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SURVEILLANCE REPORT

Surveillance of surgical site infections in Europe

2010–2011

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This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Jolanta Griškevičienė.
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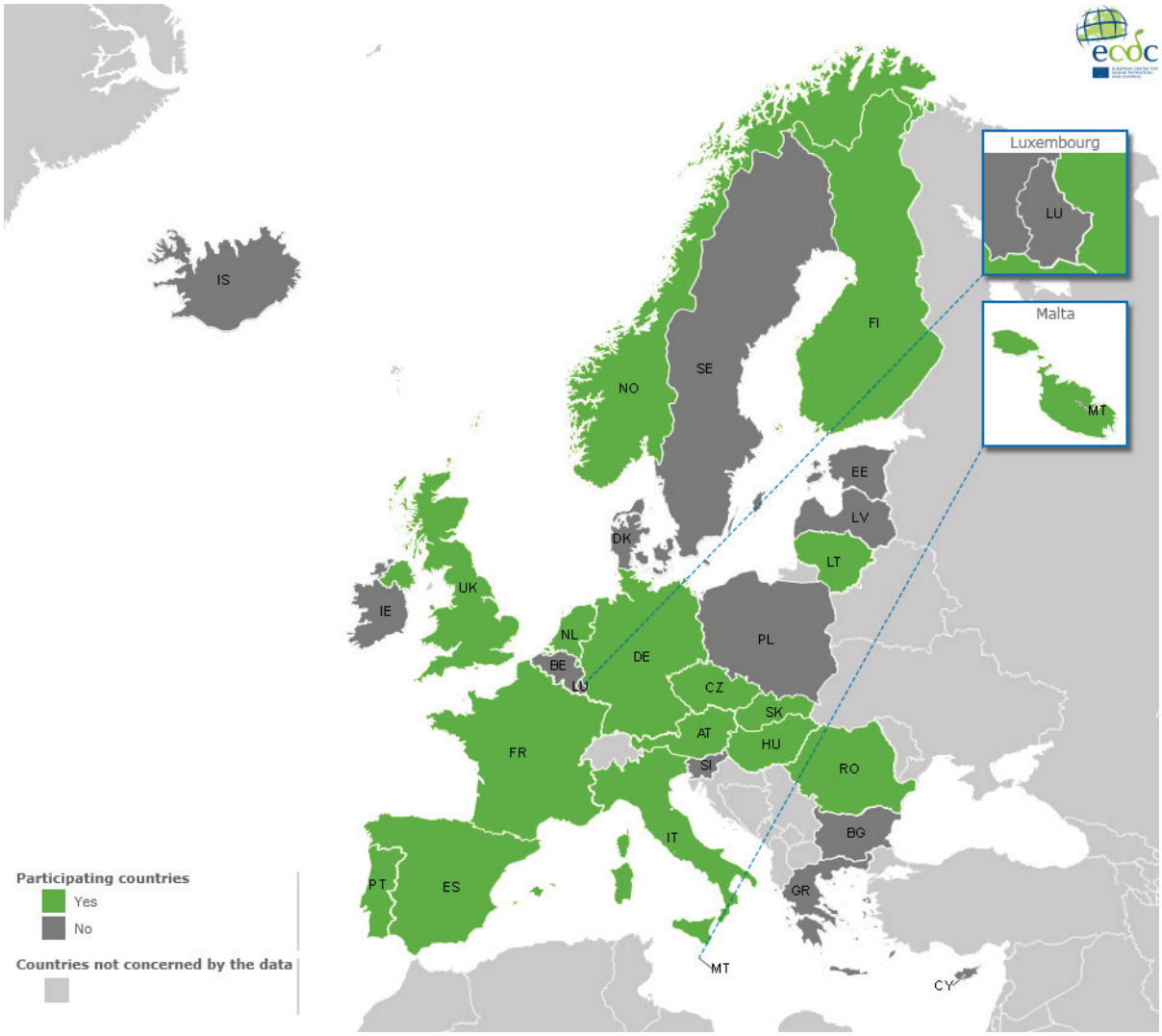
Abbreviations

ASA	American Society of Anaesthesiologists
CABG	Coronary artery bypass graft
CDC	US Centers for Disease Control and Prevention
CHOL	Cholecystectomy
COLO	Colon surgery
CSEC	Caesarean section
HAI	Healthcare-Associated Infections
HAI-Net	Healthcare-Associated Infections Surveillance Network
HELICS	Hospitals in Europe Link for Infection Control through Surveillance
HPRO	Hip prosthesis
IPSE	Improving Patient Safety in Europe
KPRO	Knee prosthesis
LAM	Laminectomy
MRSA	Meticillin-resistant *Staphylococcus aureus*
NHSN	National Healthcare Safety Network (formerly NNIS)
SSI	Surgical site infection
TESSy	The European Surveillance System

Country participation 2010–2011

Figure 1. Countries participating in surveillance of surgical site infections in Europe, HAI-Net, 2010-2011



Country codes of participating countries

AT	Austria
CZ	Czech Republic
DE	Germany
ES	Spain
FI	Finland
FR	France
HU	Hungary
IT	Italy
LT	Lithuania
MT	Malta
NL	Netherlands
NO	Norway
SK	Slovakia
PT	Portugal
RO	Romania
UK	United Kingdom

List of national institutions and organisations participating in surveillance of surgical site infections, HAI-Net 2010–2011

Country	Network acronym	Network name	Network website	Coordination
Austria	ANISS	Austrian Nosocomial Infection Surveillance System (ANISS)	http://www.meduniwien.ac.at/hp/krankenhaushygiene/forschung-lehre/aniss-surveillance/	Medical University of Vienna, Department of Infection Control and Hospital Epidemiology
Czech Republic	CZ-HAI-Net	Czech HAI Network	http://www.szu.cz/narodni-referencni-centrum-pro-infekce-spojene-se-zdravotni	National Institute of Public Health, National Reference Centre for HAI
Finland	SIRO	Finnish Hospital Infection Programme (SIRO)	http://www.thl.fi/fi_FI/web/infektiotaudit-fi/hoitoon_liittyvien_infektioiden_seuranta	National Institute for Health and Welfare (THL), Helsinki
France	RAISIN	French HAI Early Warning, Investigation and Surveillance Network (Raisin)	www.invs.sante.fr/raisin http://www.invs.sante.fr/iso-raisin	Institut de Veille Sanitaire (InVS), Saint Maurice
			http://www.cclin-france.fr/	West Interregional Infection Control Coordinating Centre (CClin Ouest)
Germany	KISS	German Nosocomial Infection Surveillance System (KISS)	http://www.nrz-hygiene.de/en/nrz/welcome/	National Reference Centre for Nosocomial Infection Surveillance, Charité Medical University, Berlin
Hungary	NNSR	National Nosocomial Surveillance System (NNSR)	www.oek.hu/oek.web	Department of Hospital Epidemiology and Hygiene, National Centre for Epidemiology, Budapest
Italy	SNICh		http://assr.regione.emilia-romagna.it/it/aree_attivita/rischio-infettivo/progetti/sostegno-attivita-ccm	Regional Health Authority of Emilia-Romagna, Bologna
	ISChIA		www.lpss.unict.it	Gruppo di Lavoro S.It.I GISIO
Lithuania			http://www.hi.lt	Institute of Hygiene, Vilnius
Malta				Mater Dei Hospital, Msida
Netherlands	PREZIES	Prevention of Nosocomial Infection through Surveillance (PREZIES)	www.prezies.nl	National Institute for Public Health and Environment (RIVM), Bilthoven
Norway	NOIS	Norwegian Surveillance system for Hospital-associated infections (NOIS)	www.fhi.no	Norwegian Institute of Public Health (FHI), Oslo
Portugal	PPCIRA	Directorate-General of Health (Direcção Geral da Saúde)	http://www.dgs.pt	Directorate-General of Health Lisbon
Romania		National Institute of Public Health	http://www.pub-health-iasi.ro/index.html	National Institute of Public Health, Bucharest

Country	Network acronym	Network name	Network website	Coordination
Slovakia	NNSS	National nosocomial Surveillance system (NNSS)	www.ruvztn.sk/nozokomialne nakazy	Regional Authority of Public Health in Trenčín, Trenčín
Spain			www.iscii.es	Institute of Health Carlos III, Madrid
UK-England	SSISS		http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/HCAI/	Public Health England , London
UK-Northern Ireland			http://www.publichealth.hscni.net/directorate-public-health/health-protection/healthcare-associated-infectionsantimicrobial-resistance	Public Health Agency (PHA), Belfast
UK-Scotland	SSHAIP	The Scottish Surveillance of Healthcare Associated Infection Programme (SSHAIP)	www.hps.scot.nhs.uk/haiic/sshaip/index.aspx	Health Protection Scotland, Glasgow
UK-Wales	WHAIP	Welsh Healthcare Associated Infection Programme (WHAIP)	www.wales.nhs.uk/sites3/home.cfm?orgid=379	National Public Health Service (NHS) Wales, Cardiff

Executive summary

Surgical site infections (SSI) are among the most common healthcare-associated infections (HAIs), and are associated with longer post-operative hospital stays, additional surgical procedures, treatment in an intensive care unit, and often higher mortality. All patients undergoing surgery are at risk of complications, including SSI. This report presents the results of SSI surveillance in Europe for 2010–2011, as well as the results of trend analysis for 2008–2011. Data for 2010 and 2011 were received from 20 networks in 16 European countries (15 EU Member States and one EEA country) and included 811 468 surgical operations: 796 495 operations reported using the patient-based protocol and 14 973 (<2%) operations using the unit-based protocol. The Czech Republic, Slovakia and Romania submitted HAI-Net SSI data (2011) for the first time, Malta expanded the surveillance by including new types of operation.

Coronary artery bypass graft

A total of 41 725 coronary artery bypass graft (CABG) operations and 1 467 (3.5%) SSI were reported within 30 days of the operation. Of these, 745 (51%) were superficial incisional SSI, 495 (34%) were deep incisional SSI, 222 (15%) were organ/space SSI and five (<1%) were of unknown type. Sixty-two per cent of SSI were detected during hospitalisation. The incidence density was 1.9 in-hospital SSI per 1 000 post-operative patient-days. The majority of reported microorganisms were Gram-positive cocci (61%) followed by Enterobacteriaceae (22%). The overall CABG trend analysis in networks contributing data for at least three years during 2008–2011 showed no significant trends.

Cholecystectomy

A total of 80 563 cholecystectomy (CHOL) operations and 1 149 (1.4%) SSI were reported within 30 days of the operation. Of these, 679 (59%) were superficial incisional SSI, 258 (22%) were deep incisional SSI, 201 (17%) were organ/space SSI and for 11 (1%) the type of SSI was unknown. A lower cumulative incidence (1.0%) of SSI was reported in laparoscopic CHOL operations compared to non-endoscopic CHOL operations (4.1%). Forty-eight per cent of SSI were detected during hospitalisation. The incidence density was 1.5 in-hospital SSI per 1 000 post-operative patient-days. The most frequently isolated microorganisms were Enterobacteriaceae (50%) followed by Gram-positive cocci (37%). The overall CHOL trend analysis in countries contributing data for all years 2008–2011 showed a significant decreasing trend for the incidence density of SSI, but no significant trend for the cumulative incidence of SSI.

Colon surgery

A total of 51 526 colon surgery (COLO) operations and 4 893 (9.5%) SSI were reported within 30 days of the operation. Of these, 2 466 (50%) were superficial incisional SSI, 1 446 (30%) were deep incisional SSI, 958 (20%) were organ/space SSI and 23 (<1%) were of unknown type. Eighty per cent of SSI were detected during hospitalisation. The incidence density was 6.2 in-hospital SSI per 1 000 post-operative patient-days. Enterobacteriaceae (47%) were the most frequently reported microorganisms followed by Gram-positive cocci (30%). The overall COLO trend analysis in countries contributing data for all years 2008–2011 showed a significant decrease for the incidence density of SSI, but no significant trend for the cumulative incidence of SSI.

Caesarean section

A total of 167 202 caesarean section (CSEC) operations and 4 894 (2.9%) SSI were reported within 30 days of the operation. Of these, 4 247 (87%) were superficial incisional SSI, 485 (10%) were deep incisional SSI, 143 (3%) were organ/space SSI and 19 (<1%) were of unknown type. Sixteen per cent of SSI were detected during hospitalisation. The incidence density was 0.8 in-hospital SSI per 1 000 post-operative patient-days. The most frequently isolated microorganisms were Gram-positive cocci (54%) followed by Enterobacteriaceae (29%). The overall CSEC trend analysis in countries contributing data for all years 2008–2011 showed a significant decrease of both the cumulative incidence of SSI and the incidence density of SSI.

Hip prosthesis

A total of 267 985 hip prosthesis (HPRO) operations and 2 788 (1.0%) SSI were reported within one year of the operation. Of these, 1 086 (39%) were superficial incisional SSI, 1 080 (39%) were deep incisional SSI, 602 (22%) were organ/space SSI and 20 (<1%) were of unknown type. Forty per cent of SSI were detected during hospitalisation. The incidence density was 0.5 in-hospital SSI per 1 000 post-operative patient-days. Gram-positive cocci (66%) were the most frequently reported microorganisms, followed by Enterobacteriaceae (18%). The overall HPRO trend analysis in countries contributing data for all years 2008–2011 showed a statistically significant decrease of both the cumulative incidence of SSI and the incidence density of SSI.

Knee prosthesis

A total of 187 786 knee prosthesis (KPRO) operations and 1 340 (0.7%) SSI were reported within one year of the operation. Of these, 621 (46%) were superficial incisional SSI, 429 (32%) were deep incisional SSI, 274 (20%) were organ/space SSI and 16 (1%) were of unknown type. Only 30% of SSI were detected during hospitalisation. The incidence density was 0.3 in-hospital SSI per 1 000 post-operative patient-days. The most frequently reported microorganisms were Gram-positive cocci (74%) followed by Enterobacteriaceae (12%). The overall KPRO trend analysis in countries contributing data for all four years (2008–2011) showed a statistically significant decrease of the cumulative incidence but an increase of the incidence density of SSI.

Laminectomy

A total of 14 681 laminectomy (LAM) operations and 122 (0.8%) SSI were reported within 30 days of the operation. Of these, 53 (43%) were superficial incisional SSI, 38 (31%) were deep incisional SSI, 27 (22%) were organ/space SSI and 4 (3%) were of unknown type. Forty-seven per cent of SSI were detected during hospitalisation. The incidence density was 0.7 in-hospital SSI per 1 000 post-operative patient-days. The most frequently reported microorganisms were Gram-positive cocci (57%) followed by Enterobacteriaceae (23%) and non-fermentative Gram-negative bacilli (14%). The overall LAM trend analysis in countries contributing data for all four years (2008–2011) showed significant decrease for the cumulative incidence of SSI.

In conclusion, the results of SSI surveillance presented in this report represent an essential contribution to our knowledge of SSI in the participating European countries for the period 2010–2011. The number of reported operations increased. Czech Republic, Romania and Slovakia reported data for the first time in 2011. Efforts are needed to extend the surveillance of SSI to other EU Member States. ECDC will continue to provide support for setting up national surveillance networks by making available a free software package to network coordination centres and hospitals, by organising training courses on HAI surveillance and by performing on-demand country visits for technical support on HAI surveillance.

Introduction

History

The European Council Recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare associated infections (2009/C 151/01) [1], recommends 'performing the surveillance of the incidence of targeted infection types' and 'using, where appropriate, 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 [2].'

The Hospitals in Europe Link for Infection Control through Surveillance (HELICS) network was created in 2000 in the context of Decision 2119/98/EC, as a network for the surveillance of healthcare-associated infections (HAIs) and funded by the European Commission's Directorate-General for Health and Consumers. From 2000 to 2002, HELICS standardised the European methodology for the surveillance of surgical site infections (SSI) and nosocomial infections in intensive care units. From 2003 onwards, the HELICS project collected data from national networks for the surveillance of HAIs. In 2005, HELICS surveillance became a part of the Improving Patient Safety in Europe (IPSE) network, which from 2005 to 2008 was the dedicated European surveillance network for the surveillance of HAIs. The scope of the IPSE network included the development of the existing national surveillance initiatives and other approaches for supporting infection control efforts in Europe. In July 2008, coordination of HAI surveillance in Europe was transferred to ECDC and the surveillance network became the Healthcare-Associated Infections Surveillance Network (HAI-Net) [3]. In 2009 and 2010, ECDC continued surveillance of SSI following the former IPSE/HELICS protocol and methods until this type of surveillance was fully integrated into The European Surveillance System (TESSy) in October 2010.

Objectives

The objectives of European surveillance of SSI are:

- to work towards comparable surveillance methods and analyse inter-country differences
- to draw up European reference tables for inter-hospital comparisons of risk-adjusted SSI rates
- to contribute to the extension of SSI surveillance in the European Union (EU)
- to follow up and report on long-term trends in SSI rates throughout the EU and in the Member States, as well as trends in the occurrence of microorganisms associated with SSI, including trends in antimicrobial resistance.

