI (secondary to another infection site) should be reported. The origin of the BSI should be reported in a different variable:

- Catheter-related: the same microorganism was cultured from the catheter or symptoms improve within 48 hours after removal of the catheter. Important: if microbiologically confirmed, report BSI with origin C-CVC or C-PVC as CRI3-CVC or CRI3-PVC, respectively (see CRI3 definition); if catheter-related infections (CRI) are not included in the surveillance, or if catheter tip culture was not done, then report as BSI with origin C-CVC or C-PVC.
  - C-CVC: central vascular catheter
  - C-PVC: peripheral vascular catheter
  - C-ART: arterial catheter
- Secondary to another infection: the same microorganism was isolated from another infection site or strong clinical evidence exists that bloodstream infection was secondary to another infection site, invasive diagnostic procedure or foreign body.
  - Pulmonary (S-PUL)
  - Urinary tract infection (S-UTI)
  - Digestive tract infection (S-DIG)
  - Surgical site infection (S-SSI)
  - Skin and soft tissue (S-SST)
  - Other (S-OTH): central nervous system, bone infection (e.g. osteomyelitis, etc.)
- Unknown (UO): BSI of unknown origin (origin was verified but no source could be found for the BSI).
- Missing, data unavailable (UNK): only use this code if data on the BSI origin is missing.

Notes:

- 'Primary' bloodstream infections include catheter-related BSI and BSI of unknown origin.
- A CVC-associated bloodstream infection according to CDC/NHSN definitions (different from CVC-related BSI) is a primary BSI with central vascular catheter use (even intermittent) in the 48 hours preceding the onset of the infection. Therefore the presence of 'the relevant device' (in this case, the central vascular catheter, not peripheral catheters) in the 48 hours before onset of infection is collected even in the absence of microbiological confirmation[2].

3.3 Pneumonia (PN1–PN5)

X-ray

Two or more serial chest X-rays or CT-scans with a suggestive image of pneumonia for patients with underlying cardiac or pulmonary disease. In patients without underlying cardiac or pulmonary disease, one definitive chest X-ray or CT-scan is sufficient.

And at least one of the following:

- fever > 38 °C with no other cause
- leukopenia (< 4 000 WBC/mm^3) or leucocytosis (≥ 12 000 WBC/mm^3).

Symptoms

and

at least one of the following (or at least two, if clinical pneumonia only = PN4 and PN5):

- new onset of purulent sputum, or change in character of sputum (colour, odour, quantity, consistency)
- cough or dyspnea or tachypnea
- suggestive auscultation (rales or bronchial breath sounds), rhonchi, wheezing
- worsening gas exchange (e.g. O_2 desaturation or increased oxygen requirements or increased ventilation demand).

[2] Also see Horan TC, Emori TG. Definitions of key terms used in the NNIS system. Am J Infect Control 1997; 25:112-6.

and

according to the used diagnostic method:

a) Bacteriologic diagnostic performed by:

Positive quantitative culture from minimally contaminated LRT specimen **(PN1)**

- Broncho-alveolar lavage (BAL) with a threshold of ≥ 10^4 colony forming units (CFU)/ml or ≥ 5% of BAL-obtained cells contain intracellular bacteria on direct microscopic exam (classified on the diagnostic category BAL)
- protected brush (PB Wimberley) with a threshold of ≥ 10^3 CFU/ml
- distal protected aspirate (DPA) with a threshold of ≥ 10^3 CFU/ml.

Positive quantitative culture from possibly contaminated LRT specimen **(PN2)**

- Quantitative culture of LRT specimen (e.g. endotracheal aspirate) with a threshold of 10^6 CFU/ml.

Microbiology

b) Alternative microbiology methods (PN3)

- Positive blood culture not related to another source of infection
- positive growth in culture of pleural fluid
- pleural or pulmonary abscess with positive needle aspiration
- histologic pulmonary exam shows evidence of pneumonia
- positive exams for pneumonia with virus or particular germs (*Legionella*, *Aspergillus*, mycobacteria, mycoplasma, *Pneumocystis carinii*):
  - positive detection of viral antigen or antibody from respiratory secretions (e.g. EIA, FAMA, shell vial assay, PCR)
  - positive direct exam or positive culture from bronchial secretions or tissue
  - seroconversion (example: influenza viruses, *Legionella, Chlamydia*)
  - detection of antigens in urine (*Legionella)*.

c) Others

- Positive sputum culture or non-quantitative LRT specimen culture **(PN4)**
- No positive microbiology **(PN5).**

Note: PN1 and PN2 criteria were validated without previous antimicrobial therapy.

Comment

Splitting the definition of pneumonia into five subcategories allows for the comparison of similar types of pneumonia within and between networks. It is essential that all ICUs and networks also report PN4 and PN5 (clinical pneumonia without microbiological evidence) in order to achieve overall comparability, even if microbiological exams yielded negative results (PN5). It is also advised, both for clinical and surveillance purposes, that networks promote microbiological confirmation (PN1–3) as a routine practice in ICUs.

3.4 Urinary tract infection

3.4.1 UTI-A: microbiologically confirmed symptomatic urinary tract infection (UTI)

- Patient has at least one of the following symptoms with no other recognised cause: fever (> 38 °C), urgency, frequency, dysuria, or suprapubic tenderness

and

- patient has a positive urine culture, i.e. ≥ 10^5 microorganisms per ml of urine with no more than two species of microorganisms.

3.4.2 UTI-B: not microbiologically confirmed symptomatic UTI

- Patient has at least two of the following, with no other recognised cause: fever (> 38 °C), urgency, frequency, dysuria, or suprapubic tenderness;

and at least one of the following:

- positive dipstick for leukocyte esterase and/or nitrate
- pyuria urine specimen with ≥ 10 WBC/ml or ≥ 3 WBC/high-power field of unspun urine

- organisms seen on Gram stain of unspun urine
- at least two urine cultures with repeated isolation of the same uropathogen (Gram-negative bacteria or *S. saprophyticus*) with ≥ 10^2 colonies/ml urine in non-voided specimens
- ≤ 10^5 colonies/ml of a single uropathogen (Gram-negative bacteria or *S. saprophyticus*) in a patient being treated with effective antimicrobial agent for a urinary infection
- physician diagnosis of a urinary tract infection
- physician institutes appropriate therapy for a urinary infection.

Note: UTI-C (asymptomatic bacteriuria) is now excluded from the surveillance of ICU-acquired infections. However, bloodstream infections secondary to asymptomatic bacteriuria are reported as BSI with source (origin) S-UTI.

3.5 Catheter-related infection (CRI)

3.5.1 CRI1: local CVC-related infection (no positive blood culture)

- Quantitative CVC culture ≥ 103 CFU/ml [3] or semi-quantitative CVC culture > 15 CFU [4]

and

- pus/inflammation at the insertion site or tunnel.

3.5.2 CRI2: general CVC-related infection (no positive blood culture)

- Quantitative CVC culture ≥ 103 CFU/ml or semi-quantitative CVC culture > 15 CFU

and

- clinical signs improve within 48 hours after catheter removal.

3.5.3 CRI3: microbiologically confirmed CVC-related bloodstream infection

- BSI occurring 48 hours before or after catheter removal

and positive culture with the same microorganism of either:

- quantitative CVC culture ≥ 103 CFU/ml or semi-quantitative CVC culture > 15 CFU
- quantitative blood culture ratio CVC blood sample/peripheral blood sample > 5 [5]
- differential delay of positivity of blood cultures [6]: CVC blood sample culture positive two hours or more before peripheral blood culture (blood samples drawn at the same time)
- positive culture with the same microorganism from pus from insertion site.

Notes

- CVC = central vascular catheter
- Central vascular catheter colonisation should not be reported.
- A CRI3 is also a bloodstream infection with source C-CVC; however, when a CRI3 is reported, the BSI should not be reported separately; microbiologically confirmed catheter-related BSI should be reported as CRI3.
- If CRIs are not included in the national surveillance protocol, report CRI3 as BSI with origin C-CVC.

3.6 Other definitions

3.6.1 Central vascular catheter

A definition of central vascular catheter can be found in the module 'Central Line-Associated Bloodstream Infection' of the NHSN Patient Safety Component Manual website[3].

A central vascular catheter (or central line) is an intravascular catheter that terminates at, or close to, the heart or in one of the great vessels, which is used for infusion, withdrawal of blood or hemodynamic monitoring. The following are considered great vessels for the purpose of reporting central-line BSI and counting central-line days in the NHSN system: aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins,

[3] National Healthcare Safety Network (NHSN), Centers for Disease Control and Prevention. Guidelines and procedures for monitoring CLABSI. Atlanta: CDC; 2010. Available from: http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf

internal jugular veins, subclavian veins, external iliac veins, common iliac veins, common femoral veins, and in neonates, the umbilical artery/vein.

Notes

- Neither the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of these vessels or in or near the heart to qualify as a central line.
- An introducer is considered an intravascular catheter.
- Pacemaker wires and other non-lumened devices inserted into central blood vessels or the heart are not considered central lines, because fluids are not infused, pushed, nor withdrawn through such devices.

Infusion

The introduction of a solution through a blood vessel via a catheter lumen. This may include continuous infusions such as nutritional fluids or medications, or it may include intermittent infusions such as flushes or IV antimicrobial administration, or blood, in the case of transfusion or haemodialysis.

Umbilical catheter

A central vascular device inserted through the umbilical artery or vein in a neonate.

Temporary central line

A non-tunneled catheter

Permanent central line

Includes:

- tunneled catheters, including certain dialysis catheters; and
- implanted catheters (including ports).

3.6.2 Type of hospital

Primary

- Often referred to as 'district hospital' or 'first-level referral'
- Often corresponds to 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 hospitals
- 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
- Examples: paediatric hospital, infectious diseases hospital.

4 Data collection

4.1 Eligibility criteria for intensive care units

The intensive care units admitted to the surveillance networks must fit the definition established by the European Society of Intensive Care Medicine [7]:

> 'An ICU is a geographically defined area in the hospital providing care for critically ill patients with specialised personnel and complex equipment. […]
> The ICU is staffed with a specific group of specially trained doctors, nurses and other allied personnel (e.g. physiotherapists, technicians) in appropriate numbers. […]
> The ICU should provide at least facilities for temporary cardiac pacing and invasive haemodynamic monitoring, ventilation supports and pump-controlled administration of infusions. Facilities for blood gas, haemoglobin and electrolyte measurements should be provided in the ICU or in the immediate vicinity. An ICU should function 24 hours a day, seven days a week. There must be at least one doctor immediately available at all times who can deal with all emergencies.'

Neonatal and paediatric ICUs can be included in the network, but results should be separately identified in the analysis.

The aim should be to include as many units as possible. Since the range of units that fall within the definition is too wide, clearly defined subgroups should be established which allow meaningful comparisons between the various ICUs. Criteria for defining these subgroups will be developed through a questionnaire to be filled in by all participating ICUs.

4.2 Inclusion of patients

Only patients staying more than two calendar days are included in the surveillance, according to the following algorithm:

Date of discharge from the ICU – Date of admission to the ICU + 1 > 2

Patients who stay less than three days in the ICU are excluded. They add a lot of patient- and device-days to the denominator, but are not at risk of developing an infection after only two days in the ICU. Infections which appear after discharge from the ICU (post-discharge) are excluded. Post-discharge surveillance is time-consuming, adds little to the performance of the surveillance system and, in practice, is rarely done [8,9].

In the light protocol (unit-based surveillance), patient-days are included in the denominator if patients have been present for more than two days within the time window of the surveillance, even if they were admitted before the beginning of that period.

In the standard protocol (patient-based surveillance), patients may be included as follows:

- Prospective inclusion: patients are included if the ICU admission date falls within the time window of the surveillance. After the end of the surveillance period, patients still under follow-up are 'censored' (arbitrarily discharged) at the last day of the month following the end of the surveillance period (e.g. 31 July if surveillance runs from 1 January to 30 June) in order to allow for data encoding and transmission to the national/regional coordination centre. The follow-up of these patients may be completed, and data are sent in for correction, for example at the end of the next surveillance period.
- Retrospective inclusion: patients are included if the ICU discharge date falls within the time window of the surveillance. Censoring is not an issue in this case and, therefore, this method is recommended.

Note: The different inclusion methods result in slightly different denominator data for the same unit during the same surveillance period. In practice, however, these differences are very small. Approximately 2–3% of patients stay longer than 30 days in the ICU, and less than 0.05% stay more than three months. The difference between unit-based and patient-based denominator data, such as patient-days, will decrease as the surveillance period increases.

4.3 Infections under surveillance

All infections with date of onset after day 2 and later in the ICU should be reported and be regarded as healthcare-associated infections, even if there are reasons to believe that the infection was acquired in another ward or in the community. Infections occurring before day 3 may be recorded, but will not be included in the analysis. Data on ICU-acquired bloodstream infection and/or pneumonia should always be reported. The national surveillance coordinator should report to TESSy which infections are included in the national/regional surveillance system (DataSource data).

In unit-based surveillance, all ICU-acquired infections occurring (date of onset) within the time window of the surveillance period are included, even if the patient was admitted to the ICU before the start of the surveillance period.

In patient-based surveillance, infections may occur outside the time window, since the inclusion criterion is either the ICU admission or discharge date of the patient.

4.4 Levels of data requirement

In ECDC's TESSy system, variables are classified according to three levels of requirement:

- **Required true** (error) **(E):** Data will be rejected if this variable is missing (previously called 'mandatory').
- **Required true** (warning) **(W):** Variables are required for the correct interpretation of the results and/or for routine analysis; a warning will be produced if this variable is missing (previously called 'required').
- **Required false (F):** No error if data are missing; data used for additional analysis (previously called 'optional').

5 Data at the network (DataSource) level

Information at the level of the regional or national HAI surveillance network should be collected once a year in the DataSource section of TESSy. The following information is collected for surveillance of ICU-acquired infections.

