SURVEILLANCE

Healthcare-associated infections: surgical site infections

Annual Epidemiological Report for 2021–2022

Key facts

- Surgical site infections (SSIs) are among the most common healthcare-associated infections (HAIs). They are associated with longer post-operative hospital stays, additional surgical procedures, treatment in intensive care units and higher mortality.
- In 2021–2022, 11 EU Member States and one EEA country reported 10 193 SSIs from a total of 662 309 surgical procedures for nine types of surgical procedures.
- The percentage of SSIs varied from 0.6% in laminectomies to 9.6% in open colon surgery, depending on the type of surgical procedure.
- The incidence density of in-hospital SSIs per 1 000 post-operative patient-days varied from 0.1 to 5.3, depending on the type of surgical procedure.
- Comparing 2022 to 2021, two additional countries reported data to ECDC. France continued their reporting after a pause, and Belgium reported SSI surveillance data for the first time. Overall, there was an increase in the number of reported surgical procedures, especially for hip and knee prosthesis and laminectomy procedures.

Introduction

Surgical site infections (SSIs) are among the most common healthcare-associated infections (HAIs). SSIs are associated with longer post-operative hospital stays, may necessitate additional surgical procedures, may require intensive care, and result in higher attributable morbidity and mortality. SSIs are hence an important target for the surveillance of healthcare-associated infections (HAI).

Methods

This report is based on data for 2021–2022 retrieved on 21 August 2024, and with the last country update on 20 January 2025, from The European Surveillance System (TESSy) and ECDC's decentralised data storage for antimicrobial resistance and healthcare-associated infections (ARHAI). TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. EU/EEA countries contribute to the system by uploading infectious disease surveillance data at regular intervals. The ARHAI decentralised data storage is a system allowing EU/EEA countries to store their surveillance data on their national servers in TESSy data format.

For a detailed description of methods used to produce this report, please refer to the *Methods* chapter [1].

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Stockholm, February 2025

Additional data on this topic are accessible from ECDC's online *Surveillance atlas of infectious diseases* [2].

SSI surveillance data for 2021–2022 were reported to ECDC by 12 countries (11 EU Member States and one EEA country).

Data on SSIs following surgical procedures that took place in 2021–2022 were collected in hospitals participating in national or regional surveillance of SSIs across Europe. The surveillance protocol allowed these hospitals to opt for patient-based or unit-based reporting, but as in 2018–2020, in 2021–2022 all countries provided patient-based data [3,4]. SSI cases were classified according to the modified 2012 EU case definitions [5,6].

The SSI surveillance protocol includes nine types of surgical procedures: coronary artery bypass graft (CABG), open and laparoscopic cholecystectomy (CHOL), open and laparoscopic colon surgery (COLO), caesarean section (CSEC), hip prosthesis (HPRO), knee prosthesis (KPRO) and laminectomy (LAM). SSIs detected within a defined follow-up period were included in the analysis. The standardised follow-up period was 30 days. For deep or organ/space infections following orthopaedic operations with an implant in place (HPRO/KPRO), the follow-up period was extended to 90 days [4]. Laparoscopic/open procedures for CHOL and COLO only include the data for which the variable 'endoscopic procedure (yes/no)' was reported.

For all patients with an SSI, basic demographics, infection characteristics and outcome at hospital discharge were collected. In the patient-based surveillance option, these data were collected from all surgical patients. Furthermore, information on each surgical procedure was collected, including whether the operation was urgent (i.e. not planned at least 24 hours in advance). The United States National Healthcare Safety Network (NHSN) risk index, which is based on the presence of three major risk factors (duration of the operation, wound contamination class and the American Society of Anesthesiologists' physical status classification), was used to assign all surgical patients to one of four categories from low to high risk (0, 1, 2 and 3) [8,9]. In this analysis, categories 2 and 3 were combined because of the small number of operations in these categories. For the duration of the operation, instead of set cut-offs used in the SSI surveillance protocol v2.2, the 75th percentile was calculated from the surveillance data 2021–2022 to classify procedures with long duration [4].

For each type of surgical procedure under surveillance, two main indicators were calculated:

- The percentage of SSIs per 100 operations: an indicator which includes both SSIs diagnosed during hospital stay and after discharge from the hospital (detected at hospital readmission or by post-discharge surveillance);
- The incidence density of in-hospital SSIs per 1 000 post-operative patient-days: an indicator that only includes SSIs diagnosed during hospital stay in patients with a known date of discharge from the hospital.

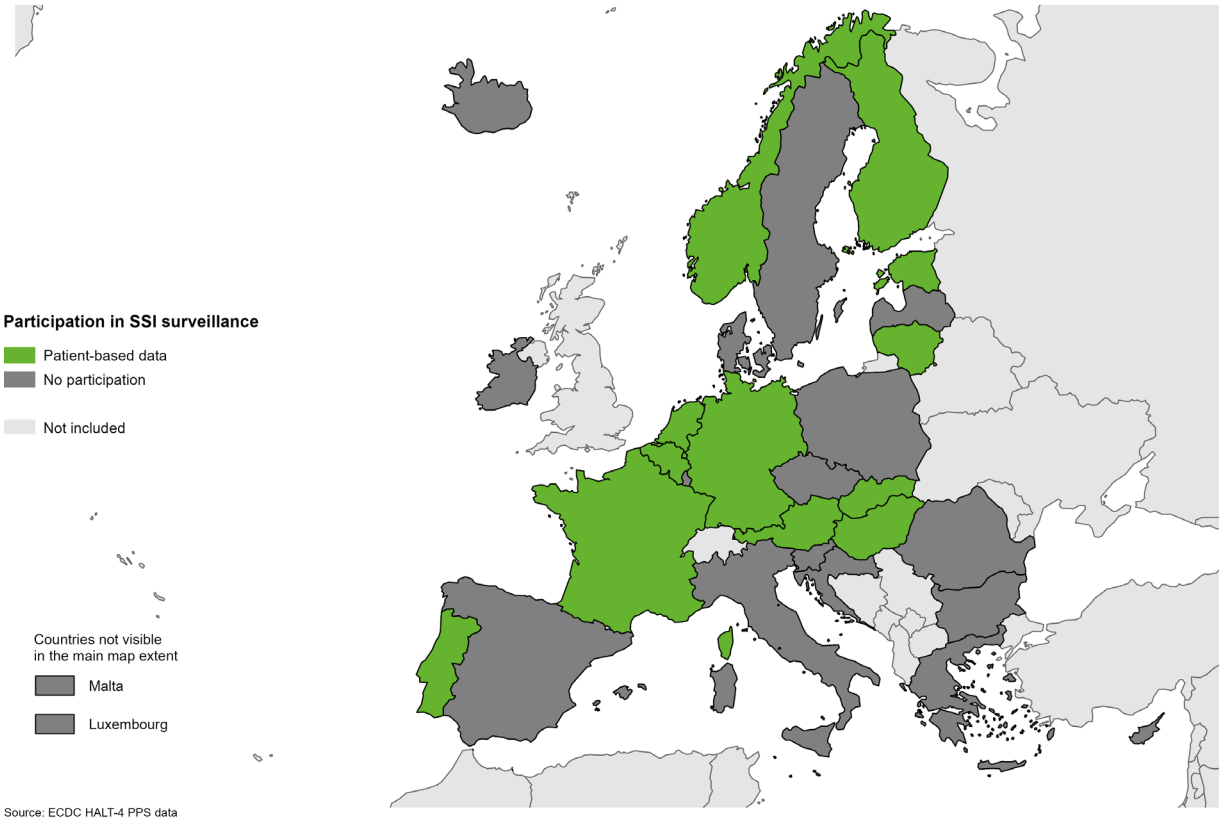
Both indicators were also calculated including only deep or organ/space SSIs, and for SSIs with positive microbiological finding, and stratified by NHSN risk index categories (the latter is shown by type of surgical procedure in the annexed Tables A2.2 to A10.2).

Data on structure and process indicators for SSI prevention, included in the protocol v2.2, were only provided by one country in 2021–2022 and are thus not included in this report [4].