The aim of this report is to present the results of SSI surveillance in Europe for 2010–2011, as well as the results of analysis of trends for 2008–2011.

Data collection and technical notes

Data collection 2010–2011

Surveillance data of SSI in 2010 and 2011 (with partial follow-up for orthopaedic operations until 31 December 2012) were collected using TESSy, after the integration of the HAI surveillance dataset in October 2010. These data were collected by ECDC from Member States until 31 July 2013.

Methodology

Data on surveillance of SSI for 2010 and 2011 were collected in hospitals according to the new HAISSI protocol v1.02 [4]. This new protocol is based on the HELICS-SSI protocol and [5] provides standard case definitions, data collection procedures and reporting procedures for hospitals that participate in national/regional surveillance of SSI across Europe.

The HAISSI protocol includes seven types of operation: coronary artery bypass graft (CABG), cholecystectomy (CHOL), colon surgery (COLO), caesarean section (CSEC), hip prosthesis (HPRO), knee prosthesis (KPRO) and laminectomy (LAM). The case definitions for specific types of SSI (i.e. superficial incisional, deep incisional and organ/space) and other definitions (e.g. risk index, wound contamination class, American Society of Anaesthesiologists (ASA) score, duration of operation) are described in the HAISSI protocol v1.02 [4].

Data analysis

The approach to SSI surveillance taken by the HAISSI protocol is to enhance comparability of results by targeting selected types of operation and collecting data that enable adjustment for variation in case-mix. Adjustment for case-mix is based on a risk index developed by the National Healthcare Safety Network (NHSN, US CDC, Atlanta, Georgia, USA), formerly the National Nosocomial Infections Surveillance (NNIS) System [6, 7]. The NHSN risk index is built from three variables: wound class, duration of operation and ASA score. One point is added to the NHSN risk index when wound class is reported as 'contaminated' or 'dirty', when the duration of operation is greater than the NNIS 75th percentile duration for same type of operation, and if the ASA score is greater than two. For each operation, the NHSN risk index therefore varies from 0 to 3 depending on how many of the risk factors are present.

For each type of operation, two indicators are used to express the incidence of SSI:

- the cumulative incidence of SSI, which includes SSI diagnosed during hospital stay and SSI diagnosed after discharge from the hospital)
- the incidence density of SSI, which only includes SSI diagnosed during hospital stay in patients with a known date of discharge from the hospital).

The cumulative incidence of SSI is the crude percentage of operations resulting in a SSI.

The incidence density of SSI is the number of in-hospital SSI per 1 000 post-operative days in the hospital and is the preferred measure for comparison of incidence of SSI between countries since it only uses observations during the hospital stay for both the numerator and the denominator. This indicator is therefore not influenced by variations in the length of post-operative hospital stay or in the intensity of post-discharge case-finding. However, the incidence density of SSI can only be calculated if the date of discharge from the hospital is known and this indicator is less appropriate for procedures for which very few infections occur while the patient is still in the hospital. This indicator may also over-adjust when the length of post-operative hospital stay is very long (e.g. a small number of patients each contributing for a large number of days) because the probability of detecting an SSI is not the same for each day following the operation (see general discussion).

Trends for the cumulative incidence of SSI and for the incidence density of SSI between 2008 and 2011 were analysed by logistic and Poisson regression, respectively. Both trend analyses were adjusted for the NHSN risk index. In addition, trend analysis of the SSI incidence density was adjusted for length of post-operative stay in the hospital and only used SSI detected before discharge from the hospital. Given the dichotomous outcome, standard errors for Poisson regression coefficients (incidence density trend analysis) were corrected using a robust sandwich variance estimator. Trend analyses for individual countries were performed for data sources that contributed data for at least three years during the period 2008–2011. Overall EU trends were only calculated to include countries that contributed data for all four years. Data from 2008 from UK-England were excluded from all cumulative incidence trend analyses (as requested by the UK-England SSI surveillance coordination centre) because the surveillance protocol changed to include SSI on re-admission mid-2008. For the same reason, data from UK-England data were excluded for overall EU trend analysis of the cumulative incidence, but included for the incidence density analysis.

The internal data quality for missing and unknown values, discordant values or impossible dates (e.g., discharge date before operation date) was checked at the time of data submission during upload in TESSy, with an additional manual quality check for 2010–2011 data. The results of these checks were fed back to Member States, which submitted updates and corrections when available. An analysis of the remaining missing values after correction by Member States is provided in Annex 1. The percentage of missing values is influenced by the fact that some of the variables in the HAISSI protocol were not included in national surveillance protocols in the participating countries.

Interpretation of the results

Interpretation of the results, especially inter-country comparisons of the cumulative incidence of SSI, should be made with caution. Inter-country differences can often be explained by one or several of the following factors, some of which are being accounted for or adjusted for in this report.

Factors that are adjusted or accounted for when using the indicator 'incidence density of in-hospital SSI per 1 000 post-operative patient-days' are:

- Differences in post-discharge surveillance methods, e.g. in UK-England, post-discharge surveillance only started with SSI detected at re-admission mid-2008.
- Differences in length of post-operative hospital stay between countries and hospitals, and variations over time in the average post-operative length of hospital stay within the same country or hospital. Indeed, infections are more likely to be detected in the hospital than in the community, after discharge from the hospital.
- Follow-up of orthopaedic operations (HPRO and KPRO) until one year after the operation. Although this is part of the case definition of SSI, it is not consistently implemented in all participating countries (e.g. France, UK-Scotland). Similarly, one-year follow-up data were not available for all operations/hospitals within a country at the time of data collection. SSI detected between 30 days and one year of follow-up represented 15% of all SSI reported in HPRO and 25% in KPRO and this percentage varied from 0% to over 50% depending on the country.

Factors that can be partially adjusted or accounted for during analysis are:

- Differences in the mix of hospitals that participate each year. This can be adjusted for in the analysis, provided that participating countries always use the same hospital identification number from one year to another, as specified in the HAISSI protocol.
- Differences in patient case-mix and mix of operation types. These differences are partly taken into account by the variables collected following the HAISSI protocol, such as the variables used to calculate the NHSN risk index and the ICD-9-CM code (optional) which provides more details on the operations within a given type of operation. For instance, some countries perform more total HPRO operations and less partial HPRO operations; the latter having a higher intrinsic risk of infection.
- Different interpretations of the case definitions, resulting in variations in the percentage of superficial incisional SSI as part of the total reported SSI. This problem can be partially accounted for by only looking at the incidence of deep incisional SSI and organ/space SSI for which inter-hospital and inter-country variations in the interpretation are expected to be lower. However, exclusion of superficial incisional SSI means that the analysis only considers a smaller number of infections and therefore increases the width of 95% confidence intervals around the indicator.

Factors that cannot be adjusted or accounted for during analysis are:

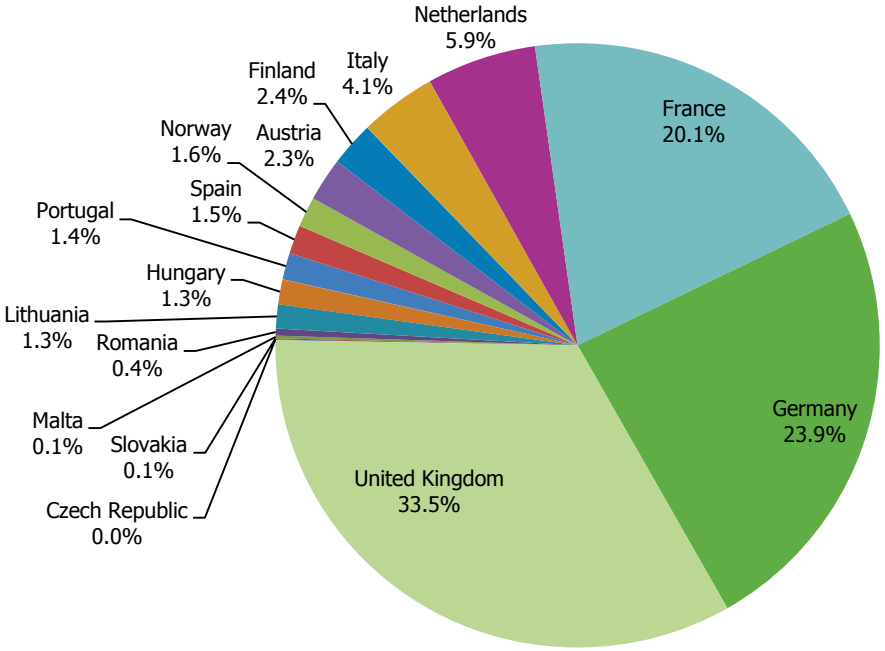
- Missing data. For example missing components of the NHSN risk index or ICD-9-CM codes, compromise the performance of the risk adjustment or stratified analysis. Similarly, missing discharge dates cause the incidence density to be calculated for a subpopulation of the reported interventions only.
- Selection bias due to participation of hospitals that are not representative of hospitals in the country, e.g. hospitals that are known to have a problem with the prevention of SSI. This is mainly a problem in countries with a low level of hospital participation in national SSI surveillance.
- Differences in surveillance sensitivity and specificity due to other factors such as differences in training on surveillance methods, differences in in-hospital case finding methods, or national organisational aspects such as mandatory participation in national SSI surveillance, with or without public disclosure of SSI indicators.
- Small numbers of reported operations and SSI resulting in a high level of uncertainty due to chance. To express this uncertainty, 95% confidence intervals are provided in this report. For example, if three SSI are reported for a total of 100 consecutive operations during a three-month period, the cumulative incidence of SSI is 3.0% with a 95% confidence interval of [0.6–8.5%], indicating that it is ninety five per cent certain that the true SSI incidence lies within the estimated range. Because of these variations due to chance, it is recommended that SSI surveillance is performed continuously or at least for longer periods each year.

Results

Participation

Data for 2010 and 2011 were received from 20 networks in 16 countries (15 EU countries and one EEA country) and included 811 468 surgical operations (Table 3.1 and Figure 1). The Czech Republic, Slovakia and Romania submitted HAI-Net SSI data for the first time, and Malta expanded surveillance with new types of operations. In total, 796 495 operations were reported using the patient-based protocol and 14 973 (<2%) using the unit-based protocol. A total of 386 597 and 424 871 operations were reported in 2010 and in 2011, respectively, provided by 1 557 hospitals in 2010 and 1 635 hospitals in 2011 (Table 3.2). The number of reported operations increased by 34% in 2011 compared to 2008 [8]. The United Kingdom (four separate surveillance networks in England, Northern Ireland, Scotland and Wales) contributed 34% of the total operations reported in 2010–2011, whereas Germany accounted for 24% and France 20% of the total of operations (Figure 2).

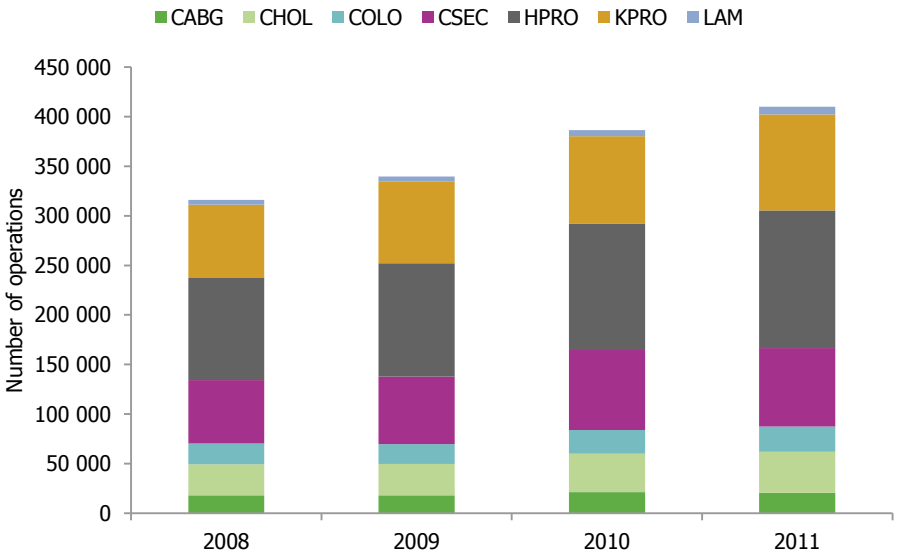
Figure 2. Distribution of operations reported to the European SSI surveillance by participating countries, EU/EEA, 2010–2011



Main results

The types of surgical operations reported by country and year are presented in Table 3.1 and in Figure 3.1 respectively. The distribution of types of operations remained stable as compared to 2008–2009 [8]. Hip prosthesis was the most frequently reported type of operation in European surveillance of SSI, representing 33% of operations in 2010–2011, followed by knee prosthesis (23%), caesarean section (21%), cholecystectomy (10%), colon surgery (6%), coronary artery bypass graft (5%) and laminectomy (2%).

Figure 3.1. Types of operations reported to the European SSI surveillance scheme by operation type, EU/EEA participating countries, 2008–2011



CABG=Coronary artery bypass graft, CHOL=Cholecystectomy, COLO=Colon surgery, CSEC=Caesarean section, HPRO=Hip prosthesis, KPRO=Knee prosthesis, LAM=Laminectomy.

Table 3.1. Number of reported operations by country and type of operation, 2010–2011

Country	Number of reported surgical operations, by type of operation							
	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Total
Patient-based data								
Austria	586	840	507	6 803	9 542	597	0	18 875
Finland					10 788	8 557		19 345
France	2 236	28 427	13 315	37 969	50 503	26 946	3 746	163 142
Germany	21 609	24 450	13 208	28 770	65 160	34 719	6 117	194 033
Hungary	370	3 247	659	4 998	1 089	236	290	10 889
Italy*	1 533	7 210	4 761	8 842	6 818	2 997	1 107	33 268
Lithuania	1 170	1 990	782	4 393	1 221	848	0	10 404
Malta	451			493	236			1 180
Netherlands		6 822	4 604	9 153	15 157	10 588	1 178	47 502
Norway	1 140	1 347	694	4 709	5 168			13 058
Portugal		3 367	1 751	3 344	1 719	1 213	128	11 522
Slovakia		418						418
Spain	883	2 003	2 123	1 666	3 355	1 900	502	12 432
United Kingdom**	11 747	0	7 259	49 399	94 177	97 184	661	260 427
Subtotal	**41 725**	**80 121**	**49 663**	**160 539**	**264 933**	**185 785**	**13 729**	**796 495**
Unit-based data								
Czech Republic			318					318
Romania		442	1 545		114		952	3 053
United Kingdom***				6 663	2 938	2 001		11 602
Subtotal	**0**	**442**	**1 863**	**6 663**	**3 052**	**2 001**	**952**	**14 973**
EU/EEA	**41 725**	**80 563**	**51 526**	**167 202**	**267 985**	**187 786**	**14 681**	**811 468**

CABG=Coronary artery bypass graft, CHOL=Cholecystectomy, COLO=Colon surgery, CSEC=Caesarean section, HPRO=Hip prosthesis, KPRO=Knee prosthesis, LAM=Laminectomy. Data reported by 2 networks in Italy: SNICh and ISChIA. ** Data reported by 4 networks in UK: UK-England (CABG, COLO, KPRO, HPRO), UK-Northern Ireland (CSEC, KPRO, HPRO, LAM), UK-Scotland (CSEC, KPRO, HPRO) and UK-Wales (CSEC, KPRO, HPRO). *** Data reported by one network in UK: UK-Scotland.*

Table 3.2. Number of participating hospitals by country and type of operation, 2010–2011