Description	Coded value list
Bloodstream infections are included in the national/regional surveillance system.	Y = Yes (all) YP = Yes, but primary BSI only YC = Yes, but catheter-associated only N = No
Pneumonia are included in the national/regional surveillance system.	Y = Yes (all) YV = Yes, ventilator-associated pneumonia only YI = Yes, intubation-associated pneumonia only N = No
Urinary tract infections are included in the national/regional surveillance system.	Y = Yes, symptomatic UTI only YAS = Yes, but asymptomatic UTI included YC = Yes, but symptomatic catheter-associated UTI only YCAS = Yes, but catheter-associated only (includes asymptomatic UTI) N = No
Catheter-related infections are included in the national/regional surveillance system.	CRIA = All CRI CRI1 = CRI1: Local CRI only CRI2 = CRI2: Generalised CRI without culture only CRI3 = CRI3: Generalised CRI with culture only CRI12 = CRI1 + CRI2 CRI13 = CRI1 + CRI3 CRI23 = CRI2 + CRI3 N = No

Country code: 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=United Kingdom, GR=Greece, 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 code: 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 sub-networks that are reported through by single DateSource (e.g. data from five regional CCLIN networks reported to one database by France).

Subject: HAIICU

5.1 Technical TESSy variables

RecordType: Tells TESSy to which surveillance protocol and CSV level the data belong (HAIICU or HAIICULIGHT). Record TYPE should be according to CSV level and the protocol:

CSV files level	Standard protocol HAIICU	Light protocol HAIICULIGHT
Level 1	HAIICU	HAIICULIGHT
Level 2	HAIICU$PT	HAIICULIGHT$DENO
Level 3	HAIICUPTEXP HAIICUPTAM HAIICUPTINF	HAIICULIGHT$DENO$INF
Level 4	HAIICUPTINf$RES	HAIICULIGHT$DENO$INF$RES

RecordTypeVersion: Version of the 'protocol' implemented in TESSy

RecordId: Unique identifier for each record

ParentId: Links hierarchical data (CSV format): ParentId links to RecordId of the level above

6 Standard protocol

6.1 Hospital/unit data (first level)

The first level (RecordType 'HAIICU') includes data referring to the hospital and ICU that are valid for all related records about ICU patient data, infection data, microorganisms and resistance data.

Information at this level is used for stratification and should be collected once a year.

Variable name	Description	Value list	Required
Network identifier	Unique identifier for each network – Member State selected and generated. Can be omitted if the hospital identifiers are unique within the reporting country		No
Hospital identifier	Unique identifier for each hospital – Member State selected and generated, should remain identical in different surveillance periods/years		True (Error)
Hospital size	Number of beds in the hospital or rounded down to the closest 100 beds	min: 0, max: 9999, UNK	True (Warning)
Hospital type	Type of hospital	PRIM = Primary level (district hospital or first-level referral) SEC = Secondary level (provincial hospital) TERT = Tertiary level (regional or tertiary-level hospital) SPEC = Specialist/Other UNK = Unknown	No
Region where hospital is located	Region as NUTS-1 code where hospital is located	See NUTS-1 codes in Annex 1	No
ICU identifier	Unique identifier for each ICU within an hospital, should remain identical in different surveillance periods/years – Member State selected and generated		No
ICU size	Number of beds in the ICU	min: 0, max: 99, UNK	No
Type of ICU	Type of ICU. If 80% of the patients belong to a particular category, the ICU falls within that category	MIX = Mixed MED = Medical SURG = Surgical CORO = Coronary BURN = Burns NEUR = Neurosurgical PED = Paediatric NEON = Neonatal O = Other UNK = Unknown	No
Percentage of intubated patients in the ICU	Percentage of intubated patients over the past year in the ICU. Measured or estimated average percentage of patients with an invasive respiratory device over the last year in the current ICU	Num (0.00–100.00), UNK. If > 0.00 and < 1.00 → warning: 'Probably a proportion, not percentage.'	No

6.2 Patient ICU admission data (second level)

The second level (RecordType HAIICU$PT) includes variables at the patient level, mainly at admission to the ICU (within the first 24 hours), but also date and status at discharge from the ICU.

Variable name	Description	Value list	Required
Patient counter	Numeric Code for each patient, unique within hospital. Anonymous code assigned by hospital to specify patient		True (Error)
Age	Age corresponds to the age of the patient at date of admission to the ICU	Num (0–120), UNK	True (Warning)
Gender	Gender of the patient	M = Male F = Female O = Other UNK = Unknown	True (Warning)
Outcome from ICU	Patient status at discharge from the ICU or at end of follow-up in the ICU	A = Alive D = Dead in ICU UNK = Unknown	True (Warning)
Date of ICU admission	Date of admission in the ICU	Date (YYYY-MM-DD), UNK	True (Error)
Date of ICU discharge	Date the patient was discharged from the ICU or date of in-ICU death or date of last follow-up in the ICU	Date (YYYY-MM-DD), UNK	True (Warning)
Origin of the patient	Origin of the patient at the time he/she was admitted at the ICU	HOSP = Ward in this/other hospital OICU = Other ICU COM = Community (patient came from his home, via emergency or not) LTC = Long-term care/nursing home O = Other UNK = Unknown	No
Date of hospital admission	Date patient was admitted to hospital in order to undergo the operation under surveillance	Date (YYYY-MM-DD), UNK	No
SAPS II score	Simplified Acute Physiology Score at admission (first 24h) – Severity of illness score developed to predict mortality[a]		No
APACHE II score	Acute Physiology, Age, Chronic Health Evaluation score; Severity of illness score developed to predict mortality[b]; Alternative to SAPS II score.		No
Type of ICU admission	Type of admission as defined in SAPS II score: (medical: no surgery within one week of admission to ICU; scheduled surgical: surgery was scheduled at least 24 hours in advance +/- 7 days ICU admission; unscheduled surgical: patients added to the operating room schedule within 24 hours of the operation)	MED = Medical SSUR = Scheduled surgical USUR = Unscheduled surgical UNK = Unknown	No
Trauma patient	Intensive care unit admission resulted from blunt or penetrating traumatic injury to the patient, with or without surgical intervention	Y = Yes N = NO UNK = Unknown	No
Impaired Immunity	Impaired immunity as defined in APACHE II score: impaired immunity due to treatment (chemotherapy, radiotherapy, immune suppression, corticosteroids long duration or high doses recently), due to disease (leukaemia, lymphoma, AIDS), or < 500 PMN/mm^3	Y = Yes N = NO UNK = Unknown	No
Antibiotic treatment in 48 hours before or after ICU admission	Specify 'yes' if any antibiotic therapy in the 48 hours preceding ICU admission and/or during the first two days of ICU stay (=antibiotic therapy for an infectious event around ICU admission, excl. antifungal and antiviral treatment) has been given; not: antimicrobial prophylaxis, SDD, local treatment	Y = Yes N = NO UNK = Unknown	No
Patient needed acute coronary care	All acute non-surgical cardiac disease. Larger than coronary suffering	Y = Yes N = NO UNK = Unknown	No
Surgery before ICU admission + site	Specify whether patient had surgery in the last 30 days before ICU admission including the day of admission, and if so, specify the surgery site	NO = No surgery ABDO = Abdominal CORO = Coronary surgery CARD = Other cardiac surgery THOR = Other thoracic surgery VASC = Other vascular surgery NEURO = Neurosurgery O = Other surgery UNK = Unknown	No

Variable name	Description	Value list	Required
Intubation	Patient was intubated (invasive respiratory device) during ICU stay; if yes, fill dates in corresponding exposure data	Y = Yes N = NO UNK = Unknown	True (Warning)
Central vascular catheter	Patient had central vascular catheter (CVC) during ICU stay; if yes, fill dates in corresponding exposure data	Y = Yes N = NO UNK = Unknown	True (Warning)
Indwelling urinary catheter	Patient had indwelling urinary catheter during ICU stay; if yes, fill dates in corresponding exposure data	Y = Yes N = NO UNK = Unknown	True (Warning)
Parenteral nutrition	Patient had parenteral nutrition during ICU stay; if yes, fill dates in corresponding exposure data	Y = Yes N = NO UNK = Unknown	No
Antimicrobial received during ICU stay	Patient received any antimicrobial during ICU stay	Y = Yes N = NO UNK = Unknown	No

[a] *Richardson DK et al. Score for Neonatal Acute Physiology: a physiologic severity index for neonatal intensive care. Pediatrics. 1993;91:617–23.*
[b] *Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Critical Care Medicine 1985;13(10):818–29.*

6.3 Exposure data (third level)

In the ICU standard protocol, different types of data are attached to the patient (ICU admission) level. Exposure data (RecordType HAIICUPTEXP) contain information on invasive device use and are collected by episode and by type of invasive device.

Variable name	Description	Value list	Required
ParentId/Patient counter	Anonymous patient number. Necessary to make the link between infections and patient data (second level)		True (Error)
Exposure start date	Start date exposure episode within the ICU	Date (YYYY-MM-DD), UNK	True (Error)
Exposure end date	End date exposure episode within the ICU	Date (YYYY-MM-DD), UNK	True (Error)
Type of exposure	Type of exposure (invasive device) for this exposure episode entry. In case of stop and restart of an exposure type on the same day (e.g. re-intubation), start a new exposure episode. In case of multiple exposures of the same type in the same day (e.g. more than one CVC), use only one exposure episode.	CVC = Central vascular catheter INT = Intubation UC = Urinary catheter PNUT = Parenteral nutrition	True (Error)

6.4 Antimicrobial use data (third level)

Antimicrobial use data (RecordType HAIICUPTAM) are collected by episode and for each antimicrobial agent and indication.

Variable name	Description	Value list	Required
ParentId/Patient Counter	Anonymous patient number. Necessary to make the link between infections and patient data (second level)		True (Error)
Antimicrobial start date	Start date for antimicrobial use within the ICU for this antimicrobial agent/indication (days before ICU admission should not be reported)	Date (YYYY-MM-DD), UNK	True (Error)
Antimicrobial end date	End date antimicrobial use within the ICU for this antimicrobial/indication	Date (YYYY-MM-DD), UNK	True (Error)
Antimicrobial ATC5 code	Antimicrobial coded as ATC5 code, include ATC2 classes J01 antibacterials, J02 antifungals and ATC4 A07AA, P01AB, D01BA and ATC5 J04AB02	See ATC5 list in Annexes 5 and 6	True (Error)
Indication for antimicrobial use	Indication for use of this antimicrobial episode.	P = Prophylaxis E = Empiric treatment M = Documented treatment S = Selective digestive decontamination O = Other UNK = Unknown	True (Error)

6.5 Infection data (third level)

Infection data (RecordType HAIICUPTINF) are collected for each infection episode, by type of infection. For distinguishing between different infection episodes, see Section 3.1 (definition of key terms).

Variable name	Description	Value list	Required
ParentId/Patient Counter	Anonymous patient number. Necessary to make the link between infections and patient data (second level)		True (Error)
Date of infection onset	Date of onset of symptoms or, if unknown, date treatment was started or date first diagnostic examination was done	Date (YYYY-MM-DD), UNK	True (Error)
Site of Infection	Site of infection according the case definition (including subcategory). See Chapter 3 (case definitions)	BSI = Bloodstream infection CRI1 = CVC-related infection (local) CRI2 = CVC-related infection (generalised no positive haemoculture) CRI3 = CVC-related infection (generalised with positive haemoculture) PN = Pneumonia (unknown subcategory) PN1 = Pneumonia (protected sample + quantitative culture) PN2 = Pneumonia (non-protected sample (ETA) + quantitative culture) PN3 = Pneumonia (alternative microbiological criteria) PN4 = Pneumonia (sputum bacteriology or non-quantitative ETA) PN5 = Pneumonia (no microbiology) UTI = Symptomatic urinary tract infection (unknown subcategory) UTI-A = Symptomatic urinary tract infection (microbiologically confirmed) UTI-B = Symptomatic urinary tract infection (not microbiologically confirmed)	True (Error)

Variable name	Description	Value list	Required
Origin of the bloodstream infection	Origin of the bloodstream infection. C = The same microorganism was cultured from the catheter or symptoms improve within 48 hours after removal of the catheter. Exception: Report microbiologically confirmed CVC-related BSI as CRI3	C = Catheter, catheter type unknown C-CVC = Central venous catheter C-PER = Peripheral catheter C-ART = Arterial catheter S = Secondary to another site, primary site unknown S-PUL = Pulmonary infection S-UTI = Urinary tract infection S-SSI = Surgical site infection S-DIG = Digestive tract infection S-SST = Skin/Soft Tissue infection S-OTH = Other infection UO= None of the above, BSI of unknown origin UNK=Unknown/Missing	False (conditional true warning)
Invasive device in the 48 hours preceding the infection	Necessary to distinguish device-associated infections. Relevant invasive device was present (even intermittently) in the 48 hours preceding the infection: intubation for pneumonia, central vascular catheter for bloodstream infection, urinary catheter for urinary tract infections.	Y = Yes N = No UNK = Unknown	True (warning)

6.6 Microorganism and antimicrobial resistance data (fourth level)

Microorganisms and antimicrobial resistance data (RecordType HAIICUPTINF$RES) for a given infection episode are reported at the fourth level. Although the data format allows reporting of any bug-drug combination in a flexible way, the protocol defines a list of minimal and recommended markers (target list) for antimicrobial resistance in ICU-acquired infections.

Variable name	Description	Value list	Required
Isolate result	Microorganism or reason why not available	_NA = Results not available _NOEXA = Examination not done _NONID = Microorganism not identified _STERI = Sterile examination See Code list in Annexes 2 and 3. (extended and minimal list allowed)	True (Error)
Antibiotic	Antibiotic code	_NOTEST = No antimicrobial susceptibility data available	True (Error)
SIR	Final interpretation result of all different susceptibility tests performed. If antibiotic code is _NOTEST, SIR=NA	S = Susceptible I = Intermediate R = Resistant UNK = Unknown NA = Not applicable	True (Error)

6.6.1 Minimal antimicrobial resistance markers and codes in the ICU

The minimal AMR marker set for the surveillance of ICU-acquired infections has been changed to the AMR marker set used in the European Point Prevalence Survey of healthcare-associated infections and antimicrobial use in acute care hospitals.

Countries limiting AMR collection to these markers may choose to use a resistance marker code system as in the PPS protocol (codes 0, 1, 2, 9):

Microorganisms	0	1	2	9
Staphylococcus spp.	Oxa-S **MSSA**	Oxa-R **MRSA**	Gly-I **GISA**	Unknown
Enterococcus spp.	Gly-S	Gly-R **VRE**		Unknown
Enterobacteriaceae Escherichia coli, Klebsiella spp., *Enterobacter* spp., *Proteus* spp., *Citrobacter* spp., *Serratia* spp. (also see table microorganisms by category, Annex 2)	C3G-S, Car-S	C3G-R, Car-S	C3G-R, Car-R	Unknown
Pseudomonas spp., *Acinetobacter* spp.	Car-S	Car-R		Unknown

Oxa = oxacillin; Gly = glycopeptides (vancomycin, teicoplanin); C3G = third-generation cephalosporins (cefotaxim, cetriaxone, ceftazidim), Car = carbapenems (imipenem, meropenem, doripenem).