Epidemiology

All 12 EU/EEA countries that participated in surveillance of SSIs in 2021–2022 reported patient-based data (Figure 1). The number of participating hospitals as well as country representativeness varied between countries, with noticeable differences in the national coverage of the surveillance systems (Table 1). Only five of the 12 EU/EEA countries reported performing post-discharge surveillance, using different methods varying from SSIs being reported by the patients themselves to SSIs being reported by the surgeon or general practitioner.

Figure 1. Participation in the surveillance of surgical site infections (SSIs), EU/EEA, 2021–2022



Source: ECDC HALT-4 PPS data

The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union. ECDC. Map produced on 3 January 2025

Sources: ECDC, HAI-Net, 2021–2022

Overall, 662 309 surgical procedures from 1 638 hospitals were reported in 2021–2022; 300 908 procedures in 2021 and 361 401 procedures in 2022 (Table 1). The most frequently reported types of surgical procedure were HPRO, followed by KPRO and CSEC.

Table 1. Number of reporting hospitals and reported surgical procedures by country/network and type of surgical procedure, EU/EEA, 2021–2022

Surveillance year	Country	Number of reporting hospitals	Number of procedures									Total
			CABG	Laparoscopic CHOL	Open CHOL	Laparoscopic COLO	Open COLO	CSEC	HPRO	KPRO	LAM	
2021	Austria	32	413	2 127	304	9	46	3 138	6 591	4 139		16 767
	Estonia	2						153		258		411
	Finland	10							6 986	7 793		14 779
	Germany	542	6 794	18 544	979	4 399	6 312	28 286	61 131	34 728	4 560	165 733
	Hungary	21	69	404	156	15	92	1 506	21	36	92	2 391
	Lithuania	28	329	417	36	58	49	518	533	346		2 286
	Netherlands	67		5 876		2 151	712	4 997	23 479	19 879	1 015	58 109
	Norway	53	1 048	6 134	161	1 876	1 206	7 806	12 600			30 831
	Portugal	25	30	1 742		931		3 542	1 732	1 109	347	9 433
	Slovakia	2		161	7							495
	EU/EEA	**782**	**8 683**	**35 405**	**1 643**	**9 439**	**8 417**	**49 946**	**113 073**	**68 288**	**6 014**	**300 908**
2022	Austria	30	390	1 814	246	3	22	3 273	6 162	4 692		16 602
	Belgium	9							1 586	1 007		2 593
	Estonia	2	119				1	433		380		933
	Finland	12							8 151	7 538		15 689
	France	41	459					4 237	4 957	3 024	728	13 405
	Germany	566	7 608	19 573	999	4 961	6 376	29 923	78 502	46 763	6 405	201 110
	Hungary	21		656	128	31	229	1 418	55	90	134	2 741
	Lithuania	27	550	589	60	177	210	656	988	755	46	4 031
	Netherlands	60		5 904		1 714	548	4 678	25 422	23 293	1 482	63 041
	Norway	62	976	6 409	154	2 053	1 106	6 766	14 045			31 509
	Portugal	25	28	1 450		775		3 607	1 843	1 520	466	9 689
	Slovakia	1		58								58
	EU/EEA	**856**	**10 130**	**36 453**	**1 587**	**9 714**	**8 492**	**54 991**	**141 711**	**89 062**	**9 714**	**361 401**
Total	**EU/EEA**	**1 638**	**18 813**	**71 858**	**3 230**	**19 153**	**16 909**	**104 937**	**254 784**	**157 350**	**15 275**	**662 309**

Sources: Country reports from Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
CABG: coronary artery bypass graft; CHOL: cholecystectomy; COLO: colon surgery; CSEC: caesarean section; HPRO: hip prosthesis; KPRO: knee prosthesis; LAM: laminectomy.

Nine countries reported, at least partially, the ICD-9-CM codes corresponding to the procedures included in surveillance (Finland and Hungary did not report any detailed coding; France reported codes from the Classification des Actes Médicaux (CCAM) in 2022). In total, 260 842 (39.4%) of 662 309 reported procedures had a specific ICD-9-CM code. ICD-9-CM code inclusion by type of procedure and by country is shown in Annex Tables A11.1 to A11.9.

The ratio of male to female patients was the highest in CABG operations (4.5:1) and the lowest in HPRO and laparoscopic CHOL operations (0.6:1); this ratio was not reported for CSEC operations (Table 2). The median age of patients varied from 32 years in CSEC operations to 73 years in HPRO operations. Post-operative in-hospital case fatality (9.6%) was the highest among open COLO operations, while the proportion of contaminated or dirty operations (49.2%) was the highest among open CHOL operations. The median duration of operation was the longest in CABG operations (212 minutes), and the median length of post-operative stay was the longest in open COLO operations (11 days). The proportion of urgent operations varied from only 2.1% in KPRO operations to 43.9% in CSEC operations. For most types of surgical procedures, over 85% and up to 99% patients received antibiotic prophylaxis, with the exception of CHOL operations, for which 37% patients with a laparoscopic procedure and 55% patients with an open procedure received antibiotic prophylaxis.

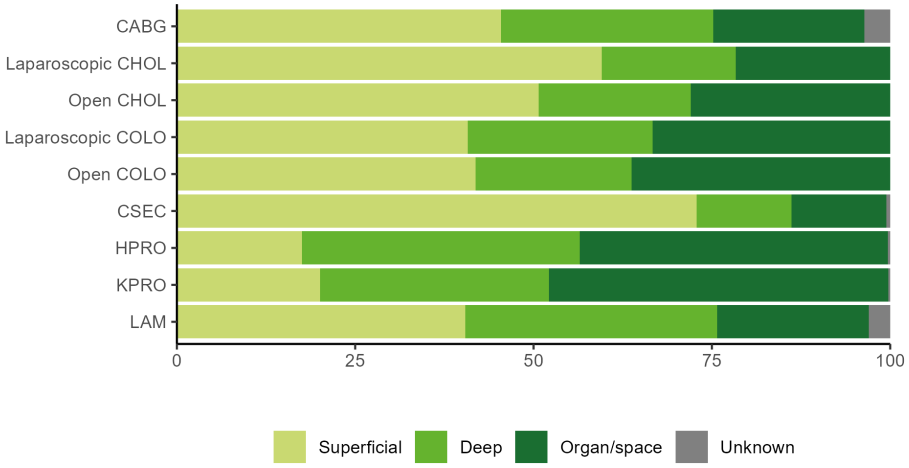
Table 2. Characteristics of patients by type of surgical procedure, patient-based data, EU/EEA, 2021–2022

Characteristics	CABG (n=18 813)	Laparoscopic CHOL (n=71 858)	Open CHOL (n=3 230)	Laparoscopic COLO (n=19 153)	Open COLO (n=16 909)	CSEC (n=104 937)	HPRO (n=254 784)	KPRO (n=157 350)	LAM (n=15 275)
Sex ratio (male:female)	4.5	0.6	1	0.9	1	NA	0.6	0.7	1.1
Median age (years)	68	56	68	68	71	32	73	70	58
Post-operative in-hospital case fatality (%)	2.3	0.3	1.9	3.0	9.6	0	2.9	0.1	0.4
Contaminated or dirty operations (%)	0.2	21.5	49.2	24.9	38.1	11.9	1.3	1.1	1.0
Median duration of operation (minutes)	212	59	90	147	136	37	66	70	64
75th percentile of the duration of operation (minutes)*	260	80	134	193	181	47	84	88	95
Median length of post-operative stay (days)	9	3	6	7	11	4	7	6	4
Urgent operations (%)	10.9	21.8	32.5	11.1	35	43.9	22.6	2.1	5.5
Antibiotic prophylaxis (%)	98.6	36.6	54.5	90.0	88.7	85.4	96.1	99.2	86.2

** CABG with both chest and donor site incisions: 255 minutes; CABG with only chest incision: 265 minutes.*
Source: Country reports from Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
See Table 1 for reporting hospitals and reported surgical procedures in EU/EEA countries.
CABG: coronary artery bypass graft; CHOL: cholecystectomy; COLO: colon surgery; CSEC: caesarean section; HPRO: hip prosthesis surgery; KPRO: knee prosthesis surgery; LAM: laminectomy.
NA: Not applicable.