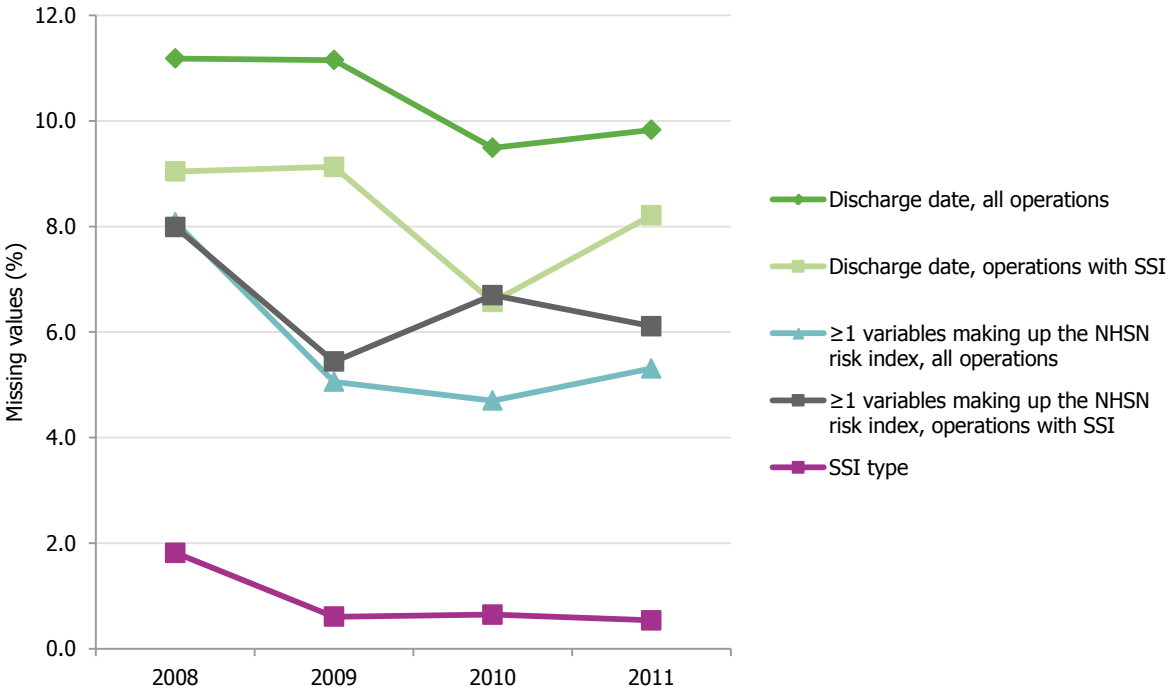
Country	Number of participating hospitals, by type of operation (2010/2011)							
	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Overall
Patient-based data								
Austria	2/1	6/0	6/4	16/15	25/24	2/3		37/35
Finland					13/9	12/10		13/10
France	30/24	470/482	414/436	291/315	543/560	485/505	111/114	671/689
Germany	24/23	80/91	85/86	51/52	171/188	96/110	14/18	289/320
Hungary	3/1	14/13	5/6	11/14	3/7	3/6	1/2	26/32
Italy*	5/15	34/45	52/54	21/31	40/40	35/36	8/14	84/91
Lithuania	2/2	8/9	6/6	11/14	10/11	8/9		17/21
Malta	1/1			1/1	0/1			1/1
Netherlands		15/17	24/28	17/22	26/33	23/31	4/6	36/46
Norway	5/5	24/28	12/15	39/36	40/39			53/47
Portugal		16/12	17/15	3/5	9/8	7/6	3/2	21/21
Slovakia		0/6						0/6
Spain	9/5	13/4	19/9	10/4	27/10	20/8	6/4	31/12
United Kingdom**	14/15		31/29	44/41	234/230	216/228	3/2	278/275
Subtotal	**95/92**	**680/707**	**671/688**	**515/550**	**1141/1160**	**907/952**	**150/162**	**1557/1606**
Unit-based data								
Czech Republic			0/1					0/1
Romania		0/2	0/3		0/2		0/1	0/4
United Kingdom***				0/12	0/20	0/17		0/24
Subtotal	**0**	**0/2**	**0/4**	**0/12**	**0/22**	**0/17**	**0/1**	**0/29**
EU/EEA	**95/92**	**680/709**	**671/692**	**515/562**	**1141/1182**	**907/969**	**150/163**	**1557/1635**

CABG=Coronary artery bypass graft, CHOL=Cholecystectomy, COLO=Colon surgery, CSEC=Caesarean section, HPRO=Hip prosthesis, KPRO=Knee prosthesis, LAM=Laminectomy. Data reported by 2 networks in Italy: SNICh and ISChIA. ** Data reported by 4 networks in UK: UK-England (CABG, COLO, KPRO, HPRO), UK-Northern Ireland (CSEC, KPRO, HPRO, LAM), UK-Scotland (CSEC, KPRO, HPRO) and UK-Wales (CSEC, KPRO, HPRO). *** Data reported by one network in UK: UK-Scotland.*

The percentage of missing values for the variables that are essential for performing inter-hospital and inter-country comparisons (i.e. discharge date, NHSN risk index and type of SSI – see 'data collection and technical notes') decreased dramatically between 2004 and 2009 as described in the previous ECDC report, but remained stable from 2009 to 2011 (Figure 3.2).

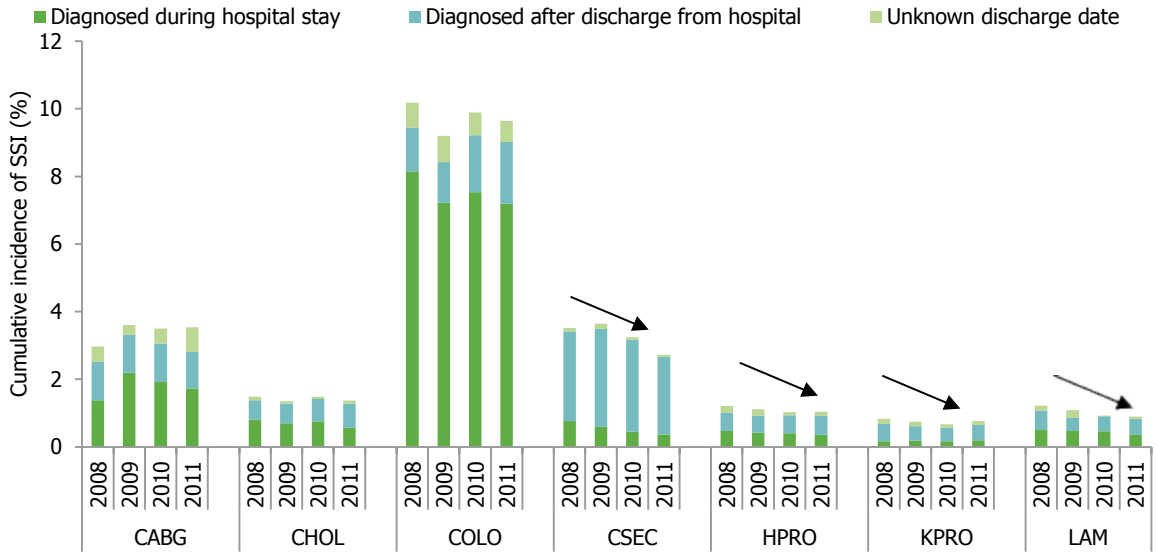
As expected, the overall cumulative incidence of SSI in 2010–2011 was the highest in COLO (9.5%) and the lowest in KPRO (0.7%). The incidence density was also the highest in COLO (6.2 SSI per 1 000 post-operative patient-days) and the lowest in KPRO (0.3 in-hospital SSI per 1 000 post-operative patient-days).

Figure 3.2. Percentage of missing values for the main variables used in the adjustment of SSI rates, 2008–2011



In accordance with general ECDC surveillance analysis practice, trends for the cumulative incidence and the incidence density of SSI were only analysed for the last four years of surveillance (2008–2011), and for networks that had contributed data for at least three of these years. For CSEC and HPRO a significant decrease was observed in both the cumulative incidence and incidence density of SSI ($p<0.05$). For CHOL and COLO there was a significant decrease of the incidence density ($p<0.001$), but no significant trends were observed for the cumulative incidence. For LAM, the cumulative incidence decreased ($p<0.05$) and no trends were observed for the incidence density. For KPRO, the cumulative incidence decreased significantly ($p<0.001$) while the incidence density increased ($p<0.05$). Details for each type of operation are given in the following chapters (Figure 3.3, Figure 3.4).

Figure 3.3. Cumulative incidence for SSI by year and operation type, EU/EEA countries, 2008–2011

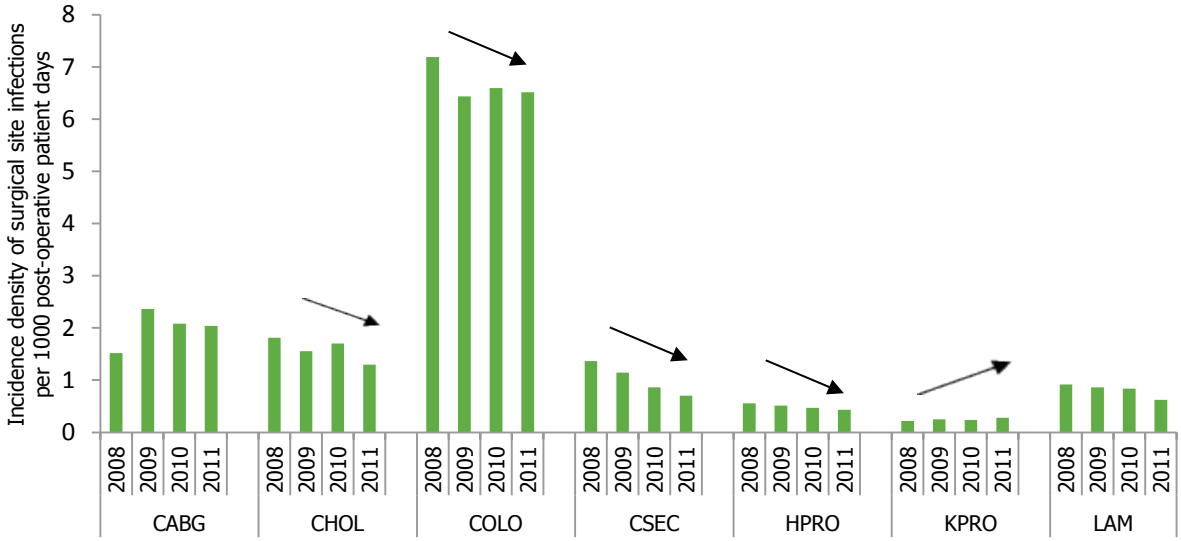


Data source: ECDC, HAI-Net SSI patient-based data 2008–2011.

Countries (networks) participating at last three years from 2008 to 2011 by type of operation: CABG: AT, DE, ES, FR, HU, IT (SNICh), LT, MT, NO, UK (England); CHOL: AT, DE, ES, FR, HU, IT(SNICh), LT, NL, NO, PT; COLO: AT, DE, ES, FR, HU, IT (SNICh), LT, NL, NO, PT, UK (England); CSEC: AT, DE, ES, FR, HU, IT(SNICh), LT, NL, NO, PT, UK (Northern Ireland, Scotland and Wales); HPRO: AT, DE, ES, FI, FR, HU, IT(SNICh), LT, NL,NO, PT, UK (England, Northern Ireland, Scotland and Wales); KPRO: AT, DE, ES, FI, FR, HU, IT(SNICh), LT, NL, PT, UK (England, Northern Ireland, Scotland and Wales); LAM: DE, ES, FR, HU, IT(SNICh), NL, PT. Arrows indicate a significant trend for cumulative incidence (p<0.05). United Kingdom was excluded from the trend analysis of CABG, COLO, HPRO and KPRO because of a change in the surveillance protocol in UK-England in 2008 (see methods).

Note: Post-discharge surveillance methods and practices differ considerably among countries.

Figure 3.4. Incidence density of SSI (diagnosed in-hospital) by year and operation type, EU/EEA countries, 2008–2011



Data source: ECDC, HAI-Net SSI patient-based data 2008–2011.

Countries (networks) participating at last three years from 2008 to 2011 by type of operation: CABG: AT, DE, ES, FR, HU, IT (SNICh), LT, MT, NO, UK (England); CHOL: AT, DE, ES, FR, HU, IT(SNICh), LT, NL, NO, PT; COLO: AT, DE, ES, FR, HU, IT (SNICh), LT, NL, NO, PT, UK (England); CSEC: AT, DE, ES, FR, HU, IT(SNICh), LT, NL, NO, PT, UK (England, Scotland and Wales); HPRO: AT, DE, ES, FI, FR, HU, IT(SNICh), LT, NL,NO, PT, UK (England, Northern Ireland, Scotland and Wales); KPRO: AT, DE, ES, FI, FR, HU, IT(SNICh), LT, NL, PT, UK (England, Northern Ireland, Scotland and Wales); LAM: DE, ES, FR, HU, IT(SNICh), NL, PT. Arrows indicate a significant trend for incidence density (p<0.05). Note: Only in-hospital diagnosed surgical site infections are included.

Coronary artery bypass graft (CABG)

Key points

- 41 725 CABG operations were reported for 2010–2011.
- All CABG operations were reported using the patient-based protocol (10 EU/EEA countries).
- The cumulative incidence of SSI was 3.5% [inter-country range: 2.8%–7.1%] in 2010–2011.
- The incidence density of SSI was 1.9 [inter-country range: 0.6–5.6] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 41 725 CABG operations and 1 467 SSI subsequent to the operation, were reported to ECDC for 2010 and 2011. The characteristics of the patients with CABG operations are summarised in Table 4.1. SSI were detected in 3.5% [inter-country range: 2.8%–7.1%] of CABG operations (cumulative incidence) within 30 days of surgery (Table 4.2). The cumulative incidence of SSI was 3.4% [95% CI: 3.0%–3.8%] in CABG operations with chest incision only (n=8 270 operations) and 3.5% [95% CI: 3.3%–3.7%] in CABG with chest and donor site incisions (n=32 201 operations). For the latter, only SSI at the chest incision site were recorded, in accordance with the European surveillance protocol (HAISSI protocol v1.01).

Sixty-two per cent of SSI were diagnosed in hospitals, whereas 38% were detected after discharge. The percentage of SSI detected after discharge ranged from 13% (2 of 15 SSI) in Hungary to 89% (65 of 73 SSI) in Italy (Figure 4.1). Although the SSI case definition specifies that only infections reported within a time frame of 30 days after surgery must be included, 179 (10.9%) of 1 646 SSI in CABG operations were reported after 30 days. These infections were excluded from further data analysis according to the current protocol (HAISSI protocol v1.02).

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=155 hospital-years) is given by NHSN risk index in Table 4.3. The mean of hospital cumulative incidences was 3.8 SSI per 100 operations, with 10% of the hospitals reporting a cumulative incidence of SSI of more than 7.2%. The cumulative incidence by NHSN risk index (database mean) varied from 2.5% for CABG operations with a risk index of 0 to 5.7% for CABG operations with a risk index of 2 or 3 (Table 4.3).

The percentile distribution of the SSI incidence density in hospitals reporting at least 20 operations with a known discharge date (n=135 hospital-years) is given by NHSN risk index in Table 4.4. The mean of incidence densities in participating hospitals was 2.1 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal or greater than 4.9 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 1.6 in-hospital SSI per 1 000 post-operative patient-days for CABG operations with a risk index of 0 to 2.8 in-hospital SSI per 1 000 post-operative patient-days for CABG operations with a risk index of 2 or 3 (Table 4.4).

The distribution of SSI by type showed that 745 (51%) were superficial incisional SSI, 495 (34%) were deep incisional SSI, 222 (15%) were organ/space SSI and for 5 (0.3%) SSI the type was unknown (Figure 4.2). Microbiological data with identified microorganisms were available for 54% of 1 467 SSI in nine countries reporting microbiological data for SSI in CABG (Annex 2, Table A2.1). A total of 983 microorganisms were reported (Annex 2, Table A2.2). Of these, 596 (60.6%) were Gram-positive cocci. Coagulase-negative staphylococci were predominant (30.0 %) followed by *Staphylococcus aureus* (21.6%). Of the latter, 12 out of 46 (26%) tested isolates were meticillin-resistant *S. aureus* (MRSA). Enterobacteriaceae represented 22.0% of all microorganisms, followed by non-fermentative Gram-negative bacilli (6.3%).

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI after CABG during the period 2008–2011 are shown in Figure 4.1. Logistic regression of the cumulative incidence by country showed an increase in Malta and Italy and a decrease in France. Poisson regression of the incidence density showed an increasing trend in Malta, Norway and Spain and a decreasing trend in Italy. The overall trend analysis for CABG in countries contributing data for all four years showed no trend (Figure 3.3).

Discussion

The results should be interpreted with caution. In 2010–2011, 1 467 SSI were reported in 41 725 CABG operations within 30 days of the operation. The cumulative incidence and the incidence density of SSI in CABG remained stable from 2008 to 2011 (Figure 3.3). A relatively high percentage (10.9%) of SSI was excluded from analysis, because SSI occurred after the 30 days of the operation, due to the HAI-Net SSI current protocol requirements. A new version of the protocol will recommend report these infections, because many patients with CABG have sternal wires, which are considered as implants, meaning that a follow-up period of one year is applied for CABG.