6.6.2 Target antimicrobial resistance data for ICU-acquired infections

Because of the rapid evolution of antimicrobial resistance, the 2009 HAI surveillance meeting approved the below extended list for the surveillance of ICU-acquired infections.

S. aureus

- Oxacillin (OXA)
- Glycopeptides (GLY) (vancomycin, teicoplanin)

Enterococci

- Aminopenicillins (AMP) (ampicillin and/or amoxicillin)
- Glycopeptides (GLY) (vancomycin, teicoplanin)

Enterobacteriaceae (Escherichia coli, Klebsiella, Serratia, Enterobacter, Proteus, etc.)

- Amoxicillin/clavulanic acid (AMC)
- Third-generation cephalosporins (C3G) (cefotaxim, cetriaxone, ceftazidim)
  - ESBL confirmed Y/N (ESBL)
- Carbapenems

P. aeruginosa

- Piperacillin or ticarcillin with or without enzyme inhibitor (PIP)
- Ceftazidim (CAZ)
- Carbapenems (CAR) (imipenem/meropenem/doripenem)
- Colistine (COL)

Acinetobacter spp.

- Carbapenems (CAR) (imipenem/meropenem/doripenem)
- Colistine (COL)
- Sulbactam (SUL)

6.6.3 Extended antimicrobial resistance data for ICU-acquired infections

Networks may also choose to report extended antimicrobial resistance data, which allows for a more detailed description of the AMR epidemiology (e.g. combined resistance, etc.). However, the main emphasis should be on the target AMR list given above. See Annex 4 for the allowed extended AMR test list.

7 Light protocol

7.1 Hospital/unit data (first level)

The first level (RecordType 'HAIICULIGHT') includes data referring to hospitals and ICUs. Data are valid for all related records about ICU patient data, infection data, microorganisms and resistance data.

Information at this level is used for stratification and should be collected once a year.

Variable name	Description	Value list	Required
Network identifier	Unique identifier for each network – Member State selected and generated. Can be omitted if the hospital identifiers are unique within the reporting country		No
Hospital identifier	Unique identifier for each hospital – Member State selected and generated, should remain identical in different surveillance periods/years		True (Error)
Hospital size	Number of beds in the hospital or rounded down to the closest 100 beds	min: 0, max: 9999, UNK	True (Warning)
Hospital type	Type of hospital	PRIM = Primary level (district hospital or first-level referral) SEC = Secondary level (provincial hospital) TERT = Tertiary level (regional or tertiary-level hospital) SPEC = Specialist/Other UNK = Unknown	No
Region where hospital is located	Region as NUTS-1 code where hospital is located	See NUTS-1 codes in Annex 1	No
ICU identifier	Unique identifier for each ICU within an hospital, should remain identical in different surveillance periods/years – Member State selected and generated		No
ICU size	Number of beds in the ICU	min: 0, max: 99, UNK	No
Type of ICU	Type of ICU. If 80% of the patients belong to a particular category, the ICU falls within that category	MIX = Mixed MED = Medical SURG = Surgical CORO = Coronary BURN = Burns NEUR = Neurosurgical PED = Paediatric NEON = Neonatal O = Other UNK = Unknown	No
Percentage of intubated patients in the year for the ICU	Percentage of intubated patients over the past year in the ICU. Measured or estimated average percentage of patients with an invasive respiratory device over the last year in the current ICU	Num, ≥ 0.00, ≤ 100.00; if > 0.00 and < 1.00 = > warning (probably proportion, not percentage), UNK	No

7.2 Hospital-unit aggregated denominator data (second level)

The second level in the light protocol (RecordType HAIICULIGHT$DENO) includes denominator data for the entire ICU, for each of the surveillance periods. The minimal time covered by one denominator record is one month; the maximum should not exceed 12 months.

Variable name	Description	Value list	Required
Start date of this surveillance period	Start date of the surveillance period (time period covered by this denominator entry)	Date (YYYY-MM-DD)	True (Error)
End date of this surveillance period	End date of the surveillance period (time period covered by this denominator entry)	Date (YYYY-MM-DD)	True (Error)
Number of admissions staying more than two days	Number of new admissions of patients staying more than two days in the ICU during the period	Min: 0, max: 9999, UNK	True (Warning)
Number of patient-days for patients staying more than two days	Number of patient-days for patients staying more than two days in the ICU during the period	Min: 0, max: 99999, UNK	True (Warning)
Total number of admissions staying	Total number of new admissions in the ICU during the period	Min: 0, max: 9999, UNK	No
Total number of patient-days for patients	Total number of patient-days in the ICU during the period	Min: 0, max: 99999, UNK	No

7.3 Infection data (third level)

Infection data (RecordType HAIICULIGHTPTINF) are collected for each infection episode, by type of infection. For distinguishing between different infection episodes, see Section 3.1 (definition of key terms).

These data are the same as for the standard version, with the addition of some basic patient variables.

Variable name	Description	Value list	Required
Patient Counter	Anonymous unique patient number. Necessary to calculate the number of infected patients		True (Error)
Age	Age corresponds to the age of the patient at date of admission to the ICU	Num (0–120), UNK	True (Warning)
Gender	Gender of the patient	M = Male F = Female O = Other UNK = Unknown	True (Warning)
Date of ICU admission	Date of admission in the ICU	Date (YYYY-MM-DD), UNK	True (Error)
Date of ICU discharge	Date the patient was discharged from ICU or date of in-ICU death or date of last follow up in ICU	Date (YYYY-MM-DD), UNK	No
Date of infection onset	Date of onset of symptoms or, if unknown, date treatment was started or date first diagnostic examination was done	Date (YYYY-MM-DD), Unk	True (Error)

Variable name	Description	Value list	Required
Site of Infection	Site of infection according the case definition (including subcategory). See Chapter 3 (case definitions)	BSI = Bloodstream infection CRI1 = CVC-related infection (local) CRI2 = CVC-related infection (generalised no positive haemoculture) CRI3 = CVC-related infection (generalised with positive haemoculture) PN = Pneumonia (unknown subcategory) PN1 = Pneumonia (protected sample + quantitative culture) PN2 = Pneumonia (non-protected sample (ETA) + quantitative culture) PN3 = Pneumonia (alternative microbiological criteria) PN4 = Pneumonia (sputum bacteriology or non-quantitative ETA) PN5 = Pneumonia (no microbiology) UTI = Symptomatic urinary tract infection (unknown subcategory) UTI-A = Symptomatic urinary tract infection (microbilogically confirmed) UTI-B = Symptomatic urinary tract infection (not microbilogically confirmed)	True (Error)
Origin of the bloodstream infection	Origin of the bloodstream infection. C = The same microorganism was cultured from the catheter or symptoms improve within 48 hours after removal of the catheter. Exception: Report microbiologically confirmed CVC-related BSI as CRI3	C = Catheter, catheter type unkown C-CVC = Central venous catheter C-PER = Peripheral catheter C-ART = Arterial catheter S = Secondary to another site, primary site unknown S-PUL = Pulmonary infection S-UTI = Urinary tract infection S-SSI = Surgical site infection S-DIG = Digestive tract infection S-SST = Skin/Soft tissue infection S-OTH = Other infection UO = None of the above, BSI of unknown origin UNK = Unknown/Missing	False (conditional true warning)
Invasive device in the 48 hours preceding the infection	Necessary to distinguish device-associated infections. Relevant invasive device was present (even intermittently) in the 48 hours preceding the infection: intubation for pneumonia, central vascular catheter for bloodstream infection, urinary catheter for urinary tract infections	Y = Yes N = No UNK = Unknown	True (warning)

7.4 Microorganism and antimicrobial resistance data (fourth level)

The fourth level in the light protocol (RecordType HAIICULIGHTPTINF$RES) is the same as in the standard protocol: minimal AMR markers, target AMR data for ICU surveillance, extended list.

Variable name	Description	Value list	Required
Isolate result	Microorganism or reason why not available	_NA = Results not available _NOEXA = Examination not done _NONID = Microorganism not identified _STERI = Sterile examination See Code list in Annexes 2 and 3. (extended and minimal list allowed)	True (Error)
Antibiotic	Antibiotic code	_NOTEST = No antimicrobial susceptibility data available	True (Error)
SIR	Final interpretation result of all different susceptibility tests performed If antibiotic code is _NOTEST, SIR=NA	S = Susceptible I = Intermediate R = Resistant UNK = Unknown NA = Not applicable	True (Error)

8 Indicators of ICU-acquired infections needed at the European level

Unit-based (light) surveillance represents the minimal dataset to be collected and is intended for continuous surveillance. The denominator is collected at the level of the unit and consists in the number of patient-days for patients staying longer than two days in the ICU (unit-based surveillance).

Level-1 indicators are intended for the follow-up of indicators within the same unit and for regional, national and international follow-up of infection trends and possibly for pathogen-specific infection rates, such as incidence density by type of ICU or by percentage of intubated patients in the ICU (proxy for case-mix severity). They offer limited inter-unit comparability but only when stratified according to the type of unit.

Patient-based (standard) surveillance is intended for advanced risk-adjusted comparisons of infection rates between ICUs, such as the device-associated infection rate and the standardised infection ratio, as a measure of quality of care in terms of infection control. Risk factors are collected for every patient staying more than two days in the ICU, whether infected or not. In order to obtain sufficient precision of indicators for a single ICU, a surveillance period of 3–6 months is recommended, depending on the size of the ICU.

The list of indicators and a protocol comparison (standard vs. light) can be found in Annex 8.

9 Confidentiality

9.1 Patient confidentiality

It will not be possible to identify individual ICU patients with NI in the European database through coding of patient information 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 anonymous unique patient numbers.

9.2 Hospital and unit confidentiality

A unique code is assigned to each hospital (unit) by the national surveillance system. The key, which links each hospital (unit) to its HELICS code, remains strictly within the national surveillance system to guarantee confidentiality. It is not to be transmitted to any other organisation under any circumstance. This unique code will be used for correspondence and feedback.

9.3 Publication policy

Data will be published in ECDC's Annual Epidemiological Reports and in disease-specific reports on HAI surveillance, in interactive online tables 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.

References

(1) Council recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare-associated infections (HAI) (2009/C 151/01).

(2) Decision No. 2119/98/EC of the European Parliament and of the Council of 24 September 1998 setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. Official Journal of the European Communities 1998:L268/1-6.

Annex 1: NUTS-1 codes (hospital location)

UNK = Unknown
AT1 = AT1: OSTÖSTERREICH
AT2 = AT2: SÜDÖSTERREICH
AT3 = AT3: WESTÖSTERREICH
BE1 = BE1: RÉGION DE BRUXELLES-CAPITALE /BRUSSELS HOOFDSTEDELIJK GEWEST
BE2 = BE2: VLAAMS GEWEST
BE3 = BE3: RÉGION WALLONNE
BG3 = BG3: SEVERNA I IZTOCHNA BULGARIA
BG4 = BG4: YUGOZAPADNA I YUZHNA TSENTRALNA BULGARIA
CY0 = CY0: ΚΥΠΡΟΣ /KIBRIS
CZ0 = CZ0: ČESKÁ REPUBLIKA
DE1 = DE1: BADEN-WÜRTTEMBERG
DE2 = DE2: BAYERN
DE3 = DE3: BERLIN
DE4 = DE4: BRANDENBURG
DE5 = DE5: BREMEN
DE6 = DE6: HAMBURG
DE7 = DE7: HESSEN
DE8 = DE8: MECKLENBURG-VORPOMMERN
DE9 = DE9: NIEDERSACHSEN
DEA = DEA: NORDRHEIN-WESTFALEN
DEB = DEB: RHEINLAND-PFALZ
DEC = DEC: SAARLAND
DED = DED: SACHSEN
DEE = DEE: SACHSEN-ANHALT
DEF = DEF: SCHLESWIG-HOLSTEIN
DEG = DEG: THÜRINGEN
DK0 = DK0: DANMARK
EE0 = EE0: EESTI
ES1 = ES1: NOROESTE
ES2 = ES2: NORESTE
ES3 = ES3: COMUNIDAD DE MADRID
ES4 = ES4: CENTRO (E)
ES5 = ES5: ESTE
ES6 = ES6: SUR
ES7 = ES7: CANARIAS
FI1 = FI1: MANNER-SUOMI
FI2 = FI2: ÅLAND
FR1 = FR1: ÎLE DE FRANCE
FR2 = FR2: BASSIN PARISIEN
FR3 = FR3: NORD - PAS-DE-CALAIS
FR4 = FR4: EST
FR5 = FR5: OUEST
FR6 = FR6: SUD-OUEST
FR7 = FR7: CENTRE-EST
FR8 = FR8: MÉDITERRANÉE
FR9 = FR9: DÉPARTEMENTS D'OUTRE-MER
GR1 = GR1: VOREIA ELLADA
GR2 = GR2: KENTRIKI ELLADA
GR3 = GR3: ATTIKI
GR4 = GR4: NISIA AIGAIOU, KRITI
HU1 = HU1: KÖZÉP-MAGYARORSZÁG
HU2 = HU2: DUNÁNTÚL
HU3 = HU3: ALFÖLD ÉS ÉSZAK
IE0 = IE0: IRELAND
ITC = ITC: NORD-OVEST
ITD = ITD: NORD-EST
ITE = ITE: CENTRO (I)
ITF = ITF: SUD