In 2021–2022, 10 193 SSIs were reported. Of these, 3 913 (38%) were superficial, 2 818 (28%) deep and 3 422 (34%) organ/space SSIs. The Netherlands reported all combined deep and organ/space SSIs as deep SSIs. In 40 (0.4%) SSIs, the type of SSI was unknown. The proportion of deep or organ/space SSIs was 27% in CSEC operations, 40% in laparoscopic CHOL operations, 49% in open CHOL operations, 51% in CABG operations, 57% in LAM operations, 58% in open COLO operations, 59% in laparoscopic COLO, 80% in KPRO operations and 82% in HPRO operations (Figure 2). Thirty-four per cent of all SSIs were diagnosed in hospitals, whereas 59% were detected after discharge and for 7% the discharge date was unknown. The proportion of SSIs diagnosed in-hospital varied from 74% in open COLO operations to 9% in KPRO operations.

Figure 2. Types of SSI by type of surgical procedure, EU/EEA, 2021–2022



CABG: coronary artery bypass graft; CHOL: cholecystectomy; COLO: colon surgery; CSEC: caesarean section; HPRO: hip prosthesis surgery; KPRO: knee prosthesis surgery; LAM: laminectomy
Source: Country reports from Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
Note: The Netherlands reported all combined deep and organ/space SSIs as deep SSIs.
See Table 1 for reporting hospitals and reported surgical procedures in EU/EEA countries.

The percentage of SSIs varied greatly by type of surgical procedure, from 0.6% in LAM operations to 9.6% in open COLO operations. Similarly, there were notable differences in the incidence density of in-hospital SSIs between different types of surgical procedure (Table 3). As expected, the percentage and incidence density of SSIs were mainly lower in laparoscopic than in open procedures for both CHOL and COLO operations. The overall percentage of deep or organ/space SSIs varied from 0.3% in CSEC to 5.6% in open COLO procedures, and the incidence density of deep or organ/space in-hospital SSIs varied similarly from 0.1 in KPRO procedures to 3.2 both in open and laparoscopic COLO procedures.

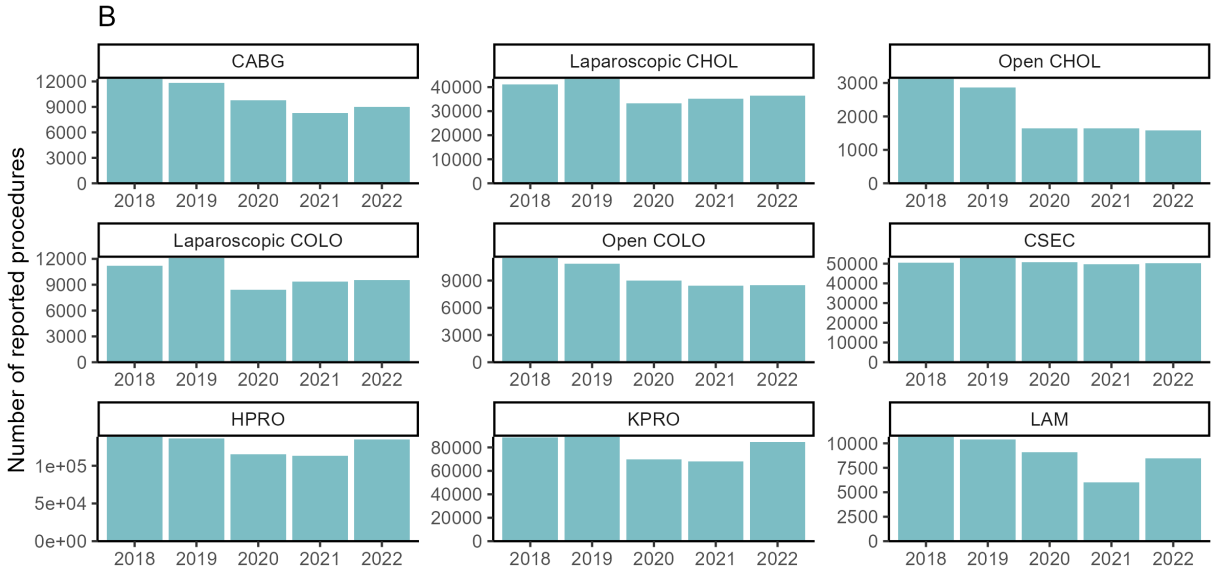
Table 3. Percentage of all SSIs and deep or organ/space SSIs and incidence density of all in-hospital SSIs and deep/organ space SSIs by type of surgical procedure, EU/EEA, 2021–2022

Type of surgical procedure	Percentage of SSIs per 100 operations [intercountry range]	Percentage of deep or organ/space SSIs per 100 operations [intercountry range]	Incidence density of in-hospital SSIs per 1 000 post-operative patient-days [intercountry range]	Incidence density of deep or organ/space in-hospital SSIs per 1 000 post-operative patient-days [intercountry range]
CABG	2.5 [0.0-8.6]	1.3 [0.0-3.4]	1.1 [0.0-7.5]	0.6 [0.0-1.9]
Laparoscopic CHOL	1.7 [0.1-4.1]	0.7 [0.0-1.4]	1.0 [0.3-4.4]	0.7 [0.0-4.4]
Open CHOL	4.2 [1.4-14.3]	2.1 [1.0-14.3]	3.0 [1.2-8.7]	1.8 [1.0-8.7]
Laparoscopic COLO	6.3 [0.0-13.5]	3.7 [0.0-8.9]	4.7 [0.0-10.4]	3.2 [0.0-9.9]
Open COLO	9.6 [0.0-23.6]	5.6 [0.0-17.0]	5.3 [0.0-19.2]	3.2 [0.0-13.8]
CSEC	1.3 [0.3-3.6]	0.3 [0.1-1.0]	0.4 [0.0-0.8]	0.2 [0.0-0.8]
HPRO	1.2 [0.0-2.3]	1.0 [0.0-1.7]	0.4 [0.0-0.8]	0.3 [0.0-0.6]
KPRO	0.7 [0.0-2.0]	0.5 [0.0-1.4]	0.1 [0.0-0.8]	0.1 [0.0-0.4]
LAM	0.6 [0.4-2.2]	0.4 [0.1-2.7]	0.3 [0.0-2.1]	0.2 [0.0-2.1]

CABG: coronary artery bypass graft, CHOL: cholecystectomy, COLO: colon surgery, CSEC: caesarean section, HPRO: hip prosthesis surgery, KPRO: knee prosthesis surgery, LAM: laminectomy
Source: Country reports from Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
See Table 1 for reporting hospitals and reported surgical procedures in EU/EEA countries.

For all types of surgical procedure, the total number of reported procedures decreased in 2020 compared to 2018 or 2019 (Figure 3). However, for HPRO, KPRO and LAM procedures reporting increased again in 2022, and the number of participating countries increased in 2022 when compared to 2021 (Table 1).