Coronary artery bypass graft (CABG)

Table 4.1. Characteristics of patients with CABG operations, 2010–2011 (n=41 725 operations)

Characteristics	Value
Sex ratio (M:F)	3.7
Median age (years)	68
Post-operative case fatality (%)	2.0
Contaminated or dirty operations (%)	0.2
Median duration of operation (min)	206
Median length of post-operative stay (days)	11.3
Urgent operations (%)	5.8
Antibiotic prophylaxis (%)	98.1

Table 4.2. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after CABG operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Austria	586	21	3.6 [2.2-5.5]	586	8 299	13	1.6 [0.8-2.7]
France	2 236	63	2.8 [2.2-3.6]	2 053	22 019	39	1.8 [1.3-2.4]
Germany	21 609	643	3.0 [2.8-3.2]	14 671	178 002	229	1.3 [1.1-1.5]
Hungary	370	15	4.1 [2.3-6.7]	370	4 009	13	3.2 [1.7-5.5]
Italy*	1 533	93	6.1 [4.9-7.4]	1 483	13 528	8	0.6 [0.3-1.2]
Lithuania	1 170	46	3.9 [2.9-5.2]	1 170	17 644	37	2.1 [1.5-2.9]
Malta	451	32	7.1 [4.9-10.0]	451	3 568	20	5.6 [3.4-8.7]
Norway**	1 140	65	5.7 [4.4-7.3]	1 140	8 607	14	1.6 [0.9-2.7]
Spain	883	52	5.9 [4.4-7.7]	812	10 415	39	3.7 [2.7-5.1]
United Kingdom***	11 747	437	3.7 [3.4-4.1]	11 747	124 857	350	2.8 [2.5-3.1]
EU/EEA	**41 725**	**1 467**	**3.5 [3.3-3.7]**	**34 483**	**390 948**	**762**	**1.9 [1.8-2.1]**

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient-days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from network SNICh only; **Data from Norway include patient-reported SSI; ***Data from UK-England only.*

Table 4.3. Percentile distribution of cumulative incidences of SSI in CABG operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	106	1 614	40	2.5	4.4	0	0	0	2.1	10.0
1	150	32 667	1 043	3.2	3.4	0	1.5	2.7	4.8	7.2
2 and 3	139	3 745	213	5.7	5.6	0	0	1.9	7.8	16.7
Unknown	55	3 509	156	4.4	5.3	0	0	0	6.4	12.5
Overall	155	41 535	1 452	3.5	3.8	0.9	2	3.3	5.1	7.2

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within 30 days of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

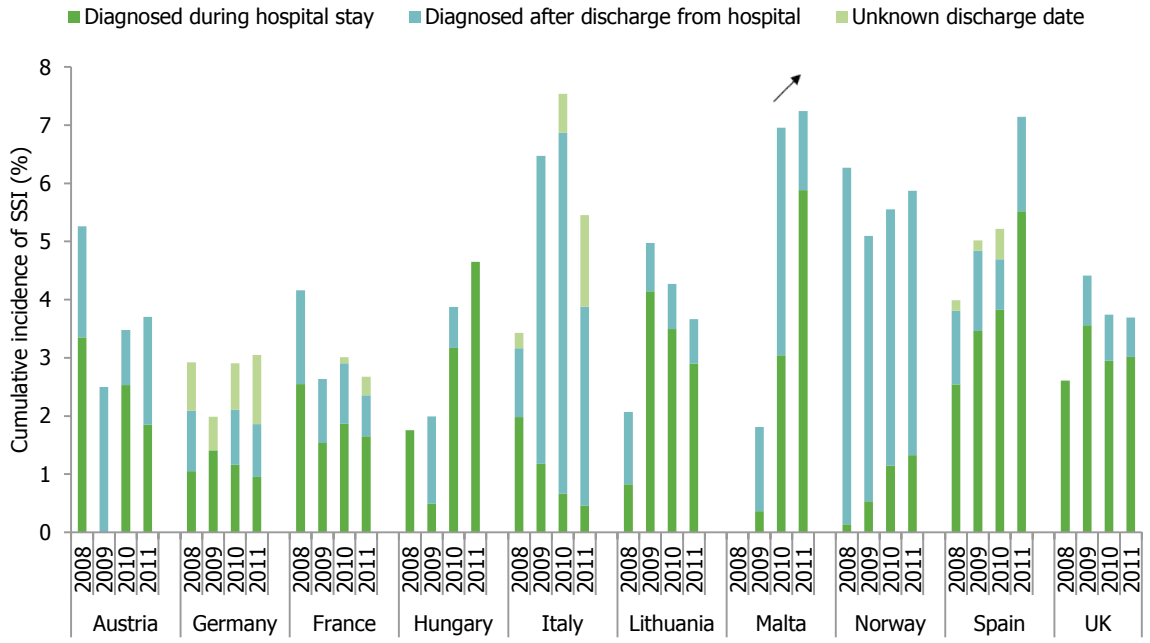
Table 4.4. Percentile distribution of incidence densities of SSI in CABG operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	92	14 039	22	1.6	2	0	0	0	0	4.1
1	131	293 740	495	1.7	1.7	0	0	1.1	2.7	4.7
2 and 3	120	45 190	128	2.8	2.4	0	0	0	3.3	8
Unknown	54	35 807	109	3	3.1	0	0	0	2.7	8.1
Overall	135	388 776	754	1.9	2.1	0	0.4	1.6	3.1	4.9

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge - date of operation+1); (3) Number of SSI reported within 30 days of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

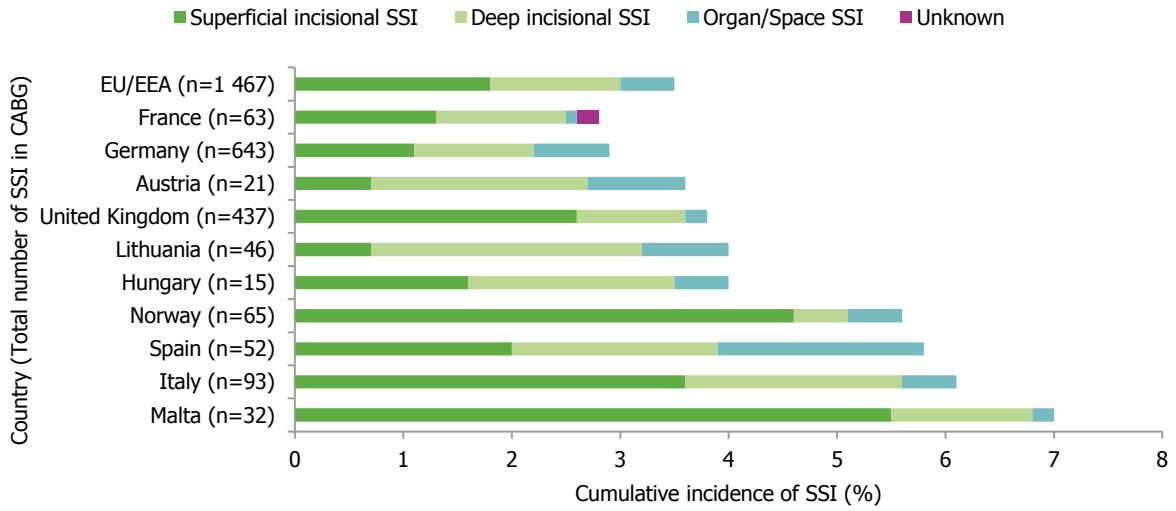
Figure 4.1. Cumulative incidence of SSI in CABG operations by country, 2008-2011



Data source: ECDC, HAI-Net SSI patient- based data 2010-2011.

Note: Trend analysis was not performed for networks reporting data for less than three years. The arrow indicates a significant trend for both cumulative incidence and incidence density ($p < 0.05$). Post-discharge surveillance methods and practices differ considerably among countries. Data from Norway include patient-reported infections. UK: data from UK-England only; 2008 data from UK were excluded from the cumulative incidence trend analysis because of protocol change mid-2008.

Figure 4.2. Cumulative incidence of SSI in CABG operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient- based data 2010–2011.

Note: Data from Norway include patient-reported SSI.

Cholecystectomy (CHOL)

Key points

- A total of 80 563 CHOL operations were reported for 2010–2011.
- CHOL operations were reported using the patient-based protocol by 11 networks in 11 EU/EEA countries, and using the unit-based protocol by one network in one EU/EEA country.
- The cumulative incidence of SSI was 1.4% [inter-country range: 0.8%–6.7%] in 2010–2011.
- The incidence density of SSI was 1.5 [inter-country range: 0.6-8.2] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

For 2010 and 2011, 80 563 CHOL operations and 1 149 subsequent SSI were reported to ECDC. The characteristics of the patients with CHOL operations are summarised in Table 5.1. SSI were detected in 1.4% [inter-country range: 0.8%–6.7%] of CHOL operations (cumulative incidence) within 30 days of surgery (Table 5.2). The cumulative incidence of SSI was 4.1% [95% CI: 3.7%–4.5%] in non-endoscopic CHOL operations (with laparotomy, referred to as 'open') (n=11 131 operations) and 1.0% [95% CI: 0.9%–1.1%] in endoscopic CHOL operations (using laparoscopy) (n=68 231 operations) (Tables 5.2a and 5.2b).

Forty-eight per cent of SSI were diagnosed during hospital stay whereas 52% were detected after discharge. The percentage of SSI detected after discharge ranged from 0% (none of 16 SSI) in Lithuania to 93% (130 of 140 SSI) in the Netherlands (Figure 5.1).

Although the SSI case definition specifies that only infections reported within a time frame of 30 days after surgery must be included, 12 (1%) of 1 166 SSI in CHOL operations were reported after 30 days. In addition, the date of infection was unknown in five (0.4%) of 1 166 SSI in CHOL operations. These infections were excluded from further data analysis according to the current protocol (HAISSI protocol v1.02).

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=918 hospital-years) is given by NHSN risk index in Table 5.3. The mean of hospital cumulative incidences was 1.3 SSI per 100 operations, with 10% of the hospitals reporting a cumulative incidence of SSI of more than 3.9%. The cumulative incidence by NHSN risk index (database mean) varied from 0.9% for CHOL operations with a risk index of 0 to 4.2% for CHOL operations with a risk index of 2 or 3 (Table 5.3).

The percentile distribution of the incidence density of SSI in hospitals reporting at least 20 operations with a known discharge date (n=880 hospital-years) is given by NHSN risk index in Table 5.4. The mean of incidence densities in these hospitals was 1.2 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal to or greater than 4.3 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 0.7 in-hospital SSI per 1 000 post-operative patient-days for CHOL operations with a risk index of 0, to 3.2 in-hospital SSI per 1 000 post-operative patient-days for CHOL operations with a risk index of 2 or 3 (Table 5.4).

The distribution of SSI by type showed that 679 (59%) were superficial incisional SSI, 258 (22%) were deep incisional SSI, 201 (17%) were organ/space SSI and for 11 (1%) SSI the type was not known (Figure 5.2).

Microbiological data were available for 41% of 1 149 SSI in countries reporting microbiological data for SSI in CHOL (Annex 2.1, Table A2.1). A total of 663 microorganisms were reported (Annex 2, Table A2.2). Of these, 333 (50.2%) were Gram-negative bacilli (Enterobacteriaceae) and 244 (36.8%) were Gram-positive cocci. The predominant species was *Escherichia coli* (25.3%), followed by Enterococci (18.9%) and *Klebsiella* spp. (10.1%). The distribution of microorganisms was similar in endoscopic and open CHOL operations.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 5.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant decreasing trend in the Netherlands ($p < 0.05$). The overall trend analysis for CHOL in countries contributing data for all four years (2008–2011) showed a significant decrease in the incidence density of in-hospital diagnosed SSI (Figure 3.3).

Discussion

The intensity of post-discharge surveillance (highest in the Netherlands, Norway and Slovakia) influences the cumulative incidence of SSI in CHOL operations, for which the average length of post-operative stay is short, with a median of five days (Table 5.1). As expected, there was a lower cumulative incidence (1.0%) of SSI in laparoscopic CHOL operations compared to non-endoscopic CHOL operations (4.1%).

Cholecystectomy (CHOL)

Table 5.1. Characteristics of patients with CHOL operations, 2010–2011 (n=80 121 operations)

Characteristics	Endoscopic	Non-endoscopic	Overall
Sex ratio (M:F)	0.5	0.8	0.5
Median age (years)	55	63	56
Post-operative case fatality (%)	0.3	1.7	0.5
Contaminated or dirty operations (%)	13.2	26.3	15.0
Median duration of operation (min)	66	92	70
Median length of post-operative stay (days)	4.2	8.5	4.8
Urgent operations (%)	11.0	20.6	12.5
Antibiotic prophylaxis (%)	55.8	59.2	56.2

Table 5.2. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after CHOL operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
Austria	840	10	1.2 [0.6-2.2]	840	5 418	7	1.3 [0.5-2.7]
France	28 427	217	0.8 [0.7-0.9]	28 239	130 406	104	0.8 [0.7-1.0]
Germany	24 450	299	1.2 [1.1-1.4]	20 067	118 201	190	1.6 [1.4-1.9]
Hungary	3 247	65	2.0 [1.5-2.6]	3 247	14 561	32	2.2 [1.5-3.1]
Italy*	7 210	128	1.8 [1.5-2.1]	6 371	29 920	22	0.7 [0.5-1.1]
Lithuania	1 990	16	0.8 [0.5-1.3]	1 990	9 643	16	1.7 [0.9-2.7]
Netherlands	6 822	140	2.1 [1.7-2.4]	6 822	17 939	10	0.6 [0.3-1.0]
Norway**	1 347	90	6.7 [5.3-8.2]	1 347	3 556	11	3.1 [1.5-5.5]
Portugal	3 367	51	1.5 [1.1-2.0]	3 366	14 461	32	2.2 [1.5-3.1]
Slovakia	418	8	1.9 [0.8-3.8]	417	1 679	1	0.6 [0-3.3]
Spain	2 003	119	5.9 [4.9-7.1]	1 923	11 859	97	8.2 [6.6-10.0]
Subtotal	**80 121**	**1 143**	**1.4 [1.3-1.5]**	**74 629**	**357 643**	**522**	**1.5 [1.4-1.6]**
Unit-based data							
Romania	442	6	1.4 [0.5-3.0]	442	2 735	6	2.2 [0.8-4.8]
Subtotal	**442**	**6**	**1.4 [0.5-3.0]**	**442**	**2 735**	**6**	**2.2 [0.8-4.8]**
EU/EEA	**80 563**	**1 149**	**1.4 [1.3-1.5]**	**75 071**	**360 378**	**528**	**1.5 [1.3-1.6]**

Data source: ECDC, HAI-Net SSI patient- based and unit-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include only one network SNICh data**Data from Norway include patient-reported SSI.*

Table5.2a (endoscopic). Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after endoscopic CHOL operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days	No. of in-hospital SSI (4)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (5)
Austria	488	6	1.2 [0.5-2.7]	488	2 683	4	1.5 [0.4-3.8]
France	23 015	123	0.5 [0.4-0.6]	22 998	94 953	45	0.5 [0.3-0.6]
Germany	21 975	166	0.8 [0.6-0.9]	18 132	95 183	91	1.0 [0.8-1.2]
Hungary	2 298	29	1.3 [0.8-1.8]	2 298	8 895	10	1.1 [0.5-2.1]
Italy*	5 842	58	1.0 [0.8-1.3]	5 181	18 720	8	0.4 [0.1-0.8]
Lithuania	1 902	9	0.5 [0.2-0.9]	1 902	8 764	9	1.0 [0.5-1.9]
Netherlands	6 696	133	2.0 [1.7-2.4]	6 696	17 118	9	0.5 [0.2-1.0]
Norway**	1 270	85	6.7 [5.3-8.3]	1 270	2 958	8	2.7 [1.2-5.3]
Portugal	2 965	25	0.8 [0.5-1.2]	2 964	10 546	12	1.1 [0.6-2.0]
Slovakia	235	6	2.6 [0.9-5.6]	234	805	0	0.0 [0-0.5]***
Spain	1 545	48	3.1 [2.3-4.1]	1 468	6 450	37	5.7 [4.0-7.9]
EU/EEA	**68 231**	**688**	**1.0 [0.9-1.1]**	**63 631**	**267 075**	**233**	**0.9 [0.8-1.0]**

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (5) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include only one network SNICh data; **Data from Norway include patient-reported SSI; ***One-sided confidence interval.*

Table5.2b (open). Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after open CHOL operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days	No. of in-hospital SSI (4)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (5)
Austria	347	4	1.2 [0.3-3.0]	347	2 680	3	1.1 [0.2-3.3]
France	4 669	93	2.0 [1.6-2.4]	4 659	32 959	59	1.8 [1.4-2.3]
Germany	2 475	133	5.4 [4.4-6.4]	1 935	23 018	99	4.3 [3.5-5.2]
Hungary	949	36	3.8 [2.7-5.3]	949	5 666	22	3.9 [2.4-5.9]
Italy*	1 367	70	5.1 [4.0-6.5]	1 189	11 184	14	1.3 [0.7-2.1]
Lithuania	88	7	8.0 [3.2-16. 4]	88	879	7	8.0 [3.2-16.4]
Netherlands	126	7	5.6 [2.2-11.4]	126	821	1	1.2 [0.3-6.7]
Norway**	75	5	6.7 [2.2-15.6]	75	595	3	5.0 [1.0-14.7]]
Portugal	402	26	6.5 [4.2-9.5]	402	3 915	20	5.1 [3.1-7.9]
Slovakia	183	2	1.1 [1.3-3.9]	183	874	1	1.1 [0.0-6.4]
Spain	450	70	15.6 [12.1-19.7]	447	5 343	59	11.0 [8.4-14.2]
EU/EEA	**11 131**	**453**	**4.1 [3.7-4.5]**	**10 400**	**87 934**	**288**	**3.3 [2.9-3.7]**

Data source: ECDC, HAI-Net SSI patient- based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (5) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. * Italy: data from only one network (SNICh) included; **Data from Norway include patient-reported SSI.*

Table 5.3. Percentile distribution of cumulative incidences of SSI in CHOL operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	910	48 348	447	0.9	1.0	0	0	0	0	2.9
1	899	18 163	348	1.9	2.1	0	0	0	0	6.3
2 and 3	674	5 764	243	4.2	4.3	0	0	0	0	12.5
Unknown	194	3 412	51	1.5	1.5	0	0	0	0	3.6
Overall	918	75 687	1 089	1.4	1.3	0	0	0	1.8	3.9