ITG = ITG: ISOLE
LT0 = LT0: LIETUVA
LU0 = LU0: LUXEMBOURG (GRAND-DUCHÉ)
LV0 = LV0: LATVIJA
MT0 = MT0: MALTA
NL1 = NL1: NOORD-NEDERLAND
NL2 = NL2: OOST-NEDERLAND
NL3 = NL3: WEST-NEDERLAND
NL4 = NL4: ZUID-NEDERLAND
PL1 = PL1: REGION CENTRALNY
PL2 = PL2: REGION POŁUDNIOWY
PL3 = PL3: REGION WSCHODNI
PL4 = PL4: REGION PÓŁNOCNO-ZACHODNI
PL5 = PL5: REGION POŁUDNIOWO-ZACHODNI
PL6 = PL6: REGION PÓŁNOCNY
PT1 = PT1: CONTINENTE
PT2 = PT2: REGIÃO AUTÓNOMA DOS AÇORES
PT3 = PT3: REGIÃO AUTÓNOMA DA MADEIRA
RO1 = RO1: MACROREGIUNEA UNU
RO2 = RO2: MACROREGIUNEA DOI
RO3 = RO3: MACROREGIUNEA TREI
RO4 = RO4: MACROREGIUNEA PATRU
SE1 = SE1: ÖSTRA SVERIGE
SE2 = SE2: SÖDRA SVERIGE
SE3 = SE3: NORRA SVERIGE
SI0 = SI0: SLOVENIJA
SK0 = SK0: SLOVENSKÁ REPUBLIKA
UKC = UKC: NORTH EAST (ENGLAND)
UKD = UKD: NORTH WEST (ENGLAND)
UKE = UKE: YORKSHIRE AND THE HUMBER
UKF = UKF: EAST MIDLANDS (ENGLAND)
UKG = UKG: WEST MIDLANDS (ENGLAND)
UKH = UKH: EAST OF ENGLAND
UKI = UKI: LONDON
UKJ = UKJ: SOUTH EAST (ENGLAND)
UKK = UKK: SOUTH WEST (ENGLAND)
UKL = UKL: WALES
UKM = UKM: SCOTLAND
UKN = UKN: NORTHERN IRELAND

Annex 2: 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 nosocomial 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	**STACNS**
	Staphylococcus haemolyticus	STAHAE	
	Coag-neg. staphylococci, not specified	STACNS	
	Other coagulase-negative staphylococci (CNS)	STAOTH	
	Staphylococcus spp., not specified	STANSP	**GPCTOT**
	Streptococcus pneumoniae	STRPNE	**STRSPP**
	Streptococcus agalactiae (B)	STRAGA	
	Streptococcus pyogenes (A)	STRPYO	
	Other haemol. Streptococcae (C, G)	STRHCG	
	Streptococcus spp., other	STROTH	
	Streptococcus spp., not specified	STRNSP	
	Enterococcus faecalis	ENCFAE	**ENCSPP**
	Enterococcus faecium	ENCFAI	
	Enterococcus spp., other	ENCOTH	
	Enterococcus spp., not specified	ENCNSP	
	Gram-positive cocci, not specified	GPCNSP	**GPCTOT**
	Other Gram-positive cocci	GPCOTH	
Gram-negative cocci	*Moraxella catharralis*	MORCAT	**GNCTOT**
	Moraxella spp., *other*	MOROTH	
	Moraxella spp., *not specified*	MORNSP	
	Neisseria meningitidis	NEIMEN	
	Neisseria spp., other	NEIOTH	
	Neisseria spp., not specified	NEINSP	
	Gram-negative cocci, not specified	GNCNSP	
	Other Gram-negative cocci	GNCOTH	
Gram-positive bacilli	*Corynebacterium* spp.	CORSPP	**GPBTOT**
	Bacillus spp.	BACSPP	
	Lactobacillus spp.	LACSPP	
	Listeria monocytogenes	LISMON	
	Gram-positive bacilli, not specified	GPBNSP	
	Other Gram-positive bacilli	GPBOTH	

	Microorganism	Code	Minimal list
Enterobacteriacea	*Citrobacter freundii*	CITFRE	**CITSPP**
	Citrobacter koseri (e.g. *diversus*)	CITDIV	
	Citrobacter spp., other	CITOTH	
	Citrobacter spp., not specified	CITNSP	
	Enterobacter cloacae	ENBCLO	**ENBSPP**
	Enterobacter aerogenes	ENBAER	
	Enterobacter agglomerans	ENBAGG	
	Enterobacter sakazakii	ENBSAK	
	Enterobacter gergoviae	ENBGER	
	Enterobacter spp., other	ENBOTH	
	Enterobacter spp., not specified	ENBNSP	
	Escherichia coli	ESCCOL	**ESCCOL**
	Klebsiella pneumoniae	KLEPNE	**KLESPP**
	Klebsiella oxytoca	KLEOXY	
	Klebsiella spp., other	KLEOTH	
	Klebsiella spp., not specified	KLENSP	
	Proteus mirabilis	PRTMIR	**PRTSPP**
	Proteus vulgaris	PRTVUL	
	Proteus spp., other	PRTOTH	
	Proteus spp., not specified	PRTNSP	
	Serratia marcescens	SERMAR	**SERSPP**
	Serratia liquefaciens	SERLIQ	
	Serratia spp., other	SEROTH	
	Serratia spp., not specified	SERNSP	
	Hafnia spp.	HAFSPP	**ETBTOT**
	Morganella spp.	MOGSPP	
	Providencia spp.	PRVSPP	
	Salmonella enteritidis	SALENT	
	Salmonella typhi or *paratyphi*	SALTYP	
	Salmonella typhimurium	SALTYM	
	Salmonella spp., not specified	SALNSP	
	Salmonella spp., other	SALOTH	
	Shigella spp.	SHISPP	
	Yersinia spp.	YERSPP	
	Other enterobacteriaceae	ETBOTH	
	Enterobacteriaceae, not specified	ETBNSP	
Gram-negative bacilli	*Acinetobacter baumannii*	ACIBAU	**ACISPP**
	Acinetobacter calcoaceticus	ACICAL	
	Acinetobacter haemolyticus	ACIHAE	
	Acinetobacter lwoffii	ACILWO	
	Acinetobacter spp., other	ACIOTH	
	Acinetobacter spp., not specified	ACINSP	
	Pseudomonas aeruginosa	PSEAER	**PSEAER**
	Stenotrophomonas maltophilia	STEMAL	**STEMAL**
	Burkholderia cepacia	BURCEP	**PSETOT**
	Pseudomonadaceae family, other	PSEOTH	
	Pseudomonadaceae family, not specified	PSENSP	
	Haemophilus influenzae	HAEINF	**HAESPP**
	Haemophilus parainfluenzae	HAEPAI	
	Haemophilus spp., other	HAEOTH	
	Haemophilus spp., not specified	HAENSP	
Gram-negative bacilli (continuation)	*Legionella* spp.	LEGSPP	**LEGSPP**
	Achromobacter spp.	ACHSPP	**GNBTOT**
	Aeromonas spp.	AEMSPP	
	Agrobacterium spp.	AGRSPP	
	Alcaligenes spp.	ALCSPP	
	Campylobacter spp.	CAMSPP	
	Flavobacterium spp.	FLASPP	
	Gardnerella spp.	GARSPP	
	Helicobacter pylori	HELPYL	
	Pasteurella spp.	PASSPP	
	Gram-negative Bacilli, not specified	GNBNSP	
	Other Gram-negative Bacilli, non enterobacteriaceae	GNBOTH	
Anaerobic bacilli	*Bacteroides fragilis*	BATFRA	**BATSPP**
	Bacteroides other	BATOTH	
	Bacteroides spp., not specified	BATNSP	

	Microorganism	Code	Minimal list
	Clostridium difficile	CLODIF	**ANATOT**
	Clostridium other	CLOOTH	
	Propionibacterium spp.	PROSPP	
	Prevotella spp.	PRESPP	
	Anaerobes, not specified	ANANSP	
	Other anaerobes	ANAOTH	
Other bacteria	Mycobacterium, atypical	MYCATY	**BCTTOT**
	Mycobacterium tuberculosis complex	MYCTUB	
	Chlamydia spp.	CHLSPP	
	Mycoplasma spp.	MYPSPP	
	Actinomyces spp.	ACTSPP	
	Nocardia spp.	NOCSPP	
	Other bacteria	BCTOTH	
	Other bacteria, not specified	BCTNSP	
Fungi	*Candida albicans*	CANALB	**CANSPP**
	Candida glabrata	CANGLA	
	Candida krusei	CANKRU	
	Candida tropicalis	CANTRO	
	Candida parapsilosis	CANPAR	
	Candida spp., other	CANOTH	
	Candida spp., not specified	CANNSP	
	Aspergillus fumigatus	ASPFUM	**ASPSPP**
	Aspergillus niger	ASPNIG	
	Aspergillus spp., other	ASPOTH	
	Aspergillus spp., not specified	ASPNSP	
	Other yeasts	YEAOTH	**PARTOT**
	Fungi other	FUNOTH	
	Fungi, not specified	FUNNSP	
	Filaments other	FILOTH	
	Other parasites	PAROTH	

	Microorganism	Code	Minimal list
Virus	Adenovirus	VIRADV	**VIRTOT**
	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	
	Influenza C virus	VIRINC	
	Norovirus	VIRNOR	
	Parainfluenzavirus	VIRPIV	
	Respiratory syncytial virus (RSV)	VIRRSV	
	Rhinovirus	VIRRHI	
	Rotavirus	VIRROT	
	SARS virus	VIRSAR	
	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.

Annex 3: Microorganism code list, alphabetically

Microorganism code	Label
_NOEXA	EXAMINATION NOT DONE
_NA	RESULTS NOT AVAILABLE
_NONID	MICROORGANISM NOT IDENTIFIED
_STERI	STERILE EXAMINATION
ACHSPP	ACHROMOBACTER SPECIES
ACIBAU	ACINETOBACTER BAUMANNII
ACICAL	ACINETOBACTER CALCOACETICUS
ACIHAE	ACINETOBACTER HAEMOLYTICUS
ACILWO	ACINETOBACTER LWOFFI
ACINSP	ACINETOBACTER SPP., NOT SPECIFIED
ACIOTH	ACINETOBACTER SPP., OTHER
ACTSPP	ACTINOMYCES SPECIES
AEMSPP	AEROMONAS SPECIES
AGRSPP	AGROBACTERIUM SPECIES
ALCSPP	ALCALIGENES SPECIES
ANANSP	ANAEROBES, NOT SPECIFIED
ANAOTH	OTHER ANAEROBES
ASPFUM	ASPERGILLUS FUMIGATUS
ASPNIG	ASPERGILLUS NIGER
ASPNSP	ASPERGILLUS SPP., NOT SPECIFIED
ASPOTH	ASPERGILLUS SPP., OTHER
BACSPP	BACILLUS SPECIES
BATFRA	BACTEROIDES FRAGILIS
BATNSP	BACTEROIDES SPECIES, NOT SPECIFIED
BATOTH	BACTEROIDES SPP., OTHER
BCTNSP	OTHER BACTERIA, NOT SPECIFIED
BCTOTH	OTHER BACTERIA
BURCEP	BURKHOLDERIA CEPACIA
CAMSPP	CAMPYLOBACTER SPECIES
CANALB	CANDIDA ALBICANS
CANGLA	CANDIDA GLABRATA
CANKRU	CANDIDA KRUSEI
CANNSP	CANDIDA SPP., NOT SPECIFIED
CANOTH	CANDIDA SPP., OTHER
CANPAR	CANDIDA PARAPSILOSIS
CANTRO	CANDIDA TROPICALIS
CHLSPP	CHLAMYDIA SPECIES
CITDIV	CITROBACTER KOSERI (EX. DIVERSUS)
CITFRE	CITROBACTER FREUNDII
CITNSP	CITROBACTER SPP., NOT SPECIFIED
CITOTH	CITROBACTER SPP., OTHER
CLODIF	CLOSTRIDIUM DIFFICILE
CLOOTH	CLOSTRIDIUM OTHER
CORSPP	CORYNEBACTERIUM SPECIES
ENBAER	ENTEROBACTER AEROGENES
ENBAGG	ENTEROBACTER AGGLOMERANS
ENBCLO	ENTEROBACTER CLOACAE
ENBGER	ENTEROBACTER GERGOVIAE
ENBNSP	ENTEROBACTER SPP., NOT SPECIFIED
ENBOTH	ENTEROBACTER SPP., OTHER
ENBSAK	ENTEROBACTER SAKAZAKII
ENCFAE	ENTEROCOCCUS FAECALIS
ENCFAI	ENTEROCOCCUS FAECIUM
ENCNSP	ENTEROCOCCUS SPP., NOT SPECIFIED
ENCOTH	ENTEROCOCCUS SPP., OTHER
ESCCOL	ESCHERICHIA COLI
ETBNSP	ENTEROBACTERIACEAE, NOT SPECIFIED
ETBOTH	OTHER ENTEROBACTERIACEAE
FILOTH	FILAMENTS OTHER
FLASPP	FLAVOBACTERIUM SPECIES