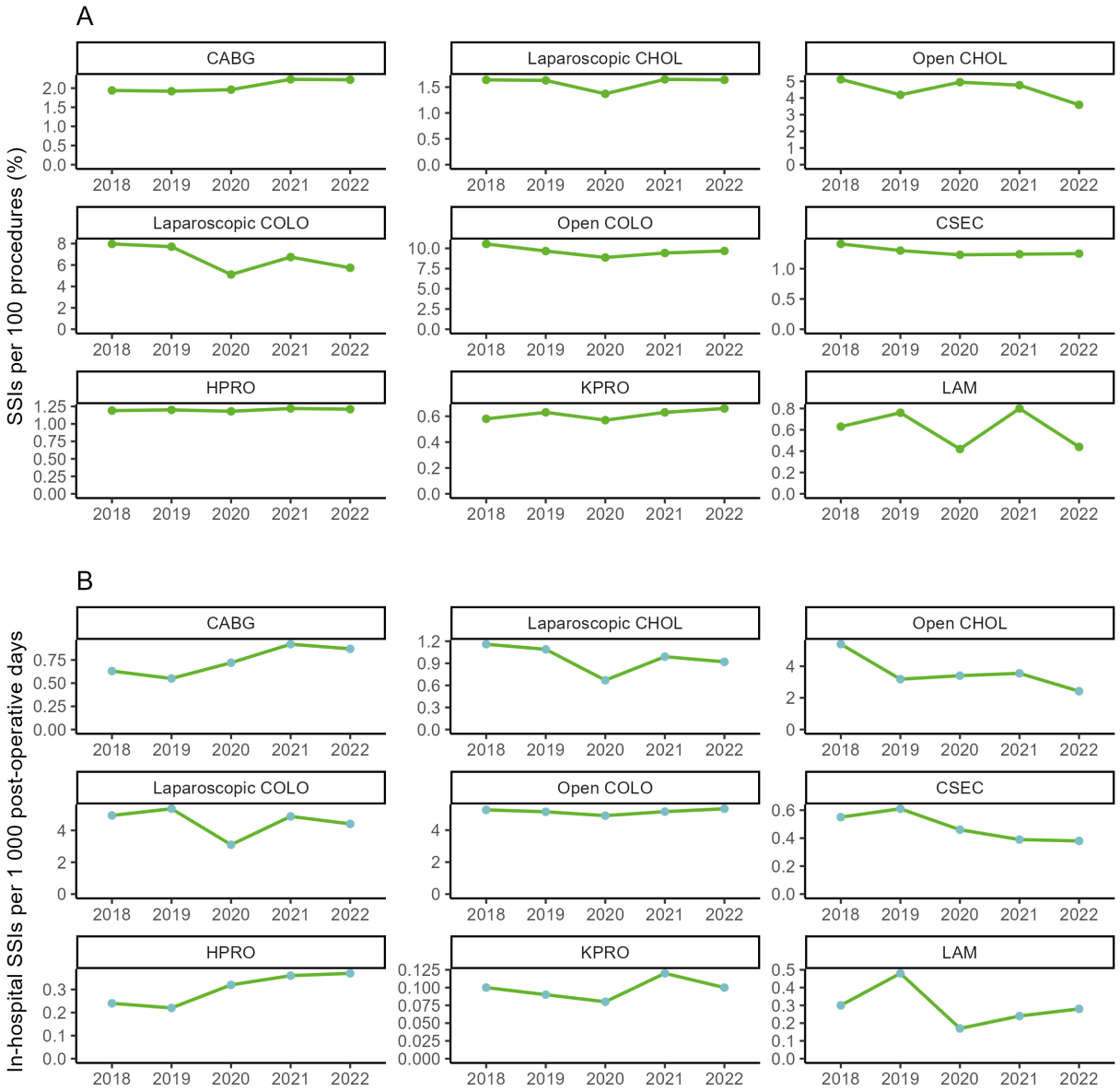
Figure 3. Number of reported procedures by year and type of surgical procedure, EU/EEA, 2018–2022



CABG: coronary artery bypass graft, CHOL: cholecystectomy, COLO: colon surgery, CSEC: caesarean section, HPRO: hip prosthesis surgery, KPRO: knee prosthesis surgery, LAM: laminectomy
Source: Country reports from Austria, Belgium, Estonia, Finland, France, Italy, Germany, Hungary, Lithuania, Malta, the Netherlands, Norway, Portugal and Slovakia.
See Table 1 for reporting countries and hospitals and reported surgical procedures in EU/EEA countries 2021–2022.

Including only the types of surgical procedures that were consistently reported by participating countries (data reported for all five years), the percentage of SSIs remained mostly stable or decreased during the period, apart from CABG procedures (Figure 4). The incidence density of in-hospital SSIs after CABG, KPRO and HPRO procedures was higher in 2021–2022 than in the preceding years.

Figure 4. Trends of (A) percentage of SSIs and (B) incidence density of in-hospital SSIs by year and type of surgical procedure, EU/EEA, 2018–2022



CABG: coronary artery bypass graft, CHOL: cholecystectomy, COLO: colon surgery, CSEC: caesarean section, HPRO: hip prosthesis surgery, KPRO: knee prosthesis surgery, LAM: laminectomy
Data included only for countries reporting data on types of surgical procedure for all five years continuously: Austria, Finland, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal.

Data on microorganisms were reported for 7 358 microorganisms in 5 084 SSIs from nine countries. In these countries, 46% of superficial, 76% of both deep and organ/space SSIs had a positive microbiological finding, varying by type of procedure (Table 4).

Table 4. Percentage of SSIs with a positive microbiological finding by type of SSI and type of surgical procedure, pooled data from nine EU/EEA countries, 2021–2022

Type of surgical procedure	Percentage of SSIs with a positive microbiological finding		
	Superficial SSIs	Deep SSIs	Organ/space SSIs
CABG	65.4	76.3	78.5
Laparoscopic CHOL	28.4	59.8	61.8
Open CHOL	46.4	73.1	58.1
Laparoscopic COLO	53.7	53.8	70.2
Open COLO	54.7	70.0	75.5
CSEC	35.4	49.0	45.1
HPRO	54.8	86.2	82.8
KPRO	47.8	91.3	75.4
LAM	60.5	63.3	66.7
Total	**46.3**	**76.0**	**76.0**

CABG: coronary artery bypass graft, CHOL: cholecystectomy, COLO: colon surgery, CSEC: caesarean section, HPRO: hip prosthesis surgery, KPRO: knee prosthesis surgery, LAM: laminectomy
See Table 1 for reporting hospitals and reported surgical procedures in EU/EEA countries.
Source: Country reports from Austria, Belgium, Estonia, Germany, Hungary, Lithuania, the Netherlands, Portugal and Slovakia.

Overall, *Staphylococcus aureus* (17.1%), *Enterococcus* species (15.1%), coagulase-negative staphylococci (15.0%) and *Escherichia coli* (14.0%) were the most frequently reported microorganisms (Table 5). The distribution of microorganisms varied by type of surgical procedure. For laparoscopic and open CHOL as well COLO, Enterobacterales were reported at least as frequently, or more often, than gram-positive cocci. For other types of surgical procedure, gram-positive cocci remained the most frequently reported microorganisms.

Table 5. Percentages of microorganisms identified in SSIs by type of surgical procedure, pooled data from nine EU/EEA countries, 2021–2022 (n=7 358)

Microorganisms	CABG (n=329)	Laparoscopic CHOL (n=527)	Open CHOL (n=94)	Laparoscopic COLO (n=942)	Open COLO (n=1 577)	CSEC (n=432)	HPRO (n=2 545)	KPRO (n=854)	LAM (n=58)	Total (n=7 358)
Gram-positive cocci	62	38.7	33.0	36.5	34.2	44.7	69.4	75.8	70.7	54.0
Staphylococcus aureus	20.7	7.2	6.4	3.2	2.5	17.6	25.2	38.9	46.6	17.1
Coagulase-negative staphylococci	33.1	3.4	5.3	2.4	2.7	9.7	26.7	20	20.7	15.0
Enterococcus species	5.8	21.1	19.1	27.4	26.5	10.2	7.7	5.0	3.4	15.1
Streptococcus species	0.3	3.6	1.1	2.2	1.0	3.0	3.9	6.3	0	3.0
Other gram-positive cocci	2.1	3.4	1.1	1.3	1.6	4.2	5.9	5.5	0	3.8
Gram-positive bacilli	2.1	0.8	1.1	0.5	0.5	1.2	3.3	4.2	5.2	2.1
Gram-negative bacilli, Enterobacterales	22.5	39.3	53.2	48.9	47.3	35.4	17.7	12.1	17.2	30.6
Escherichia coli	2.1	18.8	26.6	28	26.8	17.1	4.6	2.6	5.2	14.0
Citrobacter species	0.6	3.2	3.2	2.4	2.0	0.9	0.6	0.7	0	1.4
Enterobacter species	5.8	4.6	11.7	3.0	4.6	3.2	3.7	2.8	5.2	3.9
Klebsiella species	4.6	8.5	9.6	7.6	6.6	5.1	2.9	1.5	5.2	4.9
Proteus species	4.9	1.9	1.1	3.9	3.7	7.2	3.6	2.2	1.7	3.6
Serratia species	3.3	0.9	1.1	1.5	0.6	0.9	1.3	1.3	0	1.2
Other Enterobacteriaceae	1.2	1.3	0	2.4	3.0	0.9	1.1	0.9	0	1.6
Gram-negative non-fermentative bacilli	4.0	2.8	0	5.1	6.8	4.9	3.6	3.6	0	4.5
Acinetobacter species	0.3	0	0	0.1	0.1	0.2	0.4	0.4	0	0.2
Haemophilus species	0	0.4	0	0.1	0.1	0.2	0	0	0	0.1
Pseudomonas aeruginosa	2.7	1.3	0	4.4	6.4	3.0	2.9	2.5	0	3.6
Pseudomonadaceae family, other	0.3	0.2	0	0.2	0.1	0.2	0.1	0.4	0	0.2
Stenotrophomonas maltophilia	0.3	0	0	0.1	0	0	0	0.1	0	0.1
Other gram-negative non-fermentative bacilli	0.3	0.9	0	0.2	0.3	1.2	0.1	0.4	0	0.3
Anaerobes	6.7	12.1	8.5	4.1	5.3	12	4.9	3.3	5.2	5.8
Bacteroides species	0	3.4	3.2	3.4	3.7	1.9	0	0	0	1.6
Other anaerobes	6.7	8.7	5.3	0.7	1.6	10.2	4.8	3.3	5.2	4.1
Other bacteria	0.3	4.9	1.1	1.8	1.5	1.6	0.6	0.8	1.7	1.4
Fungi, parasites	2.4	1.3	3.2	3.0	4.2	0.2	0.5	0.2	0	1.7
Candida species	2.1	1.3	3.2	3.0	4.2	0.2	0.4	0.2	0	1.7
Other fungi or parasites	0.3	0	0	0	0.1	0	0	0	0	0