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within 30 days of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

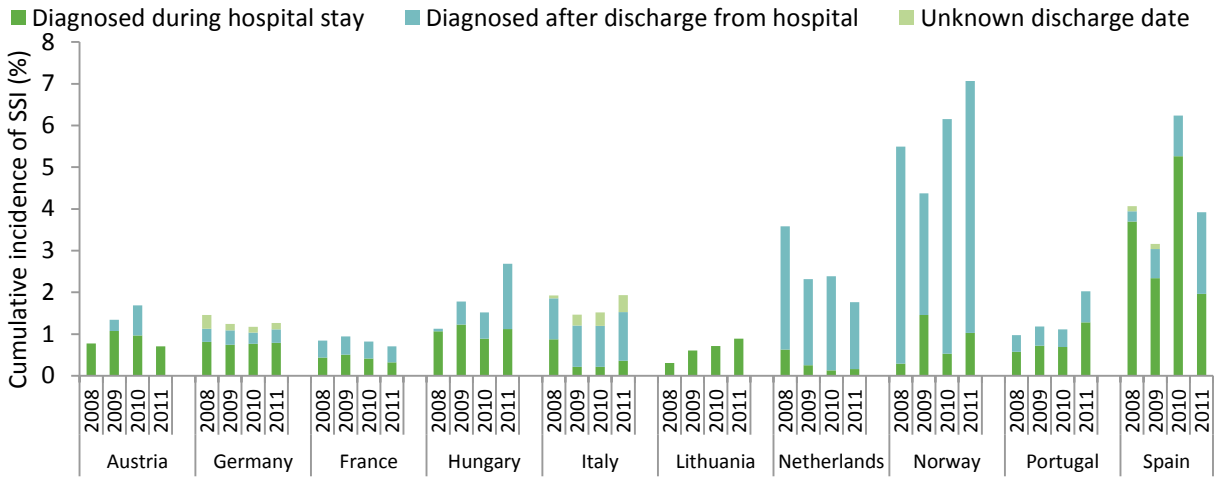
Table 5.4. Percentile distribution of incidence densities of SSI in CHOL operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	875	172 190	126	0.7	0.7	0	0	0	0	1.6
1	864	97 805	188	1.9	1.3	0	0	0	0	3.5
2 and 3	640	50 206	161	3.2	3.2	0	0	0	0	6.1
Unknown	190	15 369	23	1.5	0.8	0	0	0	0	0
Overall	880	335 570	498	1.5	1.2	0	0	0	0	4.3

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge - date of operation+1); (3) Number of SSI reported within 30 days of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

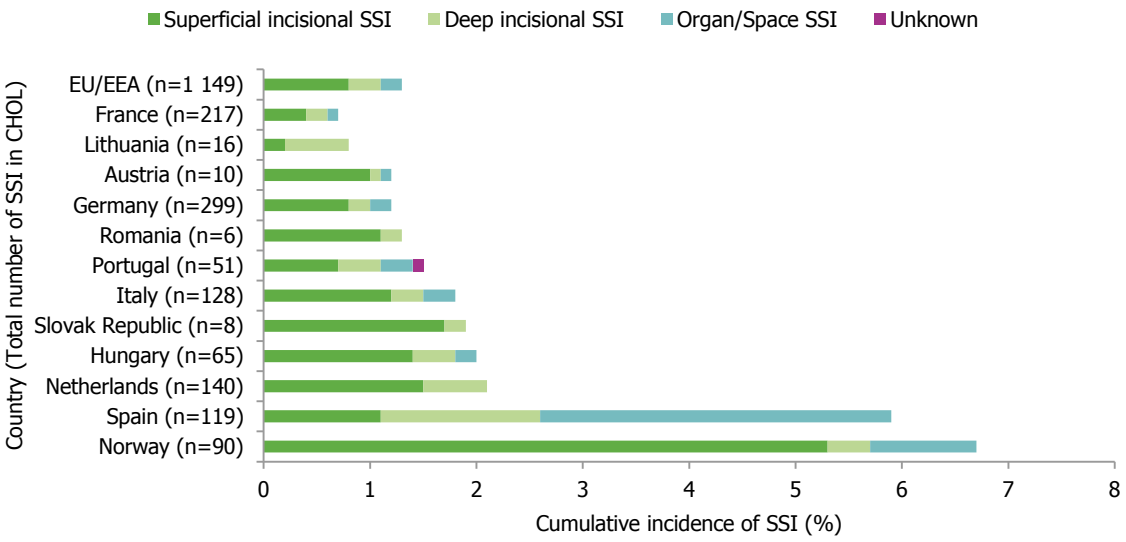
Figure 5.1. Cumulative incidence of SSI in CHOL operations by country, 2008–2011



Data source: ECDC, HAI-Net SSI patient- based data 2010–2011.

Note: Trend analysis was not performed for countries reporting data for less than three years. Post-discharge surveillance methods and practices differ considerably between countries. Data from Norway include patient-reported SSI.

Figure 5.2. Cumulative incidence of SSI in CHOL operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient- based and unit-based data 2010–2011.

Note: The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional SSI. Data from Norway include patient-reported SSI.

Colon surgery (COLO)

Key points

- A total of 51 526 COLO operations were reported for 2010–2011.
- COLO operations were reported by 11 EU/EEA countries and using the unit-based protocol by two networks in two 2 EU/EEA countries.
- The cumulative incidence of SSI was 9.5% [inter-country range: 0.8%–19.3%] in 2010–2011.
- The incidence density of SSI was 6.2 [inter-country range: 2.4-12.5] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 51 526 COLO operations, and 4 893 SSI subsequent to the operation, were reported to ECDC for 2010 and 2011. The characteristics of the patients with COLO operations are summarised in Table 6.1. SSI were detected in 9.5% [inter-country range: 0.8%–19.3%] of COLO operations (cumulative incidence) within 30 days of surgery (Table 6.2). The cumulative incidence of SSI was 10.6% [95% CI: 10.2%–10.9%] in non -endoscopic COLO operations (with laparotomy) (n=38 203 operations) and 7.1% [95% CI: 6.6%-7.6%] in endoscopic COLO operations (using laparoscopy) (n= 10 952 operations).

Eighty per cent of SSI were diagnosed in hospitals, whereas 20% were detected after discharge. The percentage of SSI detected after discharge ranged from 7% (5 of 71 SSI) in Lithuania to 92% (11 of 12 SSI) in Romania (Figure 6.1).

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=623 hospital-years) is given by NHSN risk index in Table 6.3. The mean of hospital cumulative incidences was 9.7 SSI per 100 operations, with 10% of the hospitals reporting an SSI cumulative incidence of more than 20.6%. The cumulative incidence by NHSN risk index (database mean) varied from 7.8% for COLO operations with a risk index of 0, to 12.9% for COLO operations with a risk index of 2 or 3 (Table 6.3).

The percentile distribution of SSI incidence density in hospitals reporting at least 20 operations with a known discharge date (n=584 hospital-years) is given by NHSN risk index in Table 6.4. The mean of incidence densities in participating hospitals was 5.8 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal or greater than 13.1 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 5.5 in-hospital SSI per 1 000 post-operative patient-days for COLO operations with a risk index of 0, to 7.3 in-hospital SSI per 1 000 post-operative patient-days for COLO operations with a risk index of 2 or 3 (Table 6.4).

The distribution of SSI by type showed that 2 466 (50%) were superficial incisional SSI, 1 446 (30%) were deep incisional SSI, 958 (20%) were organ/space SSI and for 23 (<1%) SSI the type was unknown (Figure 6.2).

Microbiological data were available for 52% of 4 893 SSI in countries reporting microbiological data for SSI in COLO (Annex 2, Table A2.1). A total of 3 943 microorganisms were reported (Annex 2, Table A2.2). Gram-negative bacilli (Enterobacteriaceae), the major component of the intestinal microflora, were predominant (47.3%), followed by Gram-positive cocci (30.0%). Although *S. aureus* represented only 4.5% of isolated Gram-positive cocci, 39 out of 91 (42.9%) *S. aureus* isolates were MRSA. Non-fermentative Gram-negative bacilli and anaerobes represented 8.3% and 7.4% isolated microorganisms, respectively.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 6.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant decreasing trend in Germany and Hungary. The overall trend analysis for COLO in countries contributing data for all four years (2008–2011) showed a significant decrease in the incidence density of in-hospital diagnosed SSI (Figure 3.4).

Discussion

COLO is the type of surgery with the highest cumulative incidence of SSI, sometimes exceeding 15% in certain countries and hospitals. Microbiological data shows that in most cases the isolated microorganisms reflected the intestinal microflora. As expected, a lower percentage (7.1%) of SSI occurred in endoscopic COLO operations than in non-endoscopic COLO operations (10.6%). An overall decreasing trend of the incidence density of COLO operations was observed ($p<0.01$)

Colon surgery (COLO)

Table 6.1. Characteristics of patients with COLO operations, 2010–2011 (n=49 663 operations)

Characteristics	Endoscopic	Non-endoscopic	Overall
Sex ratio (M:F)	0.9	1.1	1
Median age (years)	63	68	67
Post-operative case fatality (%)	1.1	4.2	3.6
Contaminated or dirty operations (%)	32.6	36.6	35.7
Median duration of operation (min)	163	149	152
Median length of post-operative stay (days)	10.4	13.6	12.9
Urgent operations (%)	6.8	18.5	15.9
Antibiotic prophylaxis (%)	92.3	87.2	87.8

Table 6.2. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after COLO operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
Austria	507	65	12.8 [9.9-16.3]	507	7 131	57	8.0 [6.1-10.4]
France	13 315	990	7.4 [7.0-7.9]	13 201	166 418	773	4.6 [4.3-5.0]
Germany	13 208	988	7.5 [7.0-8.0]	10 268	141 249	759	5.4 [5.0-5.8]
Hungary	659	54	8.2 [6.2-10.7]	659	7 246	44	6.1 [4.4-8.2]
Italy*	4 761	408	8.6 [7.8-9.4]	4 082	50 899	163	3.2 [2.7-3.7]
Lithuania	782	71	9.1 [7.1-11.5]	782	9 816	66	6.7 [5.2-8.6]
Netherlands	4 604	709	15.4 [14.3-16.6]	4 597	62 480	508	8.1 [7.4-8.9]
Norway**	694	116	16.7 [13.8-20.0]	694	7 093	71	10.0 [7.8-12.6]
Portugal	1 751	283	16.2 [14.3-18.2]	1 751	22 405	225	10.0 [8.8-11.4]
Spain	2 123	410	19.3 [17.5-21.3]	1 979	28 772	360	12.5 [11.3-13.9]
United Kingdom ***	7 259	753	10.4 [9.6-11.1]	7 259	85 761	626	7.3 [6.7-7.9]
Subtotal	**49 663**	**4 847**	**9.8 [9.5-10.0]**	**45 779**	**589 270**	**3 652**	**6.2 [6.0-6.4]**
Unit-based data							
Czech Republic	318	34	10.7 [7.4-14.9]	318	4 079	31	7.6 [5.2-10.8]
Romania	1 545	12	0.8 [0.4-13.6]	1 537	4 951	12	2.4 [1.3-4.2]
Subtotal	**1 863**	**46**	**2.5 [1.8-3.3]**	**1 855**	**9 030**	**43**	**4.8 [3.4-6.4]**
EU/EEA	**51 526**	**4 893**	**9.5 [9.2-9.8]**	**47 634**	**598 300**	**3 695**	**6.2 [6.0-6.4]**

Data source: ECDC, HAI-Net SSI patient- based and unit-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include data form network SNICh data; **Data from Norway include patient-reported SSI; ***Data from UK-England only.*

Table 6.2a (endoscopic). Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after endoscopic COLO laparoscopic operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Austria	212	13	6.1 [3.3-10.5]	212	2549	10	3.9 [1.9-7.2]
France	4 026	270	6.7 [5.9-7.6]	4 019	41 169	199	4.8 [4.2-5.6]
Germany	3 798	189	5.0 [4.3-5.7]	2 938	30 406	136	4.5 [3.8-5.3]
Hungary	12	3	n/a	12	158	3	n/a
Italy*	921	57	6.2 [4.7-8.0]	774	7 815	23	2.9 [1.9-4.4]
Lithuania	128	8	6.3 [2.7-12.3]	128	1 295	6	4.6 [1.7-10.1]
Netherlands	776	89	11.5 [9.2-14.1]	775	8 080	54	6.7 [5.0-8.7]
Norway**	230	26	11.3 [7.4-16.6]	230	1 810	15	8.3 [4.6-13.7]
Portugal	223	26	11.7 [7.6-17.1]	223	2 318	17	7.3 [4.3-11.7]
Spain	626	93	14.9 [12.0-18.2]	596	7 134	80	11.2 [8.9-14.0]
EU/EEA	**10 952**	**774**	**7.1 [6.6-7.6]**	**9 907**	**102 734**	**543**	**5.3 [4.9-5.7]**

Data source: ECDC, HAI-Net SSI patient- based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include data form network SNICh data; **Data from Norway include patient-reported SSI; ***Data from UK-England only.*

Table 6.2b (open). Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after open COLO operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days	No. of in-hospital SSI (4)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (5)
Austria	240	39	16.3 [11.6-22.2]	240	3 621	34	9.4 [6.5-13.1]
France	8 851	698	7.9 [7.3-8.5]	8 839	120 708	559	4.6 [4.3-5.0]
Germany	9 410	799	8.5 [7.9-9.1]	7 330	110 843	623	5.6 [5.2-6.1]
Hungary	647	51	7.9 [5.9-10.4]	647	7 088	41	5.8 [4.2-7.8]
Italy*	3 838	351	9.1 [8.2-10.2]	3 306	43 066	140	3.3 [2.7-3.8]
Lithuania	654	63	9.6 [7.4-12.3]	654	8 521	60	7.0 [5.4-9.1]
Netherlands	3 828	620	16.2 [14.9-17.5]	3 822	54 400	454	8.3 [7.6-9.1]
Norway**	464	90	19.4 [15.6-23.8]	464	5 283	56	10.6 [8.0-13.8]
Portugal	1 528	257	16.8 [14.8-19.0]	1 528	20 087	208	10.4 [9.0-11.9]
Spain	1 484	316	21.3 [19.0-23.8]	1 371	21 448	279	13.0 [11.5-14.6]
United Kingdom***	7 259	753	10.4 [9.6-11.1]	7 259	85 761	626	7.3 [6.7-7.9]
EU/EEA	**38 203**	**4 037**	**10.6 [10.2-10.9]**	**35 460**	**480 826**	**3 080**	**6.4 [6.2-6.6]**

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include data from network SNICh data; **Data from Norway include patient-reported SSI; ***Data from UK-England only.*

Table 6.3. Percentile distribution of cumulative incidences of SSI in COLO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	572	11 843	926	7.8	7.0	0	0	3.3	11.5	19.0
1	613	17 597	1 700	9.7	9.3	0	0	7.7	14.3	21.2
2 and 3	590	11 645	1 504	12.9	14.0	0	0	10.0	21.1	35.3
Unknown	201	2 581	241	9.3	9.4	0	0	0	11.1	25.0
Overall	623	43 666	4 371	10.0	9.7	0	3.4	8.1	14.3	20.6

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within 30 days of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

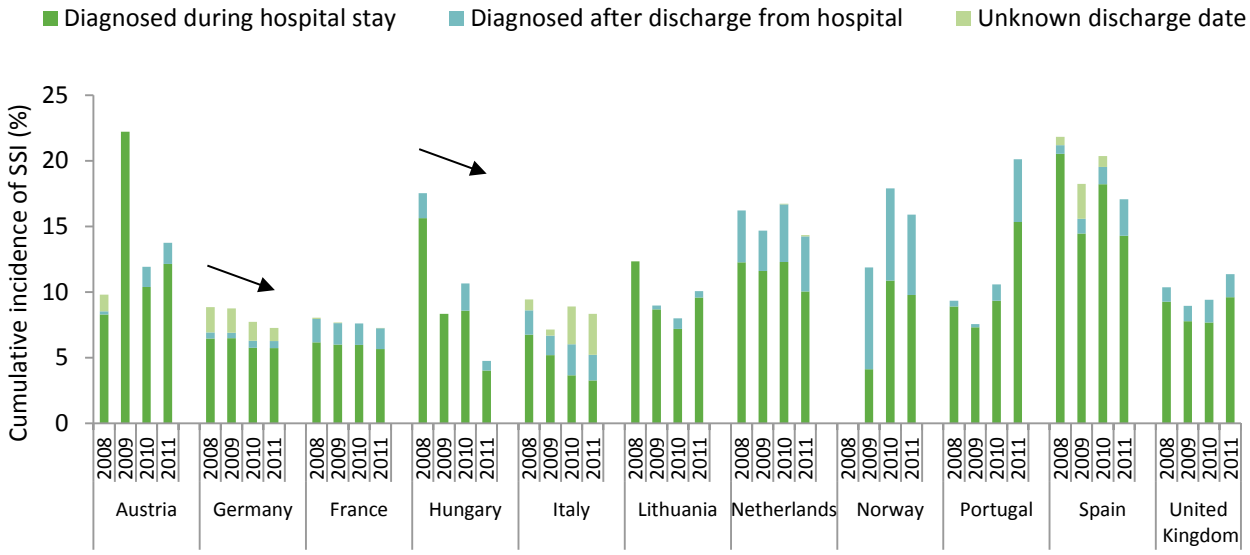
Table 6.4. Percentile distribution of incidence densities of SSI in COLO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	537	118 249	656	5.5	4.8	0	0	0	8	14.5
1	576	205 362	1 278	6.2	5.6	0	0	4.2	8.9	14.5
2 and 3	552	159 766	1 172	7.3	7.2	0	0	4.6	11.9	18.5
Unknown	194	33 923	192	5.7	4.4	0	0	0	6.6	14.2
Overall	584	517 300	3 298	6.4	5.8	0	1.7	4.8	9	13.1