Microorganism code	Label
FUNNSP	FUNGI, NOT SPECIFIED
FUNOTH	FUNGI OTHER
GARSPP	GARDNERELLA SPECIES
GNBNSP	G-BAC, NON ENTEROBACTERIACEAE, NOT SPEC.
GNBOTH	OTHER GRAM-NEGATIVE BACILLI, NON ENTEROBACTERIACIAEA
GNCNSP	GRAM-NEGATIVE COCCI, NOT SPECIFIED
GNCOTH	GRAM-NEGATIVE COCCI, OTHER
GPBNSP	GRAM-POSITIVE BACILLI, NOT SPECIFIED
GPBOTH	OTHER GRAM-POSITIVE BACILLI
GPCNSP	GRAM-POSITIVE COCCI, NOT SPECIFIED
GPCOTH	OTHER GRAM-POSITIVE COCCI
HAEINF	HAEMOPHILUS INFLUENZAE
HAENSP	HAEMOPHILUS SPP., NOT SPECIFIED
HAEOTH	HAEMOPHILUS SPP., OTHER
HAEPAI	HAEMOPHILUS PARAINFLUENZAE
HAFSPP	HAFNIA SPECIES
HELPYL	HELICOBACTER PYLORI
KLENSP	KLEBSIELLA SPP., NOT SPECIFIED
KLEOTH	KLEBSIELLA SPP., OTHER
KLEOXY	KLEBSIELLA OXYTOCA
KLEPNE	KLEBSIELLA PNEUMONIAE
LACSPP	LACTOBACILLUS SPECIES
LEGSPP	LEGIONELLA SPECIES
LISMON	LISTERIA MONOCYTOGENES
MOGSPP	MORGANELLA SPECIES
MORCAT	MORAXELLA CATHARRALIS
MORNSP	MORAXELLA SPP., NOT SPECIFIED
MOROTH	MORAXELLA SPP., OTHER
MYCATY	MYCOBACTERIUM, ATYPICAL
MYCTUB	MYCOBACTERIUM TUBERCULOSIS COMPLEX
MYPSPP	MYCOPLASMA SPECIES
NEIMEN	NEISSERIA MENINGITIDIS
NEINSP	NEISSERIA SPP., NOT SPECIFIED
NEIOTH	NEISSERIA SPP., OTHER
NOCSPP	NOCARDIA SPECIES
PAROTH	OTHER PARASITES
PASSPP	PASTEURELLA SPECIES
PRESPP	PREVOTELLA SPECIES
PROSPP	PROPIONIBACTERIUM SPECIES
PRTMIR	PROTEUS MIRABILIS
PRTNSP	PROTEUS SPP., NOT SPECIFIED
PRTOTH	PROTEUS SPP., OTHER
PRTVUL	PROTEUS VULGARIS
PRVSPP	PROVIDENCIA SPECIES
PSEAER	PSEUDOMONAS AERUGINOSA
PSENSP	PSEUDOMONADACEAE FAMILY, NOT SPECIFIED
PSEOTH	PSEUDOMONADACEAE FAMILY, OTHER
SALENT	SALMONELLA ENTERITIDIS
SALNSP	SALMONELLA SPP., NOT SPECIFIED
SALOTH	SALMONELLA SPP., OTHER
SALTYM	SALMONELLA TYPHIMURIUM
SALTYP	SALMONELLA TYPHI OR PARATYPHI
SERLIQ	SERRATIA LIQUEFACIENS
SERMAR	SERRATIA MARCESCENS
SERNSP	SERRATIA SPP., NOT SPECIFIED
SEROTH	SERRATIA SPP., OTHER
SHISPP	SHIGELLA SPECIES
STAAUR	STAPHYLOCOCCUS AUREUS
STACNS	COAGULASE-NEGATIVE STAFYLOCOCCI, NOT SPECIFIED
STAEPI	STAPHYLOCOCCUS EPIDERMIDIS
STAHAE	STAPHYLOCOCCUS HAEMOLYTICUS
STANSP	STAPHYLOCOCCUS SPP., NOT SPECIFIED
STAOTH	OTHER COAGULASE-NEGATIVE STAFYLOCOCCI (CNS)
STEMAL	STENOTROPHOMONAS MALTOPHILIA
STRAGA	STREPTOCOCCUS AGALACTIAE (B)
STRHCG	OTHER HAEMOL. STREPTOCOCCAE (C, G)

Microorganism code	Label
STRNSP	STREPTOCOCCUS SPP., NOT SPECIFIED
STROTH	STREPTOCOCCUS SPP., OTHER
STRPNE	STREPTOCOCCUS PNEUMONIAE
STRPYO	STREPTOCOCCUS PYOGENES (A)
VIRADV	ADENOVIRUS
VIRCMV	CYTOMEGALOVIRUS (CMV)
VIRENT	ENTEROVIRUS (POLIO, COXSACKIE, ECHO)
VIRHAV	HEPATITIS A VIRUS
VIRHBV	HEPATITIS B VIRUS
VIRHCV	HEPATITIS C VIRUS
VIRHIV	HUMAN IMMUNODEFICIENCY VIRUS (HIV)
VIRHSV	HERPES SIMPLEX VIRUS
VIRINF	INFLUENZA VIRUS
VIRNOR	NOROVIRUS
VIRNSP	VIRUS, NOT SPECIFIED
VIROTH	OTHER VIRUS
VIRPIV	PARAINFLUENZAVIRUS
VIRRHI	RHINOVIRUS
VIRROT	ROTAVIRUS
VIRRSV	RESPIRATORY SYNCYTIAL VIRUS (RSV)
VIRSAR	SARS-CORONAVIRUS
VIRVZV	VARICELLA-ZOSTER VIRUS
YEAOTH	OTHER YEASTS
YERSPP	YERSINIA SPECIES

Annex 4: Antimicrobial resistance (AMR) data in ICU-acquired infections

Minimal antimicrobial resistance markers and codes in the ICU

The minimal AMR marker set for the surveillance of ICU-acquired infections has been changed to the AMR marker set used in the European Point Prevalence Survey of healthcare-associated infections and antimicrobial use in acute care hospitals.

Countries limiting AMR collection to these markers may choose to use a resistance marker code system as in the PPS protocol (codes 0, 1, 2, 9) which has following significance depending on the microorganism.

Microorganisms	0	1	2	9
Staphylococcus spp.	Oxa-S **MSSA**	Oxa-R **MRSA**	Gly-I **GISA**	Unknown
Enterococcus spp.	Gly-S	Gly-R **VRE**		Unknown
Enterobacteriaceae Escherichia coli, Klebsiella spp., *Enterobacter* spp., *Proteus* spp., *Citrobacter* spp., *Serratia* spp. (also see table microorganisms by category in Annex 2)	C3G-S, Car-S	C3G-R, Car-S	C3G-R, Car-R	Unknown
Pseudomonas spp., *Acinetobacter* spp.	Car-S	Car-R		Unknown

Oxa = oxacillin; Gly = glycopeptides (vancomycin, teicoplanin), C3G = third-generation cephalosporins (cefotaxim, cetriaxone, ceftazidim), Car = carbapenems (imipenem, meropenem, doripenem).

Target antimicrobial resistance data for ICU-acquired infections

Because of the rapid evolution of antimicrobial resistance, in particular in the ICU, the 2009 HAI surveillance meeting approved the below extended list for surveillance in ICU-acquired infections.

S. aureus

- Oxacillin (OXA)
- Glycopeptides (GLY) (vancomycin, teicoplanin)

Enterococci

- Aminopenicillins (AMP) (ampicillin and/or amoxicillin)
- Glycopeptides (GLY) (vancomycin, teicoplanin)

Enterobacteriaceae (Escherichia coli, Klebsiella, Serratia, Enterobacter, Proteus etc)

- Amoxicillin/clavulanic acid (AMC)
- Third-generation cephalosporins (C3G) (cefotaxim, cetriaxone, ceftazidim)
  - ESBL confirmed Y/N (ESBL)
- Carbapenems

P. aeruginosa

- Piperacillin or ticarcillin with or without enzyme inhibitor (PIP)
- Ceftazidim (CAZ)
- Carbapenems (CAR) (imipenem/meropenem/doripenem)
- Colistine (COL)

Acinetobacter spp.

- Carbapenems (CAR) (imipenem/meropenem/doripenem)
- Colistine (COL)
- Sulbactam (SUL)

These data can be collected as follows (also see data collection forms in Annex 10). Antibiotic codes displayed in bold represent the minimal AMR marker set.

HAI	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P. aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

Bold = minimal resistance data (as in PPS); SIR = S sensitive, I intermediate resistance, R resistant, U unknown.
Antibiotic codes: AMC: amoxicillin/clavulanate; AMP: ampicillin; C3G: third-generation cephalosporins (cefotaxim/cetriaxone/ceftazidim); CAR: carbapenems (imipenem/meropenem/doripenem); CAZ: ceftazidim; COL: colistin; GLY: glycopeptides (vancomycin, teicoplanin); OXA: oxacillin; SUL: sulbactam; PIP: piperacillin/ticarcillin with or without enzyme inhibitor; ESBL: extended beta-lactamase producer, R=Yes , S=No, U=Unknown.

Extended antimicrobial resistance data for ICU-acquired infections

As in the HELICS-ICU protocol, networks may also choose to report extended antimicrobial resistance data, which allows for more detailed description of the AMR epidemiology (e.g. combined resistance, etc.). However, emphasis should be given to the target AMR list given above.

Allowed antimicrobial resistance codes (in the 'Antibiotic' field) are:

AMB = Amphotericin B
AMC = Amoxicillin/Clavulanic Acid
AMK = Amikacin
AMP = Ampicillin
AMX = Amoxicillin
AZM = Azithromycin
C1G = Cephalosporins, first generation (cefalotin/cefazolin)
C2G = Cephalosporins, second generation (cefuroxim/cefamandole/cefoxitin)
C3G = Cephalosporins, third generation (cefotaxime/ceftriaxone)
C4G = Cephalosporins, fourth generation (cefepime/cefpirome)
CAR = Carbapenems (imipenem, meropenem, doripenem)
CAS = Caspofungin
CAZ = Ceftazidime
CIP = Ciprofloxacin
CLI = Clindamycin
CLO = Cloxacillin
CLR = Clarithromycin
COL = Colistin
CRO = Ceftriaxone
CTX = Cefotaxime
DIC = Dicloxacillin
ERY = Erythromycin
ESBL = ESBL (Extended beta-lactamase producer)
FCT = Flucytosine (5-fluorocytosine)
FLC = Flucloxacillin
FLU = Fluconazole
FOS = Fosfomycin
FOX = Cefoxitin
FUS = Fusidic acid
GEH = Gentamicin-High
GEN = Gentamicin
GLY = Glycopeptides (vancomycin/teicoplanin)
IPM = Imipenem
ITR = Itraconazole
KET = Ketoconazole
LNZ = Linezolid
LVX = Levofloxacin
MEM = Meropenem
MET = Methicillin
MFX = Moxifloxacin
NAL = Nalidic acid

NET = Netilmicin
NOR = Norfloxacin
OFX = Ofloxacin
OXA = Oxacillin
PEN = Penicillin
PIP = Piperacillin
PIT = Piperacillin or ticarcillin
QDA = Quinupristin/Dalfopristin
RIF = Rifampin
SUL = Sulbactam
SXT = Trimethoprim/Sulfamethoxazole (cotrimoxazole)
TCY = Tetracyclin
TEC = Teicoplanin
TIG = Tigecyclin
TOB = Tobramycin
TZP = Piperacillin/Tazobactam
VAN = Vancomycin

Annex 5: Antimicrobials and their ATC5 codes

Antifungals for systemic use	
A07AA=Antifungals for systemic use	Neomycin (oral) A07AA01, Nystatin A07AA02, Natamycin A07AA03, Streptomycin (oral) A07AA04, Polymyxin B A07AA05, Paromomycin A07AA06, Amphotericin B (oral) A07AA07, Kanamycin A07AA08, Vancomycin (oral) A07AA09, Colistin (oral) A07AA10, Rifaximin A07AA11, Neomycin, combinations (oral) A07AA51, Streptomycin, combinations A07AA54
D01BA=Antifungals for systemic use	Griseofulvin D01BA01,Terbinafine D01BA02
Tetracyclines	
J01AA=Tetracyclines	Demeclocycline J01AA01, Doxycycline J01AA02, Chlortetracycline J01AA03, Lymecycline J01AA04, Metacycline J01AA05, Oxytetracycline J01AA06, Tetracycline J01AA07, Minocycline J01AA08, Rolitetracycline J01AA09, Penimepicycline J01AA10, Clomocycline J01AA11, Tigecycline J01AA12, Combinations of tetracyclines J01AA20, Oxytetracycline, combinations J01AA56
Amphenicols	
J01BA=Amphenicols	Chloramphenicol J01BA01, Thiamphenicol J01BA02, Thiamphenicol, combinations J01BA52
Beta-lactam antibacterials, penicillins	
J01CA=Penicillins with extended spectrum	Ampicillin J01CA01, Pivampicillin J01CA02, Carbenicillin J01CA03, Amoxicillin J01CA04, Carindacillin J01CA05, Bacampicillin J01CA06, Epicillin J01CA07, Pivmecillinam J01CA08, Azlocillin J01CA09, Mezlocillin J01CA10, Mecillinam J01CA11, Piperacillin J01CA12, Ticarcillin J01CA13, Metampicillin J01CA14, Talampicillin J01CA15, Sulbenicillin J01CA16, Temocillin J01CA17, Hetacillin J01CA18, Combinations of penicillins with extended spectrum J01CA20, Ampicillin, combinations J01CA51
J01CE=Beta-lactamase sensitive penicillins	Benzylpenicillin J01CE01, Phenoxymethylpenicillin J01CE02, Propicillin J01CE03, Azidocillin J01CE04, Pheneticillin J01CE05, Penamecillin J01CE06, Clometocillin J01CE07, Benzathine enzylpenicillin J01CE08 Procaine benzylpenicillin J01CE09 Benzathine phenoxymethylpenicillin J01CE10, Combinations of beta-lactamase sensitive penicillins J01CE30
J01CF=Beta-lactamase resistant penicillins	Dicloxacillin J01CF01, Cloxacillin J01CF02, Meticillin J01CF03, Oxacillin J01CF04, Flucloxacillin J01CF05, Sulbactam J01CG01, Tazobactam J01CG02
J01CR=Combinations of penicillins, including beta-lactamase inhibitors	Ampicillin and enzyme inhibitor J01CR01, Amoxicillin and enzyme inhibitor J01CR02, Ticarcillin and enzyme inhibitor J01CR03, Sultamicillin J01CR04, Piperacillin and enzyme inhibitor J01CR05, Combinations of penicillins J01CR50
Other beta-lactam antibacterials	
J01DB=First-generation cephalosporins	Cefalexin J01DB01, Cefaloridine J01DB02, Cefalotin J01DB03, Cefazolin J01DB04, Cefadroxil J01DB05, Cefazedone J01DB06, Cefatrizine J01DB07, Cefapirin J01DB08, Cefradine J01DB09, Cefacetrile J01DB10, Cefroxadine J01DB11, Ceftezole J01DB12
J01DC=Second-generation cephalosporins	Cefoxitin J01DC01, Cefuroxime J01DC02, Cefamandole J01DC03, Cefaclor J01DC04, Cefotetan J01DC05, Cefonicide J01DC06, Cefotiam J01DC07, Loracarbef J01DC08, Cefmetazole J01DC09, Cefprozil J01DC10, Ceforanide J01DC11
J01DD=Third-generation cephalosporins	Cefotaxime J01DD01, Ceftazidime J01DD02, Cefsulodin J01DD03, Ceftriaxone J01DD04, Cefmenoxime J01DD05, Latamoxef J01DD06, Ceftizoxime J01DD07, Cefixime J01DD08, Cefodizime J01DD09, Cefetamet J01DD10, Cefpiramide J01DD11, Cefoperazone J01DD12, Cefpodoxime J01DD13, Ceftibuten J01DD14, Cefdinir J01DD15, Cefditoren J01DD16, Cefcapene J01DD17, Ceftriaxone, combinations J01DD5, Cefoperazone, combinations J01DD62
J01DE=Fourth-generation cephalosporins	Cefepime J01DE01, Cefpirome J01DE02, Cefozopran J01DE03
J01DF=Monobactams	Aztreonam J01DF01
J01DH=Carbapenems	Meropenem J01DH02, Ertapenem J01DH03, Doripenem J01DH04, Biapenem J01DH05, Imipenem and enzyme inhibitor J01DH51, Panipenem and betamipron J01DH55
J01DI=Other cephalosporins	Ceftobiprole medocaril J01DI01
Sulfonamides and trimetoprim	
J01EA=Trimethoprim and derivatives	Trimethoprim J01EA01, Brodimoprim J01EA02, Idaprim J01EA03
J01EB=Short-acting sulfonamides	Sulfaisodimidine J01EB01, Sulfamethizole J01EB02, Sulfadimidine J01EB03, Sulfapyridine J01EB04, Sulfafurazole J01EB05, Sulfanilamide J01EB06, Sulfathiazole J01EB07, Sulfathiourea J01EB08, Combinations of short-acting sulphonamides J01EB20
J01EC=Intermediate-acting sulphonamides	Sulfamethoxazole J01EC01, Sulfadiazine J01EC02, Sulfamoxole J01EC03, Combinations of intermediate-acting sulphonamides J01EC20
J01ED=Long-acting sulphonamides	Sulfadimethoxine J01ED01, Sulfalene J01ED02, Sulfametomidine J01ED03, Sulfametoxydiazine J01ED04, Sulfamethoxypyridazine J01ED05, Sulfaperin J01ED06, Sulfamerazine J01ED07, Sulfaphenazole J01ED08, Sulfamazone J01ED09, Combinations of long-acting sulphonamides J01ED20