CABG: coronary artery bypass graft, CHOL: cholecystectomy, COLO: colon surgery, CSEC: caesarean section, HPRO: hip prosthesis surgery, KPRO: knee prosthesis surgery, LAM: laminectomy
See Table 1 for reporting hospitals and reported surgical procedures in EU/EEA countries.
Source: Country reports from Austria, Belgium, Estonia, Germany, Hungary, Lithuania, the Netherlands, Portugal and Slovakia.

Discussion

The results presented in this report constitute an updated source for information on the incidence of SSIs in the EU/EEA. The number of reporting EU/EEA countries and the number of reported procedures increased from 2021 to 2022 indicating possibly a return to normal for participation in HAI surveillance following the COVID-19 pandemic. However, the observed intercountry variation and the fact that not all EU/EEA countries participate limit the extent to which the results can be considered as representative of the overall EU/EEA situation.

Due to the decrease in reporting that was especially evident in 2020–2021, an assessment of trends for 2018–2022 was not included in this report. Nevertheless, a visual examination of the data suggests that there were year-to-year differences in 2018–2022 in both the percentage of SSIs and the incidence density of in-hospital SSIs between types of surgical procedure. These two metrics reflect slightly different aspects of SSI epidemiology, which were particularly relevant during the first two years of the COVID-19 pandemic (2020–2021), when hospitalisation, access to surgical procedures, and discharge practices may have considerably differed from previous years, or in 2022 when the COVID-19 pandemic was mainly driven by the SARS-CoV-2 Omicron variant. The differences in the hospital activity, reporting practices and availability of data still complicate year-to-year comparisons.

In addition, national representativeness, surgical practices and surveillance methods vary considerably from country to country, which makes it difficult to compare SSI rates across countries. The length of post-operative hospital stay as well as differences in post-discharge surveillance methods affect the rate of superficial SSIs that are mostly diagnosed in-hospital and can often be missed, and therefore not reported, after hospital discharge. In addition, the fact that a large proportion of deep and or organ/space SSIs have a positive microbiological finding, when reported, indicates that superficial SSIs are also possibly diagnosed and reported with varying sensitivity from different participating networks. For this reason, intercountry comparisons, when performed, should focus on the incidence density of in-hospital SSIs; even if comparisons of incidence densities still have caveats because countries have different post-operative discharge policies, they are not affected by the varying post-discharge surveillance methods.

Similarly, as reported previously in SSI surveillance [10, 11], the percentage of SSIs and incidence density of in-hospital SSIs varies by type of surgical procedure. This is because of the different population groups that undergo these procedures, of the different proportions of clean and contaminated operations for each type of surgical procedure, and whether the procedure was open or laparoscopic. Therefore, comparisons of SSI rates across countries and between years should only be made for a specific type of surgical procedure. For more detailed analyses, it also remains important to consider the specific ICD-9 codes of the procedures, when available, shown in the Annex tables A11.1-A11.9.

Public health implications

Surveillance is a key component in the prevention of healthcare-associated infections and an important tool for monitoring the effectiveness of prevention and control measures [12]. The increasing trend in reported SSIs after laparoscopic CHOL operations, noted in the dataset up to 2017, did not seem to continue in 2018–2022 [10]. Further trend analysis may be possible when SSI surveillance data become available for 2023 and 2024, allowing to assess SSI trends following the COVID-19 pandemic.

To further strengthen the surveillance of SSIs in the EU/EEA, ECDC started collecting data on structure and process indicators of SSI prevention with a 2017 protocol update that was implemented in several national surveillance systems in 2018. However, as these data were rarely reported, especially during the COVID-19 pandemic in 2021–2022, they are not included in this report. In the future, a wider periodic data collection might provide more efficient options for the inclusion of such indicators of SSI prevention measures.

Finally, SSI surveillance data provide important insights to guide the development of novel methods for surveillance of SSIs. A minor update of the SSI surveillance protocol is taking place in 2025, which includes the introduction of an indicator for SSIs with positive microbiological findings, which may allow a more automated surveillance, especially for deep and organ/space SSIs.

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Annex

Table A1. Percentage of unknown or missing values by TESSy variable and year, patient-based data, 2021–2022

Variable	Name of TESSy variable	Unknown or missing values (%)*
Gender	Gender	<0.1
In-hospital outcome	OutcomeHospital	79.4
Date of operation	DateOfOperation	0
Date of hospital admission	DateOfHospitalAdmission	60.0
Date of hospital discharge	DateOfHospitalDischarge	7.9
Operation code	OPCode	0
Wound class	WoundClass	1.1
Duration of operation	OperationDur	0.6
ASA score	ASAClassification	2.4
Urgent operation	UrgentOperation	60.2
Prophylaxis	Prophylaxis	78.4
Type of SSI	SSIType	0.4

Source: Country reports from Austria, Belgium, Estonia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
** n = 662 309 surgical procedures and n = 10 193 SSIs*

Table A2.1. Coronary artery bypass graft (CABG): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1000 post-operative patient-days [95% CI] (5)
Austria	803	30	3.7 [2.5- 5.3]	803	11 229	13 (43.3)	1.2 [0.6- 2.0]
Estonia	119	1	0.8 [0.0- 4.7]	119	1 416	0 (0)	0.0 [0.0- 2.6]
France	459	26	5.7 [3.7- 8.3]	459	5 606	12 (46.2)	2.1 [1.1- 3.7]
Germany	14 402	277	1.9 [1.7- 2.2]	14 330	173 853	151 (54.5)	0.9 [0.7- 1.0]
Hungary	69	0	0.0 [0.0- 5.3]	69	705	0	0.0 [0.0- 5.2]
Lithuania	879	59	6.7 [5.1- 8.7]	879	13 952	54 (91.5)	3.9 [2.9- 5.1]
Norway	2 024	73	3.6 [2.8- 4.5]	2 024	13 684	10 (13.7)	0.7 [0.4- 1.3]
Portugal	58	5	8.6 [2.8-20.1]	58	531	4 (80)	7.5 [2.1-19.3]
EU/EEA	**18 813**	**471**	**2.5 [2.3- 2.7]**	**18 741**	**220 976**	**244 (51.8)**	**1.1 [1.0- 1.3]**