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge – date of operation +1); (3) Number of SSI reported within 30 days of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

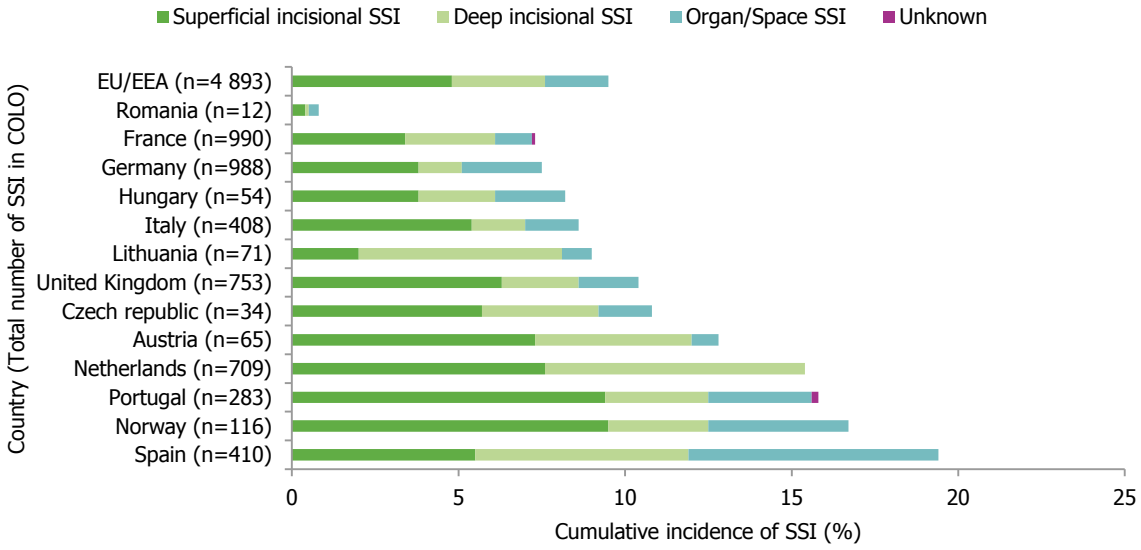
Figure 6.1. Cumulative incidence of SSI in COLO operations by country, 2008–2011



Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

Note: Trend analysis was not performed for networks reporting data for less than three years. The arrows indicate significant trends for both cumulative incidence and incidence density ($p < 0.05$). Post-discharge surveillance methods and practices differ considerably among countries. Data from Norway include patient-reported SSI. United Kingdom: data from UK-England only; 2008 data were excluded from cumulative incidence trend analysis because of a change in the surveillance protocol mid-2008 (see methods).

Figure 6.2. Cumulative incidence of SSI in COLO operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional SSI. Data from Norway include patient-reported SSI.

Caesarean section (CSEC)

Key points

- A total of 167 202 CSEC operations were reported for 2010–2011.
- CSEC operations were reported using the patient-based protocol by 14 networks in 12 EU/EEA countries, and using the unit-based protocol by one network in one EU/EEA country.
- The cumulative incidence of SSI was 2.9% [inter-country range: 0.4%–6.8%] in 2010–2011.
- The incidence density of SSI was 0.8 [inter-country range: 0.3–3.4] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 167 202 CSEC operations, and 4 894 SSI subsequent to the operation, were reported to ECDC. Characteristics of the patients with CSEC operations are summarised in Table 7.1. SSI were detected in 2.9% [inter-country range: 0.4%–6.8%] of CSEC operations (cumulative incidence) within 30 days of surgery (Table 7.2).

Sixteen per cent of SSI were diagnosed in hospitals, whereas 84% were detected after discharge. The percentage of SSI detected after discharge ranged from 0% (0 of 18 SSI) in Lithuania to 90% (97 of 108 SSI) in the Netherlands (Figure 7.1).

The percentile distribution of the SSI cumulative incidence in hospitals reporting at least 20 operations (n=885 hospital-years) is given by NHSN risk index in Table 7.3. The mean of hospital cumulative incidences was 2.1 SSI per 100 operations, with 10% of the hospitals reporting a cumulative incidence of SSI of more than 6.0%. The cumulative incidence by NHSN risk index (database mean) varied from 2.8% for CSEC operations with a risk index of 0, to 5.5% for CSEC operations with a risk index of 2 or 3 (Table 7.3).

The percentile distribution of the incidence density of SSI in hospitals reporting at least 20 operations with a known discharge date (n= 859 hospital-years) is given by NHSN risk index in Table 7.4. The mean of incidence densities in participating hospitals was 0.8 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal to or greater than 2.7 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 0.7 in-hospital SSI per 1 000 post-operative patient-days for CSEC operations with a risk index of 0, to 3.4 in-hospital SSI per 1 000 post-operative patient-days for CSEC operations with a risk index of 2 or 3 (Table 7.4).

The distribution of SSI by type showed that 4 247 (87%) were superficial incisional SSI, 485 (10%) were deep incisional SSI, 143 (3%) were organ/space SSI and for 19 (<1%) SSI, the type was unknown (Figure 7.2).

Microbiological data were available for 7.6% of 4 894 SSI in nine countries reporting microbiological data for SSI in CSEC (Annex 2, Table A2.1). A total of 462 microorganisms were reported (Annex 2, Table A2.2). Two hundred and forty-eight of 462 (53.6%) isolated microorganisms were Gram-positive cocci and of these, 116 (25.1%) were *S. aureus.* Six out of 25 (24%) *S. aureus* isolates were MRSA. Gram-negative bacilli (Enterobacteriaceae), non-fermentative Gram-negative bacilli and anaerobes represented 29.2%, 4.4% and 4.4% of isolated microorganisms respectively.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 7.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant decreasing trend in France, Hungary, Lithuania, United Kingdom and increasing trend in Portugal. The overall trend analysis for CSEC in countries contributing data for all four years (2008–2011) showed a significant decrease in the cumulative incidence of SSI and in the incidence density of in-hospital diagnosed SSI (Figure 3.3, Figure 3.4).

Discussion

There are large inter-country differences in the percentage of SSI following CSEC reported after hospital discharge, reflecting differences in national surveillance methods. The high cumulative incidences are reported by countries with intensive post-discharge surveillance system. Only 8 % of all SSI are reported with information about the isolated microorganisms. This missing information may be due to the fact that microbiological samples are not performed for outpatients with SSI or that microbiological results are not collected in some national surveillance protocols.

Caesarean section (CSEC)

Table 7.1. Characteristics of patients with CSEC operations, 2010–2011 (n=160 539 operations)

Characteristics	Value
Sex ratio (M:F)	0
Median age (years)	31
Post-operative case fatality (%)	0
Contaminated or dirty operations (%)	3.0
Median duration of operation (min)	40
Median length of post-operative stay (days)	5.6
Urgent operations (%)	53.0
Antibiotic prophylaxis (%)	89.1

Table 7.2. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after CSEC operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
Austria	6 803	41	0.6 [0.4-0.8]	6 801	45 006	26	0.6 [0.3-0.8]
France	37 969	506	1.3 [1.2-1.5]	37 846	254 100	168	0.7 [0.6-0.8]
Germany	28 770	188	0.7 [0.6-0.8]	22 425	166 366	61	0.4 [0.3-0.5]
Hungary	4 998	46	0.9 [0.7-1.2]	4 998	29 654	19	0.6 [0.4-1.0]
Italy*	8 842	159	1.8 [1.5-2.1]	6 908	36 476	11	0.3 [0.2-.05]
Lithuania	4 393	18	0.4 [0.2-0.6]	4 393	24 805	18	0.7 [0.4-1.1]
Malta	493	11	2.2 [1.1-4.0]	493	2 647	9	3.4 [1.6-6.5]
Netherlands	9 153	108	1.2 [1.0-1.4]	9 153	41 033	11	0.3 [0.1-0.5]
Norway**	4 709	320	6.8 [6.1-7.6]	4 709	24 888	52	2.1 [1.6-2.7]
Portugal	3 344	63	1.9 [1.4-2.4	3 344	13 491	8	0.6 [0.3-1.2]
Spain	1 666	37	2.2 [1.6-3.1]	1 632	8 677	15	1.7 [1.0-2.9]
United Kingdom***	49 399	3 295	6.7 [6.4-6.9]	48 925	196 520	260	1.3 [1.2-1.5]
Subtotal	**160 539**	**4 792**	**3.0 [2.9-3.1]**	**151 627**	**843 663**	**658**	**0.8 [0.7-0.8]**
Unit-based data							
United Kingdom****	6 663	102	1.5 [1.2-1.9]	n/a	n/a	n/a	n/a
Subtotal	**6 663**	**102**	**1.5 [1.2-1.9]**	**n/a**	**n/a**	**n/a**	**n/a**
EU/EEA	**167 202**	**4 894**	**2.9 [2.8-3.0]**	**151 627**	**843 663**	**658**	**0.8 [0.7-0.8]**

Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/ Number of post-operative patient-days.

**Data from Italy include data from network SNICh; **Data from Norway include patient-reported SSI; ***Combined data from UK Northern Ireland, UK-Scotland and UK-Wales (for details by UK administration, see addendum); ****UK-Scotland data contains partly patient-based and partly unit-based data. n/a=not available.*

Table 7.3. Percentile distribution of cumulative incidences of SSI in CSEC operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	874	130 966	3 729	2.8	2.1	0	0	0.8	2.5	5.9
1	798	17 577	595	3.4	2.9	0	0	0	0	9
2 and 3	224	655	36	5.5	7.7	0	0	0	0	33.3
Unknown	297	9 342	385	4.1	4.5	0	0	0	0.9	12.6
Overall	885	158 540	4 745	3.0	2.1	0	0	1	2.6	6

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within 30 days of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

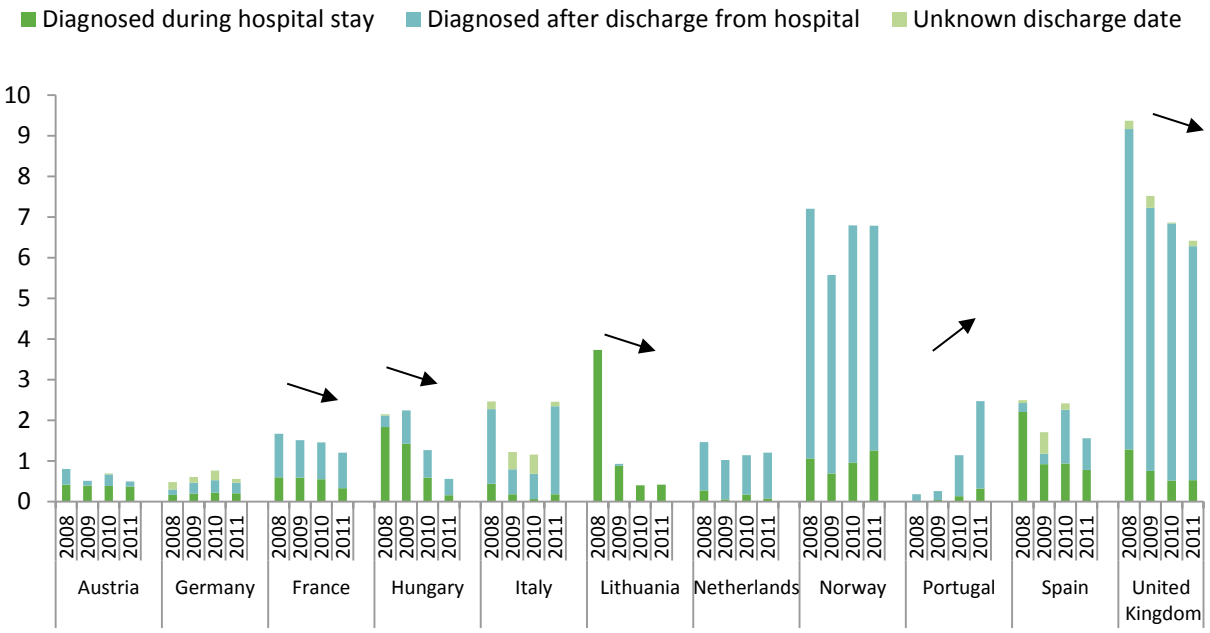
Table 7.4. Percentile distribution of incidence densities of SSI in CSEC operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	848	688 318	471	0.7	0.7	0	0	0	0.6	2.5
1	773	95 475	115	1.2	1.1	0	0	0	0	1.8
2 and 3	211	3 264	11	3.4	3.1	0	0	0	0	0
Unknown	290	43 609	42	1	0.9	0	0	0	0	0
Overall	859	830 666	639	0.8	0.8	0	0	0	1	2.7

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge – date of operation +1); (3) Number of SSI reported within 30 days after the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

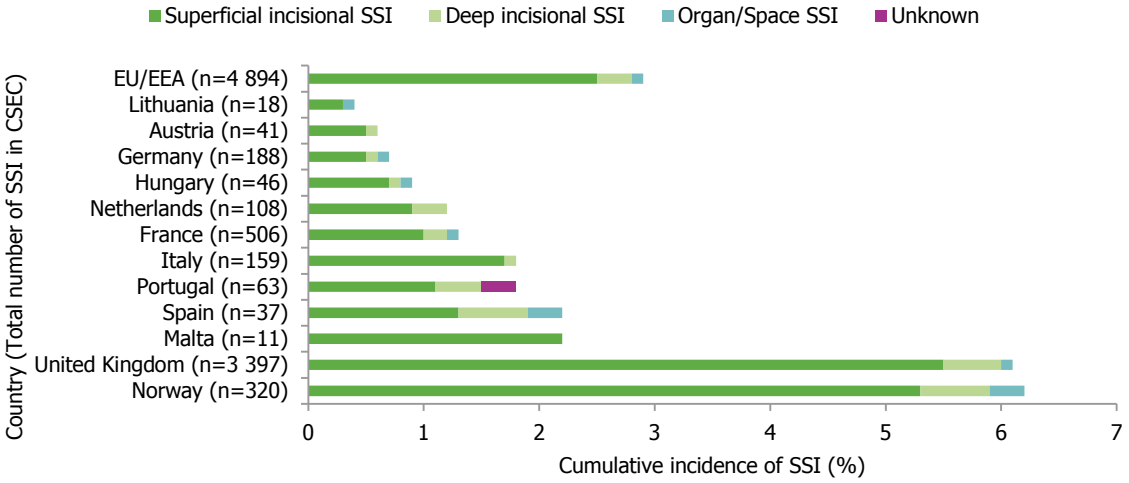
Figure 7.1. Cumulative incidence of SSI in CSEC operations by country, 2008–2011



Data source: ECDC, HAI-Net SSI patient-based data 2008–2011.

Note: Trend analysis was not performed for countries reporting data for less than three years. The arrows indicate significant trends for both cumulative incidence and incidence density ($p < 0.05$). Post-discharge surveillance methods and practices differ considerably between countries. Data from Norway include patient-reported SSI. United Kingdom: data from UK- Northern Ireland, UK-Scotland and UK-Wales

Figure 7.2. Cumulative incidence of SSI in CSEC operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

Note: The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional SSI. Data from Norway include patient-reported SSI. United Kingdom: data from UK- Northern Ireland, UK-Scotland and UK-Wales.

Hip prosthesis (HPRO)

Key points

- A total of 267 985 HPRO operations were reported for 2010–2011.
- HPRO operations were reported using the patient-based protocol by 17 networks in 13 EU/EEA countries, and using the unit-based protocol by two networks in two 2 EU/EEA countries.
- The cumulative incidence of SSI was 1.0% [inter-country range: 0.4%–11.4%] in 2010–2011.
- The incidence density of SSI was 0.5 [inter-country range: 0.1–8.2] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 267 985 HPRO operations and 2 788 SSI subsequent to the operation, were reported to ECDC for 2010 and 2011. The characteristics of the patients with HPRO operations are summarised in Table 8.1. SSI were detected in 1.0% [inter-country range: 0.4%–11.4%] of HPRO operations (cumulative incidence) within one year of surgery (Table 8.2). The cumulative incidence of SSI for total hip replacement (ICD-9-CM code 81.51, n= 163 011) was 0.9% [95%CI: 0.8%–0.9%], whereas it was 3.0% [95%CI: 2.6%–3.4%] for partial hip replacement (ICD-9-CM code 81.52, n= 7 368). For revision of hip replacement (ICD-9-CM code 81.53, n= 8 889), the cumulative incidence of SSI was 1.9% [95%CI: 1.6%–2.2%].