J01EE=Combinations of sulfonamides and trimethoprim, including derivatives	Sulfamethoxazole and trimethoprim J01EE01, Sulfadiazine and trimethoprim J01EE02, Sulfametrole and trimethoprim J01EE03, Sulfamoxole and trimethoprim J01EE04, Sulfadimidine and trimethoprim J01EE05, Sulfadiazine and tetroxoprim J01EE06, Sulfamerazine and trimethoprim J01EE07
Macrolides, lincosamides and streptogramins	
J01FA=Macrolides	Erythromycin J01FA01, Spiramycin J01FA02, Midecamycin J01FA03, Oleandomycin J01FA05, Roxithromycin J01FA06 Josamycin J01FA07, Troleandomycin J01FA08, Clarithromycin J01FA09, Azithromycin J01FA10, Miocamycin J01FA11, Rokitamycin J01FA12, Dirithromycin J01FA13, Flurithromycin J01FA14, Telithromycin J01FA15
J01FF=Lincosamides	Clindamycin J01FF01, Lincomycin J01FF02
J01FG=Streptogramins	Pristinamycin J01FG01, Quinupristin/dalfopristin J01FG02
Aminoglycoside antibacterials	
J01GA=Streptomycins	Streptomycin (parenteral) J01GA01, Streptoduocin J01GA02
J01GB=Other aminoglycosides	Tobramycin J01GB01, Gentamicin J01GB03, Kanamycin J01GB04, Neomycin (injection, infusion) J01GB05, Amikacin J01GB06, Netilmicin J01GB07, Sisomicin J01GB08, Dibekacin J01GB09, Ribostamycin J01GB10, Isepamicin J01GB11, Arbekacin J01GB12
Quinolone antibacterials	
J01MA=Fluoroquinolones	Ofloxacin J01MA01, Ciprofloxacin J01MA02, Pefloxacin J01MA03, Enoxacin J01MA04, Temafloxacin J01MA05, Norfloxacin J01MA06, Lomefloxacin J01MA07, Fleroxacin J01MA08, Sparfloxacin J01MA09, Rufloxacin J01MA10, Grepafloxacin J01MA11, Levofloxacin J01MA12, Trovafloxacin J01MA13, Moxifloxacin J01MA14, Gemifloxacin J01MA15, Gatifloxacin J01MA16, Prulifloxacin J01MA17, Pazufloxacin J01MA18, Garenoxacin J01MA19
J01MB=Other quinolones	Rosoxacin J01MB01, Nalidixic acid J01MB02, Piromidic acid J01MB03, Pipemidic acid J01MB04, Oxolinic acid J01MB05, Cinoxacin J01MB06, Flumequine J01MB07
Combinations of antibacterials	
J01RA=Combinations of antibacterials	Penicillins, combinations with other antibacterials J01RA01, Sulfonamides, combinations with other antibacterials (excl. trimethoprim) J01RA02, Cefuroxime, combinations with other antibacterials J01RA03, Spiramycin, combinations with other antibacterials J01RA04
Other antibacterials	
J01XA=Glycopeptide antibacterials	Vancomycin (parenteral) J01XA01, Teicoplanin J01XA02, Telavancin J01XA03, Dalbavancin J01XA04, Oritavancin J01XA05
J01XB=Polymyxins	Colistin (injection, infusion) J01XB01, Polymyxin B J01XB02
J01XC=Steroid antibacterials	Fusidic acid J01XC01
J01XD=Imidazole derivatives	Metronidazole J01XD01, Tinidazole J01XD02, Ornidazole (parenteral) J01XD03
J01XE=Nitrofuran derivatives	Nitrofurantoin J01XE01, Nifurtoinol J01XE02
J01XX=Other antimicrobials	Fosfomycin J01XX01, Xibornol J01XX02, Clofoctol J01XX03, Spectinomycin J01XX04, Methenamine J01XX05, Mandelic acid J01XX06, Nitroxoline J01XX07, Linezolid J01XX08, Daptomycin J01XX09, Bacitracin J01XX10
Antimycotics for systemic use	
J02AA=Antibiotics	Amphotericin B (parenteral) J02AA01, Hachimycin J02AA02
J02AB=Imidazole derivatives	Miconazole J02AB01, Ketoconazole J02AB02
J02AC=Triazole derivatives	Fluconazole J02AC01, Itraconazole J02AC02, Voriconazole J02AC03, Posaconazole J02AC04
J02AX=Other antimycotics for systemic use	Flucytosine J02AX01, Caspofungin J02AX04, Micafungin J02AX05, Anidulafungin J02AX06
Drugs for treatment tuberculosis	
J04AB=Antibiotics	Rifampicin J04AB02
Agents against amoebiasis and other protozoal diseases	
P01AA=Hydroxyquinolone derivatives	Broxyquinoline P01AA01, Clioquinol P01AA02, Chlorquinaldol P01AA04, Tilbroquinol P01AA05, Clioquinol, combinations P01AA52
P01AB=Nitroimidazole derivatives	Metronidazole P01AB01, Tinidazole P01AB02, Ornidazole (oral) P01AB03, Azanidazole P01AB04 Propenidazole P01AB05, Nimorazole P01AB06, Secnidazole P01AB07

Annex 6: Antimicrobial ATC codes, alphabetically

Antimicrobial generic name	ATC5
Amikacin	J01GB06
Amoxicillin	J01CA04
Amoxicillin and enzyme inhibitor	J01CR02
Amphotericin B (oral)	A07AA07
Amphotericin B (parenteral)	J02AA01
Ampicillin	J01CA01
Ampicillin and enzyme inhibitor	J01CR01
Ampicillin, combinations	J01CA51
Anidulafungin	J02AX06
Arbekacin	J01GB12
Azanidazole	P01AB04
Azidocillin	J01CE04
Azithromycin	J01FA10
Azlocillin	J01CA09
Aztreonam	J01DF01
Bacampicillin	J01CA06
Bacitracin	J01XX10
Benzathine benzylpenicillin	J01CE08
Benzathine phenoxymethylpenicillin	J01CE10
Benzylpenicillin	J01CE01
Biapenem	J01DH05
Brodimoprim	J01EA02
Broxyquinoline	P01AA01
Carbenicillin	J01CA03
Carindacillin	J01CA05
Caspofungin	J02AX04
Cefacetrile	J01DB10
Cefaclor	J01DC04
Cefadroxil	J01DB05
Cefalexin	J01DB01
Cefaloridine	J01DB02
Cefalotin	J01DB03
Cefamandole	J01DC03
Cefapirin	J01DB08
Cefatrizine	J01DB07
Cefazedone	J01DB06
Cefazolin	J01DB04
Cefcapene	J01DD17
Cefdinir	J01DD15
Cefditoren	J01DD16
Cefepime	J01DE01
Cefetamet	J01DD10
Cefixime	J01DD08
Cefmenoxime	J01DD05
Cefmetazole	J01DC09
Cefodizime	J01DD09
Cefonicide	J01DC06
Cefoperazone	J01DD12
Cefoperazone, combinations	J01DD62
Ceforanide	J01DC11
Cefotaxime	J01DD01
Cefotetan	J01DC05
Cefotiam	J01DC07
Cefoxitin	J01DC01
cefozopran	J01DE03
Cefpiramide	J01DD11
Cefpirome	J01DE02
Cefpodoxime	J01DD13
Cefprozil	J01DC10
Cefradine	J01DB09

Antimicrobial generic name	ATC5
Cefroxadine	J01DB11
Cefsulodin	J01DD03
Ceftazidime	J01DD02
Ceftezole	J01DB12
Ceftibuten	J01DD14
Ceftizoxime	J01DD07
Ceftobiprole medocaril	J01DI01
Ceftriaxone	J01DD04
Ceftriaxone, combinations	J01DD54
Cefuroxime	J01DC02
Cefuroxime, combinations with other antibacterials	J01RA03
Chloramphenicol	J01BA01
Chlorquinaldol	P01AA04
Chlortetracycline	J01AA03
Cinoxacin	J01MB06
Ciprofloxacin	J01MA02
Clarithromycin	J01FA09
Clindamycin	J01FF01
Clioquinol	P01AA02
Clioquinol, combinations	P01AA52
Clofoctol	J01XX03
Clometocillin	J01CE07
Clomocycline	J01AA11
Cloxacillin	J01CF02
Colistin (oral)	A07AA10
Colistin (injection, infusion)	J01XB01
Combinations of penicillins with extended spectrum	J01CA20
Combinations of beta-lactamase sensitive penicillins	J01CE30
Combinations of short-acting sulfonamides	J01EB20
Combinations of intermediate-acting sulfonamides	J01EC20
Combinations of long-acting sulfonamides	J01ED20
Combinations of penicillins	J01CR50
Combinations of tetracyclines	J01AA20
Dalbavancin	J01XA04
Daptomycin	J01XX09
Demeclocycline	J01AA01
Dibekacin	J01GB09
Dicloxacillin	J01CF01
Dirithromycin	J01FA13
Doripenem	J01DH04
Doxycycline	J01AA02
Enoxacin	J01MA04
Epicillin	J01CA07
Ertapenem	J01DH03
Erythromycin	J01FA01
Fleroxacin	J01MA08
Flucloxacillin	J01CF05
Fluconazole	J02AC01
Flucytosine	J02AX01
Flumequine	J01MB07
Flurithromycin	J01FA14
Fosfomycin	J01XX01
Fusidic acid	J01XC01
Garenoxacin	J01MA19
Gatifloxacin	J01MA16
Gemifloxacin	J01MA15
Gentamicin	J01GB03
Grepafloxacin	J01MA11
Griseofulvin	D01BA01
Hachimycin	J02AA02
Hetacillin	J01CA18
Idaprim	J01EA03
Imipenem and enzyme inhibitor	J01DH51
Isepamicin	J01GB11
Itraconazole	J02AC02
Josamycin	J01FA07

Antimicrobial generic name	ATC5
Kanamycin	A07AA08
Kanamycin	J01GB04
Ketoconazole	J02AB02
Latamoxef	J01DD06
Levofloxacin	J01MA12
Lincomycin	J01FF02
Linezolid	J01XX08
Lomefloxacin	J01MA07
Loracarbef	J01DC08
Lymecycline	J01AA04
Mandelic acid	J01XX06
Mecillinam	J01CA11
Meropenem	J01DH02
Metacycline	J01AA05
Metampicillin	J01CA14
Methenamine	J01XX05
Meticillin	J01CF03
Metronidazole	J01XD01
Metronidazole	P01AB01
Mezlocillin	J01CA10
Micafungin	J02AX05
Miconazole	J02AB01
Midecamycin	J01FA03
Minocycline	J01AA08
Miocamycin	J01FA11
Moxifloxacin	J01MA14
Nalidixic acid	J01MB02
Natamycin	A07AA03
Neomycin (oral)	A07AA01
Neomycin (injection, infusion)	J01GB05
Neomycin, combinations (oral)	A07AA51
Netilmicin	J01GB07
Nifurtoinol	J01XE02
Nimorazole	P01AB06
Nitrofurantoin	J01XE01
Nitroxoline	J01XX07
Norfloxacin	J01MA06
Nystatin	A07AA02
Ofloxacin	J01MA01
Oleandomycin	J01FA05
Oritavancin	J01XA05
Ornidazole (parenteral)	J01XD03
Ornidazole (oral)	P01AB03
Oxacillin	J01CF04
Oxolinic acid	J01MB05
Oxytetracycline	J01AA06
Oxytetracycline, combinations	J01AA56
Panipenem and betamipron	J01DH55
Paromomycin	A07AA06
Pazufloxacin	J01MA18
Pefloxacin	J01MA03
Penamecillin	J01CE06
Penicillins, combinations with other antibacterials	J01RA01
Penimepicycline	J01AA10
Pheneticillin	J01CE05
Phenoxymethylpenicillin	J01CE02
Pipemidic acid	J01MB04
Piperacillin	J01CA12
Piperacillin and enzyme inhibitor	J01CR05
Piromidic acid	J01MB03
Pivampicillin	J01CA02
Pivmecillinam	J01CA08
Polymyxin B	A07AA05
Polymyxin B	J01XB02
Posaconazole	J02AC04
Pristinamycin	J01FG01