Source: Country reports from: Austria, Estonia, France, Germany, Hungary, Lithuania, Norway and Portugal
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.
Incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A2.2. Coronary artery bypass graft (CABG): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	257	5	1.5	0	0	0	0	0	2 670	0	0	0	0	0	0	0
1	13 270	304	2.8	0	0.8	1.9	3.4	6.5	151 862	160	1.2	0	0	0.6	1.4	3.3
2 and 3	4 490	130	3.7	0	0	1.6	4.4	8.3	60 361	78	1.2	0	0	0	1.9	3.2
Unknown	796	32	4.2	0	0	1.9	6.3	12.7	6 083	6	1.7	0	0	0	0.7	3.5
Overall	**18 813**	**471**	**2.9**	**0.3**	**1.2**	**2**	**3.7**	**6.4**	**220 976**	**244**	**1.2**	**0**	**0.3**	**0.8**	**1.4**	**2.8**

Source: Country reports from: Austria, Estonia, France, Germany, Hungary, Lithuania, Norway and Portugal
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A3.1. Laparoscopic cholecystectomy (CHOL): percentage of SSIs and incidence density of in-hospital SSIs) by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	3 941	18	0.5 [0.3-0.7]	3 941	14 549	5 (27.8)	0.3 [0.1-0.8]
Germany	38 117	366	1.0 [0.9-1.1]	36 284	166 736	122 (33.3)	0.7 [0.6-0.9]
Hungary	1 060	10	0.9 [0.5-1.7]	1 060	3 875	2 (20)	0.5 [0.1-1.9]
Lithuania	1 006	1	0.1 [0.0-0.6]	1 006	3 205	1 (100)	0.3 [0.0-1.7]
Netherlands	11 780	366	3.1 [2.8-3.4]	11 780	21 808	27 (7.4)	1.2 [0.8-1.8]
Norway	12 543	348	2.8 [2.5-3.1]	12 530	26 244	42 (12.1)	1.6 [1.2-2.2]
Portugal	3 192	69	2.2 [1.7-2.7]	3 192	13 080	39 (56.5)	3.0 [2.1-4.1]
Slovakia	219	9	4.1 [1.9-7.8]	218	676	3 (33.3)	4.4 [0.9-13.0]
EU/EEA	**71 858**	**1 187**	**1.7 [1.6-1.7]**	**70 011**	**250 173**	**241 (20.3)**	**1.0 [0.8-1.1]**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.
Incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A3.2. Laparoscopic cholecystectomy (CHOL): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	36 130	486	1.1	0	0	0	1.7	3	98 096	41	0.4	0	0	0	0	0
1	23 479	396	1.3	0	0	0	2.1	4.3	84 641	87	0.9	0	0	0	0	3.5
2 and 3	11 052	255	2.2	0	0	0	2.9	6.7	63 963	104	1.7	0	0	0	0	5
Unknown	1 197	50	2.4	0	0	0	0	4.6	3 473	9	0.4	0	0	0	0	0
Overall	**71 858**	**1 187**	**1.4**	**0**	**0**	**0.8**	**2.1**	**3.5**	**250 173**	**241**	**0.9**	**0**	**0**	**0**	**1.4**	**2.8**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, the Netherlands, Norway, Portugal and Slovakia.

(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A4.1. Open cholecystectomy (CHOL): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	550	8	1.5 [0.6- 2.9]	522	5 210	6 (75)	1.2 [0.4- 2.5]
Germany	1 978	98	5.0 [4.0- 6.0]	1 856	19 158	64 (65.3)	3.3 [2.6- 4.3]
Hungary	284	4	1.4 [0.4- 3.6]	284	1 408	4 (100)	2.8 [0.8- 7.3]
Lithuania	96	2	2.1 [0.3- 7.5]	96	455	1 (50)	2.2 [0.1-12.2]
Norway	315	23	7.3 [4.6-11.0]	315	2 615	11 (47.8)	4.2 [2.1- 7.5]
Slovakia	7	1	14.3 [0.4-79.6]	7	115	1 (100)	8.7 [0.2-48.4]
EU/EEA	**3 230**	**136**	**4.2 [3.5- 5.0]**	**3 080**	**29 306**	**87 (64.0)**	**3.0 [2.4- 3.7]**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, Norway and Slovakia.
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A4.2. Open cholecystectomy (CHOL): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	779	16	1.9	0	0	0	0	5.8	3 916	6	2.1	0	0	0	0	0
1	963	33	5.4	0	0	0	7.4	13.8	7 707	21	2.6	0	0	0	4.8	9.4
2 and 3	1 174	80	5.3	0	0	0	8.1	17.3	14 716	58	3.8	0	0	0	6.9	10.5
Unknown	314	7	2.3	0	0	0	3.4	5.5	2 622	2	1.3	0	0	0	2	3.2
Overall	**3 230**	**136**	**5.1**	**0**	**0**	**4**	**8.1**	**14.2**	**28 961**	**87**	**3.7**	**0**	**0**	**2.3**	**6.3**	**8.9**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, Norway and Slovakia.
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A5.1. Laparoscopic colon surgery (COLO): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	12	0	0.0 [0.0-30.7]	12	95	0	0.0 [0.0-38.8]
Germany	9 360	452	4.8 [4.4- 5.3]	8 873	90 952	316 (69.9)	3.5 [3.1- 3.9]
Hungary	46	2	4.3 [0.5-15.7]	46	384	1 (50)	2.6 [0.1-14.5]
Lithuania	235	22	9.4 [5.9-14.2]	235	2 016	21 (95.5)	10.4 [6.4-15.9]
Netherlands	3 865	272	7.0 [6.2- 7.9]	3 865	26 184	139 (51.1)	5.3 [4.5- 6.3]
Norway	3 929	222	5.7 [4.9- 6.4]	3 928	26 021	112 (50.5)	4.3 [3.5- 5.2]
Portugal	1 706	231	13.5 [11.9-15.4]	1 706	20 724	195 (84.4)	9.4 [8.1-10.8]
EU/EEA	**19 153**	**1 201**	**6.3 [5.9- 6.6]**	**18 665**	**166 376**	**784 (65.3)**	**4.7 [4.4- 5.1]**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A5.2. Laparoscopic colon surgery (COLO): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	5 918	286	3.7	0	0	0	6.9	12.5	41 713	170	2.9	0	0	0	4.6	10
1	8 710	520	5.3	0	0	4.2	7.9	12.5	75 424	325	3.5	0	0	2	6.1	9.8
2 and 3	4 087	351	8.6	0	0	4.2	12.5	24.7	44 299	259	5.2	0	0	0	8.5	14.3
Unknown	438	44	7.7	0	0	2.2	11.7	23	4 940	30	4	0	0	0	7	11.7
Overall	**19 153**	**1 201**	**5.6**	**0**	**2**	**4.8**	**8.3**	**11.6**	**166 376**	**784**	**4**	**0**	**0**	**3.4**	**6.2**	**9.3**

Source: Country reports from: Austria, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A6.1. Open colon surgery (COLO): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	68	2	2.9 [0.4-10.6]	66	689	2 (100)	2.9 [0.4-10.5]
Estonia	1			1			
Germany	12 688	1 091	8.6 [8.1- 9.1]	11 986	181 928	840 (77)	4.6 [4.3- 4.9]
Hungary	321	32	10.0 [6.8-14.1]	321	3 088	20 (62.5)	6.5 [4.0-10.0]
Lithuania	259	61	23.6 [18.0-30.3]	259	3 185	61 (100)	19.2 [14.6-24.6]
Netherlands	1 260	210	16.7 [14.5-19.1]	1 260	14 409	151 (71.9)	10.5 [8.9-12.3]
Norway	2 312	220	9.5 [8.3-10.9]	2 308	23 808	119 (54.1)	5.0 [4.1- 6.0]
EU/EEA	**16 909**	**1 616**	**9.6 [9.1-10.0]**	**16 201**	**227 107**	**1 193 (73.8)**	**5.3 [5.0- 5.6]**

Source: Country reports from: Austria, Estonia, Germany, Hungary, Lithuania, the Netherlands and Norway
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.
**One country provided only one COLO procedure with no SSIs and is not included in the tables A6.1-A6.2.*