Forty per cent of SSI were diagnosed in hospitals, whereas 60% were detected after discharge. The percentage of SSI detected after discharge ranged from 0% (0 of 5 SSI) in Lithuania to 81% (153 of 190 SSI) in Norway (Figure 8.1). Not all countries perform post-discharge surveillance up to one year following HPRO operations as indicated in the European surveillance protocol (HAISSI protocol v1.1).

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=1 806 hospital-years) is given by NHSN risk index in Table 8.3. The mean of hospital cumulative incidences was 1.1 SSI per 100 operations, with 10% of the hospitals reporting a cumulative incidence of SSI of more than 3.3%. The cumulative incidence by NHSN risk index (database mean) varied from 0.7% for HPRO operations with a risk index of 0, to 2.4% for HPRO operations with a risk index of 2 or 3 (Table 8.3).

The percentile distribution of the incidence density of SSI in hospitals reporting at least 20 operations with a known discharge date (n=1 701 hospital-years) is given by NHSN risk index in Table 8.4. The mean of incidence densities in participating hospitals was 0.4 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal to or greater than 1.6 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 0.3 in-hospital SSI per 1 000 post-operative patient-days for HPRO operations with a risk index of 0, to 1.0 in-hospital SSI per 1 000 post-operative patient-days for HPRO operations with a risk index of 2 or 3 (Table 8.4).

The distribution of SSI by type showed that 1 086 (39%) were superficial incisional SSI, 1 080 (39%) were deep incisional SSI, 602 (22%) were organ/space SSI and for 20 (<1%) SSI the type was unknown (Figure 8.2).

Microbiological data were available for 55% of 2 788 SSI in ten countries reporting microbiological data for SSI in HPRO (Annex 2, Table A2.1). A total of 1 920 microorganisms were reported (Annex 2, Table A2.2). Gram-positive cocci were the primary cause of SSI (66.1%) and of these, *S. aureus* represented 34.0 %, followed by coagulase-negative staphylococci (18.4 %). Ninety-four out of 229 (41.1%) of tested *S. aureus* isolates were MRSA. Gram-negative bacilli (Enterobacteriaceae) and non-fermentative Gram-negative bacilli represented 17.8% and 5.8% of isolated microorganisms respectively.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 8.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant decreasing trend in the Netherlands and Portugal. The overall trend analysis for HPRO in countries contributing data for all four years (2008–2011) showed a significant decrease in the cumulative incidence and in the incidence density of in-hospital diagnosed SSI (Figure 3.3, Figure 3.4).

Discussion

The cumulative incidence of SSI in HPRO was generally low in all countries but higher in countries with more effective post-discharge surveillance. Differences in the sensitivity of the post-discharge surveillance in HPRO may be partially due to differences in national recommendations for the follow-up of HPRO until one year after the operation.

Hip prosthesis (HPRO)

Table 8.1. Characteristics of patients with HPRO operations, 2010–2011 (n=264 933 operations)

Characteristics	Value
Sex ratio (M:F)	0.6
Median age (years)	70
Post-operative case fatality (%)	0.5
Contaminated or dirty operations (%)	0.4
Median duration of operation (min)	82
Median length of post-operative stay (days)	9.4
Urgent operations (%)	5.8
Antibiotic prophylaxis (%)	95.9

Table 8.2. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after HPRO operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
Austria	9 542	113	1.2 [1.0-1.4]	9 542	121 193	46	0.4 [0.3-0.5]
Finland	10 788	148	1.4 [1.2-1.6]	1 028	6 337	8	1.3 [0.5-2.5]
France	50 503	412	0.8 [0.7-0.9]	50 227	496 654	142	0.3 [0.2-0.3]
Germany	65 160	652	1.0 [0.9-1.1]	47 750	648 197	331	0.5 [0.5-0.6]
Hungary	1 089	22	2.0 [1.3-3.1]	1 088	12 315	16	1.3 [0.7-2.1]
Italy*	6 818	82	1.2 [1.0-1.5]	5 756	66 321	17	0.3 [0.1-0.4]
Lithuania	1 221	5	0.4 [0.1-1.0]	1 221	12 255	5	0.4 [0.1-1.0]
Malta	236	27	11.4 [7.5-16.6]	236	2 435	14	5.7 [3.1-9.6]
Netherlands	15 157	277	1.8 [1.6-2.1]	15 157	97 543	57	0.6 [0.4-0.8]
Norway**	5 168	190	3.7 [3.2-4.2]	5 167	35 996	37	1.0 [0.7-1.4]
Portugal	1 719	24	1.4 [0.9-2.1]	1 719	19 425	7	0.4 [0.1-0.7]
Spain	3 355	107	3.2 [2.6-3.9]	3 178	28 747	44	1.5 [1.1-2.1]
United Kingdom***	94 177	703	0.7 [0.7-0.8]	93 865	663 248	286	0.4 [0.4-0.5]
Subtotal	**264 933**	**2 762**	**1.0 [1.0-1.1]**	**235 934**	**2 210 666**	**1 010**	**0.5 [0.4-0.5]**
Unit-based data							
Romania	114	4	3.5 [1.0-9.0]	113	485	4	8.2 [2.2-21.1]
United Kingdom****	2 938	22	0.7 [0.5-1.1]	n/a	n/a	n/a	n/a
Subtotal	**3 052**	**26**	**0.9 [0.6-1.2]**	**113**	**485**	**4**	**8.2 [2.2-21.1]**
EU/EEA	**267 985**	**2 788**	**1.0 [1.0-1.1]**	**236 047**	**2 211 151**	**1 014**	**0.5 [0.4-0.5]**

Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations. Note: Some countries do not recommend follow-up until one year and post-discharge surveillance methods and practices differ considerably between countries; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days.

** Data from Italy include data from 2 networks (ISChIA and SNICh, for detailed data, see addendum); **Data from Norway include patient-reported SSI; ***Combined data from UK-England, UK Northern Ireland, UK-Scotland and UK-Wales (for details by UK administration, see addendum); ****Data provided by UK-Scotland (unit-based data). n/a=not available.*

Table 8.3. Percentile distribution of cumulative incidences of SSI in HPRO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	1 782	161 002	1 163	0.7	0.9	0	0	0	0.9	2.6
1	1 788	78 586	1 191	1.5	1.6	0	0	0	2.2	5.0
2 and 3	1 294	9 108	220	2.4	2.9	0	0	0	0	7.1
Unknown	579	11 425	120	1.1	1.4	0	0	0	0	0.6
Overall	1 806	260 121	2 694	1.0	1.1	0	0	0.4	1.7	3.3

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within one year of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

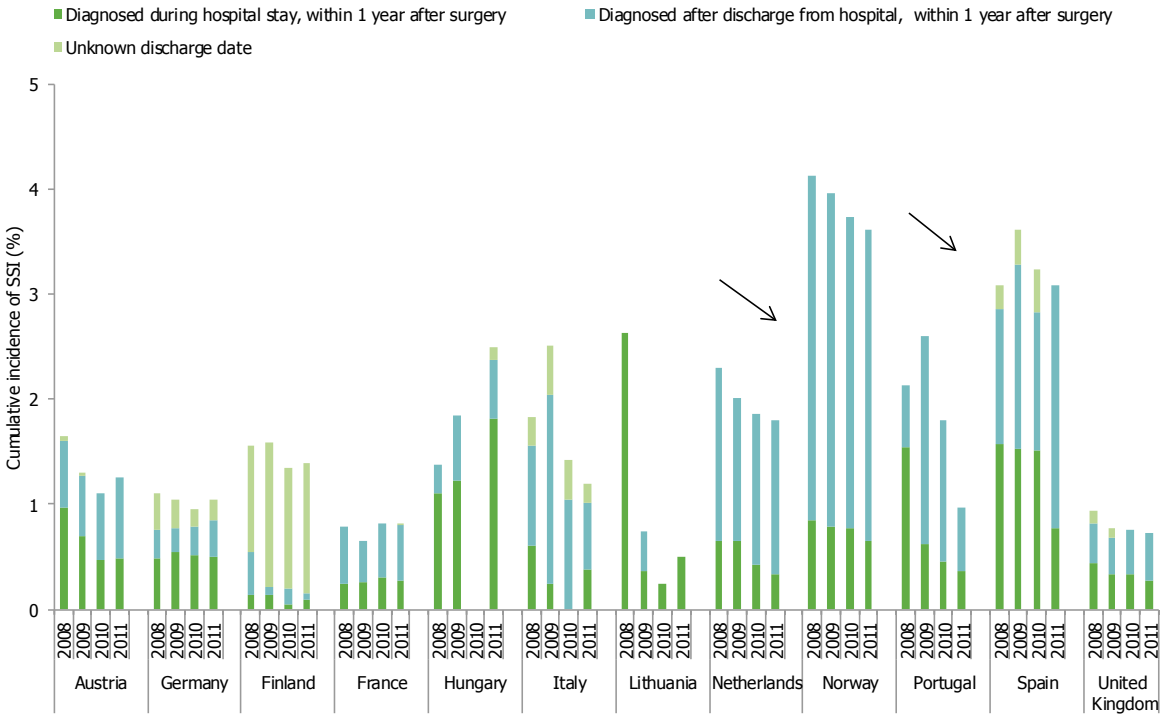
Table 8.4. Percentile distribution of incidence densities of SSI in HPRO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	1 682	1 217 767	357	0.3	0.3	0	0	0	0	1.0
1	1 687	755 464	466	0.6	0.6	0	0	0	0	2.1
2 and 3	1 211	104 124	108	1.0	0.9	0	0	0	0	0
Unknown	561	79 722	40	0.5	0.5	0	0	0	0	0
Overall	1 701	2 157 077	971	0.5	0.4	0	0	0	0.5	1.6

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge – date of operation +1); (3) Number of SSI reported within one year of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

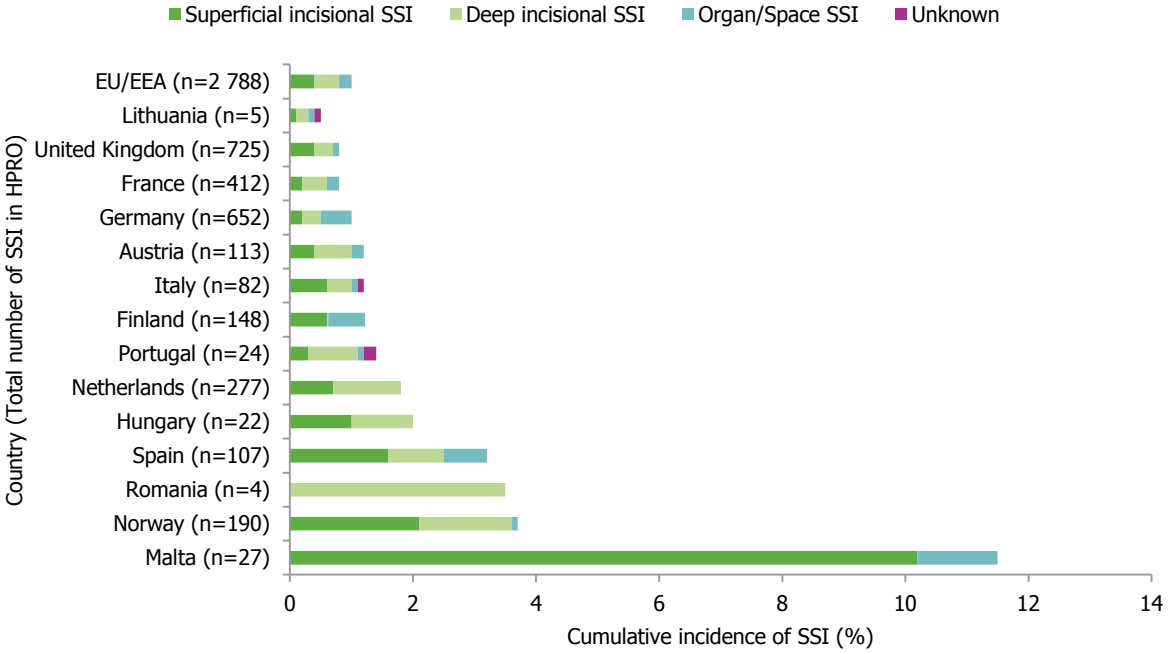
Figure 8.1. Cumulative incidence of SSI in HPRO operations by country, 2008–2011



Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

Note: Trend analysis was not performed for countries reporting data for less than three years. The arrows indicate significant decreasing trends for both cumulative incidence and incidence density ($p < 0.05$). Some countries do not recommend follow-up until one year and post-discharge surveillance methods and practices differ considerably among countries. Data from Norway include patient-reported SSI. United Kingdom: data from UK-England, UK- Northern Ireland, UK-Scotland and UK-Wales; trend analysis of the cumulative incidence for UK was only done for 2009-2011 because of change in surveillance protocol in UK-England mid-2008 (see methods).

Figure 8.2. Cumulative incidence of SSI in HPRO operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

Note: The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional SSI. Data from Norway include patient-reported SSI. . United Kingdom: data from UK-England, UK- Northern Ireland, UK-Scotland and UK-Wales.

Knee prosthesis (KPRO)

Key points

- A total of 187 786 KPRO operations were reported for 2010–2011.
- KPRO operations were reported using the patient-based protocol by 15 networks in 11 EU/EEA countries, and using the unit-based protocol by one network in one EU/EEA country.
- The cumulative incidence of SSI was 0.7% [inter-country range: 0.2%–3.2%] in 2010–2011.
- The SSI incidence density was 0.3 [inter-country range: 0–1.0] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 187 786 KPRO operations, and 1 340 SSI subsequent to the operation, were reported to ECDC for 2010 and 2011. The characteristics of the patients with KPRO operations are summarised in Table 9.1. SSI were detected in 0.7% [inter-country range: 0.2%–3.2%] of KPRO operations (cumulative incidence) within one year of surgery (Table 9.2). ICD-9-CM codes were available for 53.7% of the operations. The cumulative incidence of SSI was 0.73% [0.68%-0.78%] in total knee replacements (ICD-9-CM code 81.54, n= 107 408 operations) and 1.61% [95% CI: 1.3%-2.0%] in knee replacement revisions (ICD-9-CM code 81.55, n=5 469 operations).

Thirty per cent of SSI were diagnosed in hospitals, whereas 70% were detected after discharge. The percentage of SSI detected after discharge was above 70% in eight out of eleven countries (Figure 9.1).

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=1 232 hospital-years) is given by NHSN risk index in Table 9.3. The mean of hospital cumulative incidences was 0.6 SSI per 100 operations, with 10% of the hospitals reporting an SSI cumulative incidence of more than 2.1%. The cumulative incidence by NHSN risk index (database mean) varied from 0.6% for KPRO operations with a risk index of 0, to 1.5% for KPRO operations with a risk index of 2 or 3 (Table 9.3).

The percentile distribution of the incidence density of SSI in hospitals reporting at least 20 operations with a known discharge date (n=1 147 hospital-years) is given by NHSN risk index in Table 9.4. The mean of incidence densities in participating hospitals was 0.2 in-hospital SSI per 1 000 post-operative patient-days, with 10% of the hospitals reporting an incidence density equal to or greater than 0.8 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 0.2 in-hospital SSI per 1 000 post-operative patient-days for KPRO operations with a risk index of 0, to 0.5 in-hospital SSI per 1 000 post-operative patient-days for KPRO operations with a risk index of 2 or 3 (Table 9.4).

The distribution of SSI by type showed that 621 (46%) were superficial incisional SSI, 429 (32%) were deep incisional SSI 274 (20%) were organ/space SSI and for 16 (1%) SSI the type was unknown (Figure 9.2).

Microbiological data were available for 49.8% of 1 340 SSI in countries reporting microbiological data for SSI in KPRO (Annex 2, table A2.1). A total of 779 microorganisms were reported (Annex 2, Table A2.2). Similar to HPRO, Gram-positive cocci were the most common microorganisms associated with SSI following KPRO (74.1%) and of these, *S. aureus* represented 38.6%, followed by coagulase-negative staphylococci (23.8%). Approximately 26% of tested *S. aureus* isolates were MRSA. Gram-negative bacilli (Enterobacteriaceae) and non-fermentative Gram-negative bacilli represented 12.2% and 3.9% of isolated microorganisms, respectively.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 9.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant increasing trend in United Kingdom. The overall trend analysis for KPRO in countries contributing data for all four years (2008–2011) showed a significant decrease of the cumulative incidence but an increase in the incidence density of in-hospital diagnosed SSI (Figure 3.3, Figure 3.4).

Discussion

Differences between surveillance networks in cumulative incidence of SSI depend on post-discharge surveillance, because the more infections are diagnosed post-discharge, the higher cumulative incidence of SSI there is reported by the network.