Antimicrobial generic name	ATC5
Procaine benzylpenicillin	J01CE09
Propenidazole	P01AB05
Propicillin	J01CE03
Prulifloxacin	J01MA17
Quinupristin/dalfopristin	J01FG02
Ribostamycin	J01GB10
Rifampicin	J04AB02
Rifaximin	A07AA11
Rokitamycin	J01FA12
Rolitetracycline	J01AA09
Rosoxacin	J01MB01
Roxithromycin	J01FA06
Rufloxacin	J01MA10
Secnidazole	P01AB07
Sisomicin	J01GB08
Sparfloxacin	J01MA09
Spectinomycin	J01XX04
Spiramycin	J01FA02
Spiramycin, combinations with other antibacterials	J01RA04
Streptoduocin	J01GA02
Streptomycin (oral)	A07AA04
Streptomycin (parenteral)	J01GA01
Streptomycin, combinations	A07AA54
Sulbactam	J01CG01
Sulbenicillin	J01CA16
Sulfadiazine	J01EC02
Sulfadiazine and tetroxoprim	J01EE06
Sulfadiazine and trimethoprim	J01EE02
Sulfadimethoxine	J01ED01
Sulfadimidine	J01EB03
Sulfadimidine and trimethoprim	J01EE05
Sulfafurazole	J01EB05
Sulfaisodimidine	J01EB01
Sulfalene	J01ED02
Sulfamazone	J01ED09
Sulfamerazine	J01ED07
Sulfamerazine and trimethoprim	J01EE07
Sulfamethizole	J01EB02
Sulfamethoxazole	J01EC01
Sulfamethoxazole and trimethoprim	J01EE01
Sulfamethoxypyridazine	J01ED05
Sulfametomidine	J01ED03
Sulfametoxydiazine	J01ED04
Sulfametrole and trimethoprim	J01EE03
Sulfamoxole	J01EC03
Sulfamoxole and trimethoprim	J01EE04
Sulfanilamide	J01EB06
Sulfaperin	J01ED06
Sulfaphenazole	J01ED08
Sulfapyridine	J01EB04
Sulfathiazole	J01EB07
Sulfathiourea	J01EB08
Sulfonamides, combinations with other antibacterials (excl. trimethoprim)	J01RA02
Sultamicillin	J01CR04
Talampicillin	J01CA15
Tazobactam	J01CG02
Teicoplanin	J01XA02
Telavancin	J01XA03
Telithromycin	J01FA15
Temafloxacin	J01MA05
Temocillin	J01CA17
Terbinafine	D01BA02
Tetracycline	J01AA07
Thiamphenicol	J01BA02
Thiamphenicol, combinations	J01BA52

Antimicrobial generic name	ATC5
Ticarcillin	J01CA13
Ticarcillin and enzyme inhibitor	J01CR03
Tigecycline	J01AA12
Tilbroquinol	P01AA05
Tinidazole	J01XD02
Tinidazole	P01AB02
Tobramycin	J01GB01
Trimethoprim	J01EA01
Troleandomycin	J01FA08
Trovafloxacin	J01MA13
Vancomycin (oral)	A07AA09
Vancomycin (parenteral)	J01XA01
Voriconazole	J02AC03
Xibornol	J01XX02

Annex 7: Risk scores definitions: SAPS II, APACHE II, Glasgow

SAPS II score[4]

The Simplified Acute Physiology Score II (SAPS II) is one of the most frequently used tools to predict hospital mortality in ICUs and serves as a starting point for the evaluation of ICU efficiency. It includes 17 variables: 12 physiology variables and three underlying disease variables.

Variable	Definition	Comments
SAPS II	The SAPS II components should be measured 24 hours after admission to the ICU. The worst values within those 24 hours are to be recorded; each category of values has a weighted value in points	The total score must be computed adding the weighted values
Age	Use the patient's age (in years) at his last birthday	
Heart rate	Use the worst value in 24 hours, either low or high heart rate; if it varied from cardiac arrest (11 points) to extreme tachycardia (7 points), assign 11 points	
Systolic blood pressure	Use the same method as for heart rate: e.g., if it varied from 60 mm Hg to 205 mm Hg, assign 13 points	
Body temperature	Use the highest temperature in degrees centigrade or Fahrenheit	
PaO_2/FiO_2 ratio	If ventilated or continuous pulmonary artery pressure, use the lowest value of the ratio	Only if the patient has been mechanically ventilated
Urinary output	Total urinary output in 24 hours	Patients staying less than 48 hours are not included in the HELICS surveillance
Serum urea or serum urea nitrogen level	Use the highest value in mmol/L for serum urea, in mg/dL for serum urea nitrogen	
WBC count	Use the worst (high or low) WBC count according to the scoring sheet	
Serum potassium level	Use the worst (high or low) in mmol/L, according to the scoring sheet	
Serum sodium level	Use the worst (high or low) in mmol/L, according to the scoring sheet	
Serum bicarbonate level	Use the lowest value in mEq/L	
Bilirubin level	Use the highest value in µmol/L or mg/dL	
Glasgow Coma score*	Use the lowest value; if the patient is sedated, record the estimated Glasgow Coma Score before sedation.	This variable must be repeated on the HELICS form
Type of admission	• Unscheduled surgical • Scheduled surgical • Medical	• Patients added to the operating room schedule within 24 hours of the operation • Patient whose surgery was scheduled at least 24 hours in advance • Patients having no surgery within one week of admission to ICU This variable must be repeated on the HELICS form
AIDS	Select YES if HIV-positive with clinical complications such as *Pneumocystis carinnii* pneumonia, Kaposi's sarcoma, lymphoma, tuberculosis, or toxoplasma infection	
Haematologic malignancy	Select YES, if lymphoma, acute leukaemia or multiple myeloma	
Metastatic cancer	Select YES, if proven metastasis by surgery, computed tomographic scan, or any other method	This variable must be repeated on the HELICS form

SAPS II weights

Age (in years)	< 40[0]	40–59[7]	60–69[12]	70–74[15]	75–79[16]	≥ 80[18]
Heart rate (beats/min)	< 40[11]	40–69[2]	70–119 [0]	120–159[4]	≥ 160[7]	
Systolic BP (mm Hg)	<70[13]	70–99[5]	100–199[0]	≥ 200 [2]		
Body temperature (°C)	< 39[0]	≥ 39[3]				
Only if ventilated or positive airway pressure (BPAP/CPAP)						
– PaO_2(mmHg)/FiO_2 ratio – PaO_2(Kpa)/FiO_2 ratio	< 100[11] (< 13.3)	100–199[9] (13.2–26.4)	≥ 200[6] (≥ 26.5)	e.g. 70 mmHg /0.5 = 140 10 Kpa/0.5 = 20		
Urinary output (ml/day)	< 500[12]	500–999[4]	≥ 1000[0]			
Serum urea (mg/dl) (mmol/L)	< 60[0] (< 10.0)	< 60–179[6] (10.0–29.9)	≥ 180[10] (≥ 30.0)			
WBC count ($10^3/mm^3$)	< 1.0[12]	1.0–19.9[0]	≥ 20.0[3]			
Serum potassium (mEq/L)	< 3.0[3]	3.0–4.9[0]	≥ 5.0[3]			
Serum sodium (mEq/L)	< 125[5]	125–144 [0]	≥ 145[1]			
Bicarbonate (mEq/L)	< 15[6]	15–20[3]	≥ 20[0]			
Bilirubin (mg/dl) (µmol/L)	< 4.0[0] (<68.4)	< 4.0–5.9[4] (68.4-102.5)	≥ 6.0[9] (≥ 102.6)			

[4] Le Gall JR, Lemeshow S, Saulnier F. A new simplified acute physiology score (SAPS II) based on a European/North American Multicenter Study. JAMA 1993; 270:2957–2963.

Glasgow coma score (if patient is sedated, estimate status before sedation)	< 6[26]	6–8[13]	9–10[7]	11–13[5]	14–15[0]	
Chronic diseases	metastatic cancer[9]		haematol. malignancy[10]		AIDS[17]	
Type of admission	medical[6]		scheduled surgical[0]		unscheduled surgical[8]	

APACHE II score[5]

The APACHE II severity of disease classification system

Physiologic variable	High abnormal range					Low abnormal range			
	+ 4	+ 3	+ 2	+ 1	0	+ 1	+ 2	+ 3	+ 4
TEMPERATURE – rectal (C°)	≥ 41°	39°–40.9°		38.5°–38.9°	36°–38.4°	34°–35.9°	323°–33.9°	30°–31.9°	≤ 29.9°
MEAN ARTERIAL PRESSURE – mm Hg	≥ 160	130–159	110–129		70–109		50–69		≤ 49
HEART RATE (ventricular response)	≥ 180	140 – 179	110–139		70–109		55 – 69	40–54	≤ 39
RESPIRATORY RATE – (non-ventilated or ventilated)	≥ 50	35–49		25–34	12–24	10–11	6–9		≤ 5
OXYGENATION: A aDO_2 or PaO_2 (mm Hg) a. FIO_2 ≥ 0.5 record a A aDO_2 b. FIO_2 < 0.5 record only PaO_2	≥ 500	350–499	200–349		<200 O PO_2 > 70	O PO_2 61–70		O PO_2 55–60	O PO_2 < 55
ARTERIAL pH	≥ 7.7	7.6–7.69		7.5–7.59	7.33–7.49		7.25–7.32	7.15–7.24	< 7.15
SERUM SODIUM (mMol/L)	≥ 180	160–179	155–159	150–154	130–149		120–129	111–119	≤ 110
SERUM POTASIUM (mMol/L)	≥ 7	6–6.9		5.9–5.9	3.5–5.4	3–3.4	2.5–2.9		< 2.5
SERUM CREATININE (mg/100ml) (Double point score for acute renal failure)	≥ 3.5	2–3.4	1.5–1.9		0.6–1.4		< 0.6		
HEMATOCRIT (%)	≥ 60		50–59.9	46–49.9	30–45.9		20–29.9		< 20
WHITE BLOOD COUNT (total/mm3) (in 1.000s)	≥ 40		20–39.9	15–19.9	3–14.9		1–2.9		< 1
GLASGOW COMA SCORE (GCS) Score = 15 minus actual GCS									
A Total ACUTE PSYSIOLOGIC SCORE (APS) Sum of the 12 individual variable points									
Serum HCO2 (venous mMol/L) (Not preferred, use if no ABGs)	≥ 52	41–51.9		32–40.9	22–31.9		18–21.9	15–17.9	< 15

AGE POINTS

Assign points to age as follows:

AGE (yrs)	Points
≤ 44	0
45–54	2
55–64	3
65–74	5
≥ 75	6

CHRONIC HEALTH POINTS

If the patient has a history of severe organ system insufficiency or is immunocompromised, assign points as follows:

- for nonoperative or emergency postoperative patients – 5 points
- for elective postoperative patients – 2 points

DEFINITIONS

Organ insufficiency or immunocompromised state must have been evident prior to hospital admission and conform to the following criteria:

- LIVER: Biopsy proven cirrhosis and documented portal hypertension, episodes of past upper GI bleeding attributed to portal hypertension or prior episodes of hepatic failure/encephalopathy/coma
- CARDIOVASCULAR: New York Heart Association Class IV
- RESPIRATORY: Chronic restrictive, obstructive or vascular disease resulting in severe exercise restriction, i.e. unable to climb stairs or perform household duties; or documented chronic hypoxia, hypercapnia, secondary polycythemia, severe pulmonary hypertension (> 40mmHg); or respirator dependency

[5] From Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: A severity of disease classification system. Crit Care Med 1985;818–829.

- RENAL: Receiving chronic dialysis
- IMMUNOCOMPROMISED: The patient has received therapy that suppresses resistance to infection, e.g. immunosuppression, chemotherapy, radiation, long-term or recent high dose steroids, or has a disease that is sufficiently advanced to suppress resistance to infection, e.g. leukaemia, lymphoma, AIDS.

APACHE II score

A + B + C

A APS points

B Age points

C Chronic Health points

Total = APACHE II

Glasgow Coma Score[6]

Score Glasgow = Y + V + M

Best Eye Response (Y)	Best Verbal Response (V)	Best Motor Response (M)
1. No eye opening 2. Eye opening to pain 3. Eye opening to verbal command 4. Eyes open spontaneously	1. No verbal response 2. Incomprehensible sounds 3. Inappropriate words 4. Confused 5. Orientated	1. No motor response 2. Extension to pain 3. Flexion to pain 4. Withdrawal from pain 5. Localising pain 6. Obeys commands

Please note that, for example, the phrase 'GCS of 11' is essentially meaningless. It is important to relate the complete formula, e.g. Y3 V3 M5 = GCS 11. A Glasgow Coma Score of 13 or higher correlates with a mild brain injury; 9 to 12 is a moderate injury; and 8 or less, a severe brain injury.

[6] Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. Lancet 1974;13(2)7872:81–4.

Glasgow Paediatric Coma Score[7]

The Paediatric GCS is scored between 3 and 15, with 3 being the worst and 15 the best. It is composed of three parameters: Best Eye Response, Best Verbal Response and Best Motor Response:

- Best Eye Response (4)
  - No eye opening
  - Eye opening to pain
  - Eye opening to verbal command
  - Eyes open spontaneously
- Best Verbal Response (5)
  - No vocal response
  - Inconsolable, agitated
  - Inconsistently consolable, moaning
  - Cries but is consolable, inappropriate interactions
  - Smiles, oriented to sounds, follows objects, interacts
- Best Motor Response (6)
  - No motor response
  - Extension to pain
  - Flexion to pain
  - Withdrawal from pain
  - Localising pain
  - Obeys commands

Please note that, for example, the phrase 'GCS of 11' is essentially meaningless. It is important to relate the complete formula, such as E3 V3 M5 = GCS 11. A Glasgow Paediatric Coma Score of 13 or higher correlates with a mild brain injury; 9 to 12 is a moderate injury; and 8 or less, a severe brain injury.