Table A6.2. Open colon surgery (COLO): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	2 946	196	7.1	0	0	0	9.1	20	31 390	131	3.9	0	0	0	6.3	13.3
1	7 187	676	9.1	0	1.2	7.4	13.8	20.7	92 123	492	5.2	0	0	4.1	8	13
2 and 3	6 456	718	11.7	0	2.9	9.6	17.5	26.4	99 990	558	6.1	0	0	4.9	9.3	15.8
Unknown	320	26	8	0	0	0	11.9	18.1	3 612	12	4.8	0	0	0	4.2	14.2
Overall	**16 909**	**1 616**	**9.6**	**2.2**	**4.6**	**8.7**	**12.8**	**18.5**	**227 115**	**1 193**	**5.5**	**0**	**2.6**	**4.7**	**7.9**	**10.9**

Source: Country reports from: Austria, Estonia, Germany, Hungary, Lithuania , the Netherlands and Norway
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A7.1. Caesarean section (CSEC): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1000 post-operative patient-days [95% CI] (5)
Austria	6 411	20	0.3 [0.2-0.5]	6 366	33 662	6 (30)	0.2 [0.1-0.4]
Estonia	586	21	3.6 [2.2-5.5]	586	2 639	2 (9.5)	0.8 [0.1-2.7]
France	4 237	51	1.2 [0.9-1.6]	4 237	24 673	18 (35.3)	0.7 [0.4-1.2]
Germany	58 209	379	0.7 [0.6-0.7]	54 122	243 977	53 (14)	0.2 [0.2-0.3]
Hungary	2 924	33	1.1 [0.8-1.6]	2 924	14 396	2 (6.1)	0.1 [0.0-0.5]
Lithuania	1 174	11	0.9 [0.5-1.7]	1 174	5 625	4 (36.4)	0.7 [0.2-1.8]
Netherlands	9 675	130	1.3 [1.1-1.6]	9 675	36 758	6 (4.6)	0.2 [0.1-0.4]
Norway	14 572	498	3.4 [3.1-3.7]	14 569	66 848	79 (15.9)	1.2 [0.9-1.5]
Portugal	7 149	175	2.4 [2.1-2.8]	7 149	28 574	16 (9.1)	0.6 [0.3-0.9]
EU/EEA	**104 937**	**1 318**	**1.3 [1.2-1.3]**	**100 802**	**457 152**	**186 (14.1)**	**0.4 [0.4-0.5]**

Source: Country reports from: Austria, Estonia, France, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal (1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A7.2. Caesarean section (CSEC): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	Number of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	65 285	672	2.2	0	0	0.4	1.4	3.1	278 644	81	0.5	0	0	0	0	0.8
1	32 104	455	2.3	0	0	0	1.9	4.3	140 228	75	0.8	0	0	0	0	1.8
2 and 3	2 957	101	3.4	0	0	0	0	11.7	13 856	15	0.6	0	0	0	0	0
Unknown	4 591	90	1.8	0	0	0	0.8	7.4	24 424	15	0.1	0	0	0	0	0
Overall	104 937	1 318	1.2	0	0	0.7	1.6	3.2	457 152	186	0.4	0	0	0	0.4	1.4

Source: Country reports from: Austria, Estonia, France, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal (1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A8.1. Hip prosthesis (HPRO): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	12 753	116	0.9 [0.8-1.1]	12 719	123 825	47 (40.5)	0.4 [0.3-0.5]
Belgium	1 586	20	1.3 [0.8-1.9]	1 581	9 184	7 (35)	0.8 [0.3-1.6]
Finland	15 137	213	1.4 [1.2-1.6]				
France	4 957	84	1.7 [1.4-2.1]	4 957	35 704	20 (23.8)	0.6 [0.3-0.9]
Germany	139 633	1 636	1.2 [1.1-1.2]	132 356	1 254 701	492 (30.1)	0.4 [0.4-0.4]
Hungary	76	0	0.0 [0.0-4.9]	76	597	0	0.0 [0.0-6.2]
Lithuania	1 521	4	0.3 [0.1-0.7]	1 521	11 514	0 (0)	0.0 [0.0-0.3]
Netherlands	48 901	556	1.1 [1.0-1.2]	48 901	131 437	12 (2.2)	0.1 [0.0-0.2]
Norway	26 645	412	1.5 [1.4-1.7]	26 627	106 344	30 (7.3)	0.3 [0.2-0.4]
Portugal	3 575	83	2.3 [1.8-2.9]	3 575	28 078	23 (27.7)	0.8 [0.5-1.2]
EU/EEA	**254 784**	**3 124**	**1.2 [1.2-1.3]**	**232 313**	**1 701 384**	**631 (20.2)**	**0.4 [0.3-0.4]**

Source: Country reports from: Austria, Belgium, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal
(1) Only superficial SSIs diagnosed within 30 days or deep or organ/space SSIs diagnosed within 90 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A8.2. Hip prosthesis (HPRO): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	Number of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	118 020	877	1.3	0	0	0	1.1	2.6	649 967	91	0.2	0	0	0	0	0
1	101 100	1 456	2.1	0	0	0.9	2.3	4	757 973	304	0.4	0	0	0	0	1.4
2 and 3	28 471	700	2.8	0	0	0	3.6	7.7	262 308	224	0.8	0	0	0	0	2.7
Unknown	7 193	91	1	0	0	0	1	3.8	31 136	12	0.2	0	0	0	0	0
Overall	**254 784**	**3 124**	**1.4**	**0**	**0.3**	**1**	**1.9**	**3.4**	**1 701 384**	**631**	**0.4**	**0**	**0**	**0**	**0.6**	**1.2**

Source: Country reports from: Austria, Belgium, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Norway and Portugal
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A9.1. Knee prosthesis (KPRO): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
Austria	8 831	36	0.4 [0.3-0.6]	8 831	71 894	5 (13.9)	0.1 [0.0-0.2]
Belgium	1 007	12	1.2 [0.6-2.1]	1 005	5 502	0 (0)	0.0 [0.0-0.7]
Estonia	638	11	1.7 [0.9-3.1]	638	3 198	1 (9.1)	0.3 [0.0-1.7]
Finland	15 331	158	1.0 [0.9-1.2]				
France	3 024	33	1.1 [0.8-1.5]	3 024	16 415	2 (6.1)	0.1 [0.0-0.4]
Germany	81 491	379	0.5 [0.4-0.5]	74 430	611 222	67 (17.7)	0.1 [0.1-0.1]
Hungary	126	0	0.0 [0.0-2.9]	126	847	0	0.0 [0.0-4.4]
Lithuania	1 101	5	0.5 [0.1-1.1]	1 101	8 047	0 (0)	0.0 [0.0-0.5]
Netherlands	43 172	354	0.8 [0.7-0.9]	43 172	116 224	6 (1.7)	0.1 [0.0-0.1]
Portugal	2 629	53	2.0 [1.5-2.6]	2 629	16 699	13 (24.5)	0.8 [0.4-1.3]
EU/EEA	**157 350**	**1 041**	**0.7 [0.6-0.7]**	**134 956**	**850 048**	**94 (9)**	**0.1 [0.1-0.1]**

Source: Country reports from: Austria, Belgium, Estonia, Finland, France, Germany, Hungary , Lithuania, the Netherlands and Portugal
(1) Only superficial SSIs diagnosed within 30 days or deep or organ/space SSIs diagnosed within 90 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A9.2. Knee prosthesis (KPRO): mean and percentile distributions of percentage of SSIs and incidence density of in-hospital SSIs in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	77 886	378	0.8	0	0	0	0.3	1.5	369 004	29	0.1	0	0	0	0	0
1	60 417	458	1	0	0	0	1	2.4	359 728	36	0.1	0	0	0	0	0
2 and 3	14 642	173	1.4	0	0	0	0	4.2	107 967	27	0.3	0	0	0	0	0
Unknown	4 405	32	1.3	0	0	0	0	1.1	13 349	2	0.1	0	0	0	0	0
Overall	**157 350**	**1 041**	**0.7**	**0**	**0**	**0.2**	**1**	**1.9**	**850 048**	**94**	**0.1**	**0**	**0**	**0**	**0**	**0.4**

Source: Country reports from: Austria, Belgium, Estonia, Finland, France, Germany, Hungary , Lithuania, the Netherlands and Portugal

(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A10.1. Laminectomy (LAM): percentage of SSIs and incidence density of in-hospital SSIs by country, EU/EEA, 2021–2022

Country	No. of operations	No. of SSIs (1)	Percentage of SSIs per 100 operations [95% CI] (2)	No. of operations with a known discharge date	No. of post-operative patient-days (3)	No. of in-hospital SSIs (% of all SSIs) (4)	Incidence density of SSIs per 1 000 post-operative patient-days [95% CI] (5)
France	728	13	1.8 [1.0- 3.1]	728	4 717	4 (30.8)	0.8 [0.2- 2.2]
Germany	10 965	48	0.4 [0.3- 0.6]	10 733	55 019	13 (27.1)	0.2 [0.1- 0.4]
Hungary	226	7	3.1 [1.2- 6.4]	226	1 216	2 (28.6)	1.6 [0.2- 5.9]
Lithuania	46	1	2.2 [0.1-12.1]	46	471	1 (100)	2.1 [0.1-11.8]
Netherlands	2 497	23	0.9 [0.6- 1.4]	2 497	6 149	0 (0)	0.0 [0.0- 0.6]
Portugal	813	7	0.9 [0.3- 1.8]	813	2 765	2 (28.6)	0.7 [0.1- 2.6]
EU/EEA	**15 275**	**99**	**0.6 [0.5- 0.8]**	**15 043**	**70 337**	**22 (22.2)**	**0.3 [0.2- 0.5]**

Source: Country reports from: France, Germany, Hungary, Lithuania, the Netherlands and Portugal
(1) Only SSIs diagnosed within 30 days after the operation are included; (2) percentage of SSIs = (number of SSIs × 100)/number of operations; (3) post-operative patient-days = date of discharge – date of operation +1; (4) SSIs reported after discharge from hospital or with an unknown discharge date are excluded; (6) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days.

Table A10.2. Laminectomy (LAM): mean and percentile laminectomy (LAM) operations in hospitals stratified by NHSN risk index, EU/EEA, 2021–2022

NHSN risk index	No. of operations (1)	No. of SSIs	Mean and percentile distribution of percentages in hospitals (2)						No. of post-operative patient-days (3)	No. of in-hospital SSIs	Mean and percentile distribution of incidence densities in hospitals (4)					
			Mean	P10	P25	P50	P75	P90			Mean	P10	P25	P50	P75	P90
0	9 108	38	1.4	0	0	0	0	1.6	35 331	3	0.1	0	0	0	0	0
1	4 705	38	1.6	0	0	0	0.6	3.3	24 872	11	0.4	0	0	0	0	0
2 and 3	971	17	1.9	0	0	0	0	3.7	7 058	6	0.5	0	0	0	0	0
Unknown	491	6	3.3	0	0	0	2.9	8.7	3 076	2	1.6	0	0	0	0	4.3
Overall	**15 275**	**99**	**0.8**	**0**	**0**	**0**	**1.1**	**2.2**	**70 337**	**22**	**0.4**	**0**	**0**	**0**	**0**	**1.4**

Source: Country reports from: France, Germany, Hungary, Lithuania, the Netherlands and Portugal
(1) Operations from hospitals with less than 20 operations are excluded; (2) percentage of SSIs = (number of SSIs × 100)/number of operations, mean and percentiles in hospitals; (3) patient-days from hospitals with less than 20 operations with a known date of discharge are excluded; (4) incidence density of SSIs = (number of in-hospital SSIs × 1000)/number of post-operative patient-days, mean and percentiles in hospitals.

Table A11.1. Coronary artery bypass graft (CABG): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Lithuania	Portugal
36.1	3	0
36.1	45	0
36.11	48	2
36.12	37	1
36.13	308	0
36.14	**436**	**0**
36.15	2	21
36.16	0	33
36.19	0	1

Table A11.2. Laparoscopic cholecystectomy (CHOL): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Lithuania	Portugal	Slovakia
51	0	1	151	0
51.03	0	0	1	0
51.04	0	0	21	0
51.13	0	0	23	0
51.2	0	0	7	0
51.21	0	1	83	0
51.22	1	13	74	0
51.23	**2217**	**991**	**2594**	**219**
51.24	5	0	238	0

Table A11.3. Open cholecystectomy (CHOL): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Lithuania	Slovakia
51	0	1	0
51.2	5	0	0
51.21	1	0	0
51.22	**92**	**7**	**7**
51.23	0	88	0

Table A11.4. Laparoscopic colon surgery (COLO): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Lithuania	Portugal
17.3	1	6	0
17.31	0	0	9
17.32	0	0	2
17.33	3	0	239
17.34	0	0	2
17.35	0	0	43
17.36	1	0	137
17.39	0	0	54
45	0	0	1
45.02	0	0	5
45.03	0	0	61
45.15	0	0	19
45.26	0	0	58
45.31	0	0	3
45.33	0	0	28
45.41	0	0	19
45.5	0	0	4
45.51	0	0	9
45.52	0	0	15
45.61	0	0	2
45.62	0	0	22
45.63	0	0	13
45.7	1	0	3
45.71	0	0	53
45.72	0	0	39
45.73	**0**	**94**	**204**
45.74	1	4	79
45.75	0	5	75
45.76	1	31	155
45.79	0	0	19
45.8	0	2	3
45.81	0	0	8
45.82	0	0	21
45.83	0	0	6
45.9	0	0	1
45.9	0	0	2
45.91	0	0	40
45.92	0	0	3
45.93	0	0	14
45.94	0	0	27
45.95	0	0	1
46.03	0	0	27
46.04	0	0	23
46.1	0	8	29
46.1	0	5	1
46.11	0	0	19
46.13	0	0	6
46.2	0	0	3
46.21	0	0	2
46.39	0	0	15

ICD-9-CM code	Austria	Lithuania	Portugal
46.5	0	6	0
46.51	0	0	16
46.52	0	0	25
46.71	0	0	4
46.72	0	0	1
46.73	0	0	20
46.74	0	0	3
46.75	4	0	9
46.76	0	0	1
46.9	0	1	0
46.93	0	0	2
46.94	0	0	2
48.4	0	7	0
48.42	0	65	0
48.51	0	1	0

Table A11.5. Open colon surgery (COLO): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Lithuania
17.33	12	0
17.35	2	0
17.36	23	0
45.41	1	0
45.7	0	1
45.72	1	0
45.73	**12**	**73**
45.74	1	14
45.75	4	21
45.76	9	21
45.79	1	0
45.93	1	0
46	0	3
46.1	0	9
46.1	0	19
46.5	0	51
46.9	1	4
48.35	0	5
48.4	0	30
48.43	0	1
48.62	0	7

Table A11.6. Caesarean section (CSEC): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Estonia	Lithuania	Portugal
74	**4 076**	**586**	**1 023**	**3 699**
74.1	0	0	0	3 122
74.2	0	0	0	14
74.4	0	0	151	2
74.9	0	0	0	2
74.91	0	0	0	6
74.99	0	0	0	304

Table A11.7. Hip prosthesis (HPRO): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Belgium	Germany	Lithuania	Netherlands	Norway	Portugal
0.7	8	0	0	0	0	0	167
0.71	3	0	0	0	0	0	13
0.72	9	0	0	0	0	0	17
0.73	4	0	0	0	0	0	3
81.51	**2 721**	**198**	**106 595**	**101**	**48 901**	**19 034**	**2 911**
81.52	1 347	10	0	1 374	0	7 611	219
81.53	1 499	7	0	46	0	0	245

Table A11.8. Knee prosthesis (KPRO): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Austria	Belgium	Estonia	Lithuania	Netherlands	Portugal
0.8	1	0	22	0	0	207
0.81	0	0	1	0	0	1
0.82	0	0	3	0	0	2
0.83	0	0	6	0	0	0
0.84	1	0	12	0	0	0
81.54	**995**	**92**	**549**	**1 069**	**37 003**	**2 312**
81.55	1 472	0	9	32	0	107

Table A11.9. Laminectomy (LAM): Reported ICD-9-CM codes by country, EU/EEA, 2021–2022

ICD-9-CM code	Lithuania	Portugal
3	0	11
3.01	0	6
3.02	0	2
3.09	0	325
80.5	46	63
80.51	**0**	**392**
80.53	0	1
80.54	0	2
84.66	0	2
84.8	0	6
84.82	0	1
84.84	0	2