[7] http://www.trauma.org/scores/gpcs.html

Annex 8: Comprehensive list of indicators

Indicator	Definition	Light	Standard
Bloodstream infection			
Incidence density of nosocomial bloodstream infection in the ICU	# BSI (of all origin) >D2*1000/n of patient-days	X	X
Pathogen-specific bloodstream infection incidence rate	# BSI (of all origin, by pathogen) >D2*1000/n of patient-days	X	X
Standardised bloodstream infection ratio	Observed n of patients with BSI/Expected n of patients with bloodstream infection	-	X
Stratification of device-adjusted infection rates	Infection rates by ICU type Infection rates by risk factors	X -	X X
Pneumonia			
Incidence density of nosocomial pneumonia (clinical + microbiologically confirmed) in the ICU	# pneumonia (of all origin) >D2*1000/n of patient-days	X	X
% microbiologically confirmed pneumonia	# PN with microbiologically documentation by semi-quantitative (BAL,PB…) or quantitative culture of endotracheal aspirate/total PN	X	X
Pathogen-specific pneumonia incidence rate	# pneumonia (of all origin, by pathogen) >D2*1000/n of patient-days	X	X
Intubator-associated pneumonia rate in the ICU	# device-associated pneumonia*1000/n of intubation days	-	X
Standardised pneumonia ratio	Observed n of patients with pneumonia/Expected n of patients with pneumonia	-	X
Stratification of infection rates	Infection rates by ICU-type Infection rates by risk factors	X -	X X
Urinary tract infections			
Incidence density of nosocomial UTI in the ICU	# UTI >D2*1000/n of patient-days	X	X
Pathogen-specific UTI incidence rate	# UTI (of all origin, by pathogen) >D2*1000/n of patient-days	X	X
Catheter-associated UTI rate in the ICU	# device-associated UTI*1000/n of urinary catheter days	-	X
Stratification of infection rates	Infection rates by risk factors	X	X
Catheter Infections			
Incidence density of catheter infections in the ICU	# catheter-associated infections*1000/n of central line days (catheter-total)	-	X
Antimicrobial use in the ICU			
Antimicrobial treatment utilisation rate	N of antibiotic treatment days/N of patient-days	-	X
Ratio documented treatment/empiric treatment	N of documented AB treatment days/N of empiric AB treatment days	-	X
Stratified AM use	N of antibiotic treatment days/N of patient-days by risk factors	-	X
Device use in the ICU			
Central line utilisation rate	N of central line days/N of patient-days	-	X
Intubation utilisation rate	N of days with intubation/N of patient-days	-	X
Urinary catheter utilisation rate	N of urinary catheter days/N of patient-days	-	X

Annex 9: Variable names

Standard protocol

HAIICU

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
RecordTypeVersion	Record type version	No	No
Subject	Subject	True (Error)	No
DataSource	Data source	True (Error)	No
ReportingCountry	Reporting country	True (Error)	No
DateUsedForStatistics	Date used for statistics	True (Error)	No
Status	Status	No	No
ICU information			
NetworkId	Network identifier	No	No
HospitalId	Hospital identifier	True (Error)	No
HospitalSize	Hospital size	True (Warning)	No
HospitalType	Hospital type	No	No
HospitalLocation	Region where hospital is located.	No	No
UnitId	ICU identifier	No	No
UnitSize	ICU size	No	No
UnitSpeciality	Type of ICU	No	No
UnitPercentIntub	% of intubated in the year for the ICU	No	No

HAIICU$PT

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Patient information			
PatientCounter	Patient counter	True (Error)	No
Age	Age	True (Warning)	No
Gender	Gender	True (Warning)	No
OutcomeUnit	Outcome from ICU	True (Warning)	No
DateUnitAdmission	Date of ICU admission	True (Error)	No
DateUnitDischarge	Date of ICU discharge	True (Warning)	No
PatientOrigin	Origin of the patient	No	No
DateHospitalAdmission	Date of hospital admission	No	No
SapsII	SAPS II score	No	No
ApacheII	APACHE II score	No	No
TypeOfAdmission	Type of ICU admission	No	No
Trauma	Trauma patient	No	No
ImpairedImmunity	Impaired Immunity	No	No
AntimicrobialAdmission	Antibiotic treatment in 48 hours before or after ICU admission	No	No
AcuteCoronaryCare	Patient needed acute coronary care	No	No
PreviousSurgery	Surgery before ICU admission + site	No	Yes
Intubation	Intubation	True (Warning)	No
CVC	Central Vascular Catheter	True (Warning)	No
UrinaryCatheter	Indwelling Urinary Catheter	True (Warning)	No
ParenteralNutrition	Parenteral nutrition	No	No
AntimicrobialInUnit	Antimicrobial received during ICU stay	No	No

HAIICUPTEXP

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No

Exposure information			
DateExpStart	Exposure start date	True (Error)	No
DateExpEnd	Exposure end date	True (Error)	No
ExpType	Type of exposure	True (Error)	No

HAIICUPTAM

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Drug information			
DateAntimicrobialStart	Antimicrobial start date	True (Error)	No
DateAntimicrobialEnd	Antimicrobial end date	True (Error)	No
ATCCode	Antimicrobial ATC5 code	True (Error)	No
AntimicrobialIndication	Indication for antimicrobial use	True (Error)	No

HAIICUPTINF

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Infection information			
DateOfOnset	Date of infection onset	True (Error)	No
InfectionSite	Site of Infection	True (Error)	No
BSIOrigin	Origin of the bloodstream infection	False (conditional true warning)	No
InvasiveDevice	Invasive device in the 48 hours preceding the infection	True (Warning)	No

HAIICUPTINF$RES

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Infection information			
ResultIsolate	Isolate result	True (Error)	No
Antibiotic	Antibiotic code	True (Warning)	No
SIR	SIR	True (Warning)	No

Light protocol

HAIICULIGHT

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
RecordTypeVersion	Record type version	False	No
Subject	Subject	True (Error)	No
DataSource	Data source	True (Error)	No
ReportingCountry	Reporting country	True (Error)	No
DateUsedForStatistics	Date used for statistics	True (Error)	No
Status	Status	No	No
ICU information			
NetworkId	Network identifier	No	No
HospitalId	Hospital identifier	True (Error)	No
HospitalSize	Hospital size	True (Warning)	No
HospitalType	Hospital type	No	No
HospitalLocation	Region where hospital is located	No	
UnitId	ICU identifier	No	No
UnitSize	ICU size	No	No
UnitSpeciality	Type of ICU	No	No
UnitPercentIntub	% of intubated in the year for the ICU	No	No

HAIICULIGHT$DENO

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
ICU information			
PeriodStart	Start date of this surveillance period	True (Error)	No
PeriodEnd	End date of this surveillance period	True (Error)	No
NumUnitAdmission2d	Number of admissions staying more than two days	True (Warning)	No
NumPatDaysUnit2d	Number of patient-days for patients stayng more than two days	True (Warning)	No
NumUnitAdmission	Total number of admissions staying	No	No
NumPatDaysUnit	Total number of patient-days for patients	No	No

HAIICULIGHT$DENO$INF

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Patient information			
PatientCounter	Patient counter	True (Error)	No
Age	Age	True (Warning)	No
Gender	Gender	True (Warning)	No
DateUnitAdmission	Date of ICU admission	True (Error)	No
DateUnitDischarge	Date of ICU discharge	No	No
Infection information			
DateOfOnset	Date of infection onset	True (Error)	No
InfectionSite	Site of Infection	True (Error)	No
BSIOrigin	Origin of the bloodstream infection	False (conditional true warning)	No
InvasiveDevice	Invasive device in the 48 hours preceding the infection	True (warning)	No

HAIICULIGHTPTINF$RES

Field (TransportLabel)	Name	Required	Repeatable
Technical fields			
RecordId	Record Id	True (Error)	No
RecordType	Record type	True (Error)	No
ParentId	Parent id	True (Error)	No
Patient information			
ResultIsolate	Isolate result	True (Error)	No
Antibiotic	Antibiotic code	True (Warning)	No
SIR	SIR	True (Warning)	No

Annex 10: Data collection forms

European Surveillance of ICU-acquired infections
Standard: hospital & ICU characteristics form

Hospital data

Hospital Code ☐ **Year:** ☐ **Hospital size** (n of beds) ☐

Hospital Type: O primary O secondary O tertiary O specialized

ICU characteristics

ICU Id ☐ Unique identifier for each intensive care unit within an hospital (abbreviated name)

ICU size ☐ Number of beds in the ICU

ICU specialty O Mixed O Medical O Surgical O Coronary O Burns O Neurosurgical O Pediatric O Neonatal O Other O Unknown

Percentage of intubated patients in year (true or estimated %): ☐ %

European Surveillance of ICU-acquired infections

Patient-based risk factor form (ICU1)

Hospital code | **Date of admission in hospital:** ___ / ___ / _____

ICU code (abbr name) | Patient Counter

Patient data

Age in years: ____ yrs **Gender:** M F UNK **Date of admission in ICU:** ___ / ___ / _____

Date of ICU discharge ___ / ___ / _____ **Outcome at ICU discharge:** Alive Dead UNK

Origin of the patient O Ward this/oth hosp O Other ICU O Community O LTCF O Other O UNK

SAPS II score: **Apache II score**:

Type of admission: O medical O scheduled surgical O unscheduled surgical O UNK

Trauma: O Yes O No O UNK **Impaired immunity:** O Yes O No O UNK

Antimicrobial treatment *+/- 48 Hrs around admission* : O Yes O No O UNK

Acute coronary care: O Yes O No O UNK

Surgery site (within last 30 days before admission, incl. day of admission) O UNK O No Surgery

O coronary O other cardiac O other thoracic O other vascular O abdominal O neurosurgery O other site

Exposure to invasive devices in the ICU

Central vascular catheter in ICU: O Yes O No O Unk

If Yes: Start Date 1 : ___ / ___ / _____ End Date 1: ___ / ___ / _____

Start Date 2 : ___ / ___ / _____ End Date 2: ___ / ___ / _____

Intubation in ICU: O Yes O No O Unk

If Yes: Start Date 1 : ___ / ___ / _____ End Date 1: ___ / ___ / _____

Start Date 2 : ___ / ___ / _____ End Date 2: ___ / ___ / _____

Urinary catheter in ICU: O Yes O No O Unk

If Yes: Start Date 1 : ___ / ___ / _____ End Date 1: ___ / ___ / _____

Start Date 2 : ___ / ___ / _____ End Date 2: ___ / ___ / _____

Parenteral nutrition in ICU: O Yes O No O Unk (optional)

If Yes: Start Date 1 : ___ / ___ / _____ End Date 1: ___ / ___ / _____

Start Date 2 : ___ / ___ / _____ End Date 2: ___ / ___ / _____

Patient received **antimicrobial(s)** during ICU stay **O Yes O No O Unkown**

Antimicrobial (generic or brand name) or ATC5	Indication	Start Date	End Date

Indication: **P:** prophylaxis **E:** empiric treatment **M:** documented treatment **S:** SDD (Selective Digestive Decontamination)

European Surveillance of ICU-acquired infections
Infection and AMR form, standard (ICU2)

Patient Counter

ICU-acquired infections

	HAI 1	HAI 2	HAI 3
Case definition code			
Relevant device in situ before onset*	O Yes O No O Unknown	O Yes O No O Unknown	O Yes O No O Unknown
Date of onset**	___ / ___ / _____	___ / ___ / _____	___ / ___ / _____
BSI: source of BSI***			
	MO-code	MO-code	MO-code
Micro-organism 1			
Micro-organism 2			
Micro-organism 3			

*relevant device use (intubation for PN, CVC for BSI, urinary catheter for UTI) in 48 hours before onset of infection (even intermittent use), 7 days for UTI **Only for infections not present/active at admission

*** C-CVC, C-PER, C-ART, S-PUL, S-UTI, S-DIG, S-SSI, S-SST, S-OTH, UNK

Target antimicrobial resistance data in ICU-acquired infections

HAI1:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

HAI2:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

HAI3:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

Bold=minimal resistance data (as in PPS); SIR: S sensitive, I intermediate resistance, R resistant, U unknown

Antibiotic codes: AMC: amoxicillin/clavulanate, AMP: ampicillin, C3G: cephalosporins of third generation (cefotaxim/cetriaxone/ceftazidim), CAR: carbapenems (imipenem/meropenem/doripenem), CAZ: ceftazidim, COL: colistin, GLY: glycopeptides (vancomycin, teicoplanin), OXA: oxacillin, SUL: Sulbactam PIP: piperacillin/ticarcillin with or without enzyme inhibitor

ESBL: Extended Beta-Lactamase producing, Yes=R, No=S, U=Unknown

European Surveillance of ICU-acquired infections
Light: hospital/ICU form + aggregated denominator data

Hospital data

Hospital Code ☐ **Year:** ☐ **Hospital size** (n of beds) ☐

Hospital Type: O primary O secondary O tertiary O specialized

ICU characteristics

ICU code ☐ Unique identifier for each intensive care unit within an hospital (abbreviated name)

ICU size ☐ Number of beds in the ICU

ICU specialty O Mixed O Medical O Surgical O Coronary O Burns O Neurosurgical O Pediatric O Neonatal O Other O Unknown

Percentage of intubated patients in year (true or estimated %): ☐ %

ICU denominator data

Surveillance Period		Patients staying >2 days		All Patients	
Start date	**End date**	N of admissions	N of patient-days	N of admissions	N of patient-days

Recommended minimal surveillance period = 3 months; add more lines if needed

European Surveillance of ICU-acquired infections
Infection and AMR form, light (ICUL2)

Patient Counter:	**Date of admission in ICU:** ___ / ___ / _____
Age in years: ____ yrs **Gender:** M F UNK	**Date of ICU discharge:** ___ / ___ / _____

ICU-acquired infections

	HAI 1	**HAI 2**	**HAI 3**
Case definition code			
Relevant device in situ before onset*	O Yes O No O Unknown	O Yes O No O Unknown	O Yes O No O Unknown
Date of onset**	___ / ___ / _____	___ / ___ / _____	___ / ___ / _____
BSI: source of BSI***			
	MO-code	MO-code	MO-code
Micro-organism 1			
Micro-organism 2			
Micro-organism 3			

*relevant device use (intubation for PN, CVC for BSI, urinary catheter for UTI) in 48 hours before onset of infection (even intermittent use), 7 days for UTI **Only for infections not present/active at admission

*** C-CVC, C-PER, C-ART, S-PUL, S-UTI, S-DIG, S-SSI, S-SST, S-OTH, UNK

Target antimicrobial resistance data in ICU-acquired infections

HAI1:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

HAI2:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

HAI3:	MO-Code	AB1	SIR1	AB2	SIR2	AB3	SIR3	AB4	SIR4
Staphylococcus aureus		**OXA**		**GLY**					
Enterococcus spp.		**AMP**		**GLY**					
Enterobacteriaceae		AMC		**C3G**		ESBL		**CAR**	
		AMC		**C3G**		ESBL		**CAR**	
P.aeruginosa		PIP		CAZ		**CAR**		COL	
Acinetobacter spp.		**CAR**		COL		SUL			

Bold=minimal resistance data (as in PPS); SIR: S sensitive, I intermediate resistance, R resistant, U unknown

Antibiotic codes: AMC: amoxicillin/clavulanate, AMP: ampicillin, C3G: cephalosporins of third generation (cefotaxim/cetriaxone/ceftazidim), CAR: carbapenems (imipenem/meropenem/doripenem), CAZ: ceftazidim, COL: colistin, GLY: glycopeptides (vancomycin, teicoplanin), OXA: oxacillin, SUL: Sulbactam
PIP: piperacillin/ticarcillin with or without enzyme inhibitor
ESBL: Extended Beta-Lactamase producing, Yes=R, No=S, U=Unknown