Knee prosthesis (KPRO)

Table 9.1. Characteristics of patients with KPRO operations, 2010–2011 (n=185 785 operations)

Characteristics	Value
Sex ratio (M:F)	0.6
Median age (years)	70
Post-operative case fatality (%)	0.2
Contaminated or dirty operations (%)	0.2
Median duration of operation (min)	85
Median length of post-operative stay (days)	8
Urgent operations (%)	0.2
Antibiotic prophylaxis (%)	97.1

Table 9.2. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after KPRO operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
Austria	597	2	0.3 [0-1.2]	597	6 393	0	0 [0-0.6]*
Finland	8 557	117	1.4 [1.1-1.6]	628	4 341	0	0 [0-0.8]*
France	26 946	101	0.4 [0.3-0.5]	26 753	258 948	24	0.1 [0.1-0.1]
Germany	34 719	231	0.7 [0.6-0.8]	22 834	284 262	66	0.2 [0.2-0.3]
Hungary	236	3	1.3 [0.3-3.7]	236	2 326	0	0 [0-0.2]*
Italy**	2 997	40	1.3 [1.0-1.8]	2 606	27 996	6	0.2 [0.1-0.4]
Lithuania	848	2	0.2 [0.3-0.9]	848	8 450	1	0.1 [0-0.7]
Netherlands	10 588	136	1.3 [1.1-1.5]	10 588	61 850	13	0.2 [0.1-0.4]
Portugal	1 213	30	2.5 [1.7-3.5]	1 213	13 372	9	0.7 [0.3-1.2]
Spain	1 900	61	3.2 [2.5-4.1]	1 684	14 156	14	1.0 [0.5-1.7]
United Kingdom***	97 184	615	0.6 [0.6-0.7]	97 110	643 105	207	0.3 [0.3-0.4]
Subtotal	**185 785**	**1 338**	**0.7 [0.7-0.8]**	**165 097**	**1 325 199**	**340**	**0.3 [0.2-0.3]**
Unit-based data							
United Kingdom ****	2 001	2	0.1 [0-0.4]	n/a	n/a	n/a	n/a
Subtotal	**2 001**	**2**	**0.1 [0-0.4]**	**n/a**	**n/a**	**n/a**	**n/a**
EU/EEA	**187 786**	**1 340**	**0.7 [0.7-0.8]**	**165 097**	**1 325 199**	**340**	**0.3 [0.2-0.3]**

Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.

(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations. Note: Some countries do not recommend follow-up until up to one year and post-discharge surveillance methods and practices differ considerably between countries; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days.

**One-sided confidence interval; **Data from Italy contains data from 2 networks (SNICh and ISChIA); ***Combined data from UK-England, UK-Northern Ireland, UK-Scotland and UK-Wales (for detailed data on each part of the UK, see addendum); ****UK-Scotland unit-based data. n/a=not available.*

Table 9.3. Percentile distribution of cumulative incidences of SSI in KPRO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	1 217	118 310	672	0.6	0.6	0	0	0	0.5	1.8
1	1 213	48 671	480	1.0	0.8	0	0	0	0	2.9
2 and 3	821	5 638	85	1.5	1.4	0	0	0	0	0
Unknown	420	8 230	63	0.8	0.9	0	0	0	0	0
Overall	1 232	180 849	1 300	0.7	0.6	0	0	0	0.9	2.1

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within one year of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

Table 9.4. Percentile distribution of SSI incidence densities in KPRO operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	1 137	799 325	151	0.2	0.2	0	0	0	0	0.1
1	1 133	374 577	136	0.4	0.3	0	0	0	0	0.4
2 and 3	754	48 123	23	0.5	0.3	0	0	0	0	0
Unknown	405	52 231	16	0.3	0.2	0	0	0	0	0
Overall	1 147	1 274 256	326	0.3	0.2	0	0	0	0	0.8

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

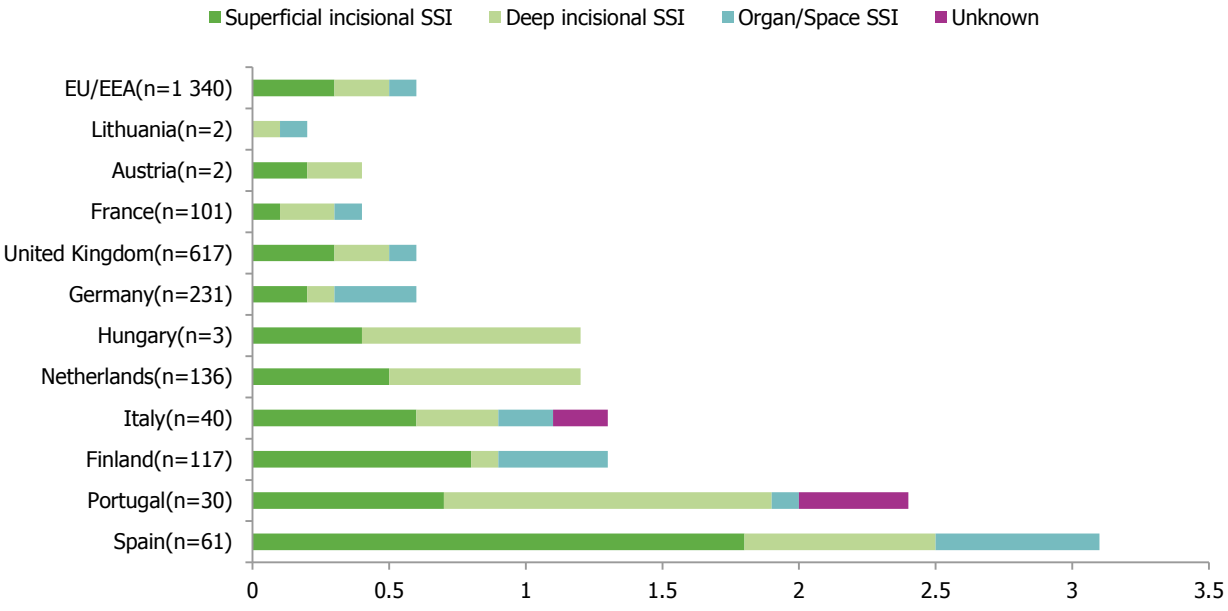
(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge - date of operation+1); (3) Number of SSI reported within one year of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1 000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

Figure 9.1. Cumulative incidence of SSI in KPRO operations by country, 2008–2011

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

Note: Trend analysis was not performed for countries reporting data for less than three years. Some countries do not recommend follow-up until up to one year and post-discharge surveillance methods and practices differ considerably among countries. United Kingdom: data from UK-England, UK- Northern Ireland, UK-Scotland and UK-Wales; trend analysis of the cumulative incidence for UK was only done for 2009-2011 because of change in surveillance protocol in UK-England mid-2008 (see methods).

Figure 9.2. Cumulative incidence of SSI in KPRO operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based and unit-based data 2010–2011.
Note: The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional SSI. United Kingdom: data from UK-England, UK- Northern Ireland, UK-Scotland and UK-Wales.

Laminectomy (LAM)

Key points

- A total of 14 681 LAM operations were reported for 2010–2011.
- LAM operations were reported using the patient-based protocol by eight networks in eight EU/EEA countries, and using the unit-based protocol by one network in one EU/EEA country.
- The cumulative incidence of SSI was 0.8% [inter-country range: 0.2%–8.3%] in 2010–2011.
- The incidence density of SSI was 0.7 [inter-country range: 0–7.2] in-hospital SSI per 1 000 post-operative patient-days in 2010–2011.

Results

A total of 14 681 LAM operations, and 122 SSI subsequent to the operation, were reported to ECDC for 2010 and 2011. The characteristics of the patients with LAM operations are summarised in Table 10.1. SSI were detected in 0.8% [inter-country range: 0.2%–8.3%] of LAM operations (cumulative incidence) within 30 days of surgery (Table 9.2).

Forty-seven per cent of SSI were diagnosed in hospitals, whereas 53% were detected after discharge (Figure 10.1).

According to the current protocol (HAISSI protocol v.1.02), only SSI reported within a time frame of 30 days following surgery must be included. Four (3.26%) of 122 SSI following LAM operations were reported after 30 days and these SSI infections were excluded from further data analysis.

The percentile distribution of the cumulative incidence of SSI in hospitals reporting at least 20 operations (n=137 hospital-years) is given by NHSN risk index in Table 10.3. The mean of hospital cumulative incidences was 1.4 SSI per 100 operations, with 10% of the hospitals reporting a cumulative incidence of SSI above 4.5%. The cumulative incidence by NHSN risk index (database mean) varied from 0.4% for LAM operations with a risk index of 0, to 4.2% for LAM operations with a risk index of 2 or 3 (Table 10.3).

Table 10.4 shows the percentile distribution of the SSI incidence density in hospitals reporting at least 20 operations with a known discharge date (n=129 hospital-years) given by NHSN risk index. The mean of incidence densities in participating hospitals was 0.7 in-hospital SSI per 1 000 post-operative patient-days, with 10% of hospitals reporting an incidence density equal to or greater than 2.3 in-hospital SSI per 1 000 post-operative patient-days. The incidence density of SSI by NHSN risk index (database mean) ranged from 0.3 in-hospital SSI per 1 000 post-operative patient-days for LAM operations with a risk index of 0, to 2.5 in-hospital SSI per 1 000 post-operative patient-days for LAM operations with a risk index of 2 or 3 (Table 10.4).

The distribution of SSI by type showed that 53 (43%) were superficial incisional SSI, 38 (31%) were deep incisional SSI, 27 (22%) were organ/space SSI and for four (3%) SSI the type was unknown (Figure 10.2).

Microbiological data were available for 58% of 122 SSI in six countries reporting microbiological data for SSI in LAM (Annex 2, Table A2.1). A total of 82 microorganisms were reported (Annex 2, Table A2.2). Most of the microorganisms were Gram-positive cocci (57.4%), of which 36.6% were *S. aureus*. Thirty per cent of the *S. aureus* isolates tested were MRSA. Enterobacteriaceae and non-fermentative Gram-negative bacilli represented 23.1% and 13.5% of isolated microorganisms, respectively.

Trends, 2008–2011

Intra-country trends for the cumulative incidence of SSI for 2008–2011 are shown in Figure 10.1. Trend analysis of the SSI cumulative incidence and of the incidence density showed a statistically significant no trends in the participating countries. The overall trend analysis for LAM in countries contributing data for all four years (2008–2011) showed a significant decrease in the cumulative incidence SSI (Figure 3.3).

Discussion

Similar to HPRO and KPRO, LAM is a 'clean' procedure with a low expected incidence of SSI. The higher cumulative incidence of SSI in LAM for Hungary was possibly due to a selection bias since only two hospitals contributed data for LAM (Figure 10.2).

Laminectomy (LAM)

Table 10.1. Characteristics of patients with LAM operations, 2010–2011 (n=13 729 operations)

Characteristics	Value
Sex ratio (M:F)	1.1
Median age (years)	56
Post-operative case fatality (%)	0.3
Contaminated or dirty operations (%)	0.3
Median duration of operation (min)	88
Median length of post-operative stay (days)	6.5
Urgent operations (%)	5.6
Antibiotic prophylaxis (%)	92.0

Table 10.2. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after LAM operations by country, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days	No. of in-hospital SSI (4)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (5)
Patient-based data							
France	3 746	51	1.4 [1.0-1.8]	3 723	25 256	11	0.4 [0.2-0.8]
Germany	6 117	15	0.2 [0.1-0.4]	4 641	32 292	7	0.2 [0.1-0.4]
Hungary	290	24	8.3 [5.3-12.3]	290	3 342	24	7.2 [4.6-10.7]
Italy*	1 107	3	0.3 [0.1-0.8]	882	5 541	1	0.2 [0-1.0]
Netherlands	1 178	9	0.8 [0.3-1.5]	1 178	4 804	0	0 [0-0.8]**
Portugal	128	1	0.8 [0-4.4]	128	554	1	1.8 [0-10.0]
Spain	502	16	3.2 [1.8-5.2]	500	3 024	9	3.0 [1.4-5.6]
United Kingdom***	661	1	0.2 [0-0.8]	656	2 748	1	0.4 [0-2.0]
Subtotal	**13 729**	**120**	**0.9 [0.7-1.0]**	**11 998**	**77 561**	**54**	**0.7 [0.5-0.9]**
Unit-based data							
Romania	952	2	0.2 [0-0.8]	952	2 856	2	0.7 [0.1-2.5]
Subtotal	**952**	**2**	**0.2 [0-0.8]**	**952**	**2 856**	**2**	**0.7 [0.1-2.5]**
EU/EEA	**14 681**	**122**	**0.8 [0.7-1.0]**	**12 950**	**80 417**	**56**	**0.7 [0.5-0.9]**

Data source: ECDC, HAI-Net SSI patient- based and unit-based data 2010–2011.

*(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations; (3) Operations with missing discharge date are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days. *Data from Italy include data from network SNICh; **One-sided confidence interval; ***Data from UK-Northern Ireland only.*

Table 10.3. Percentile distribution of cumulative incidences of SSI in LAM operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of operations	Number of SSI (2)	Cumulative incidence of SSI (per 100 operations) (3)	Mean and percentile distribution of cumulative incidences of SSI in hospitals					
					Mean (4)	P10	P25	P50	P75	P90
0	134	8 606	37	0.4	0.8	0	0	0	0	2.1
1	132	3 256	43	1.3	1.3	0	0	0	0	5.3
2 and 3	87	479	20	4.2	3.7	0	0	0	0	12.5
Unknown	41	571	7	1.2	1.6	0	0	0	0	0
Overall	137	12 912	107	0.8	1.4	0	0	0	1.7	4.5

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations in a single year are excluded; (2) Number of SSI reported within 30 days of the operation; (3) Cumulative incidence of SSI = (Number of SSI × 100)/Number of operations, database mean; (4) Mean of cumulative incidences by hospital.

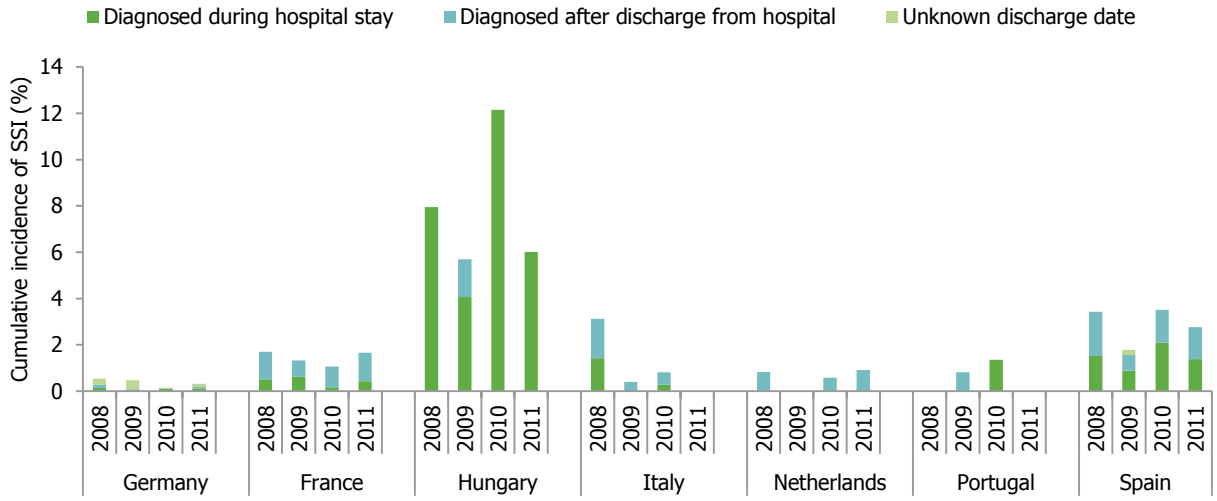
Table 10.4. Percentile distribution of SSI incidence densities in LAM operations at participating hospitals by NHSN risk index, 2010–2011

NHSN risk index	Number of hospital-years (1)	Number of post-operative patient-days (2)	Number of in-hospital SSI (3)	Incidence density of SSI (per 1 000 post-operative patient-days) (4)	Mean and percentile distribution of incidence densities of SSI in hospitals					
					Mean (5)	P10	P25	P50	P75	P90
0	126	42 846	12	0.3	0.3	0	0	0	0	0
1	124	20 985	23	1.1	0.9	0	0	0	0	2.3
2 and 3	79	4 033	10	2.5	1.1	0	0	0	0	0
Unknown	40	3 715	4	1.1	0.6	0	0	0	0	0
Overall	129	71 579	49	0.7	0.7	0	0	0	0	2.3

Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

(1) Hospitals with less than 20 operations with a known discharge date in a single year are excluded; (2) Number of post-operative patient-days = sum of post-operative patient-days (date of discharge – date of operation +1); (3) Number of SSI reported within 30 days of the operation and before discharge from the hospital (SSI reported after discharge from hospital or with an unknown discharge date are excluded); (4) Incidence density = (Number of in-hospital SSI × 1000)/Number of post-operative patient-days; (5) Mean of incidence densities by hospital.

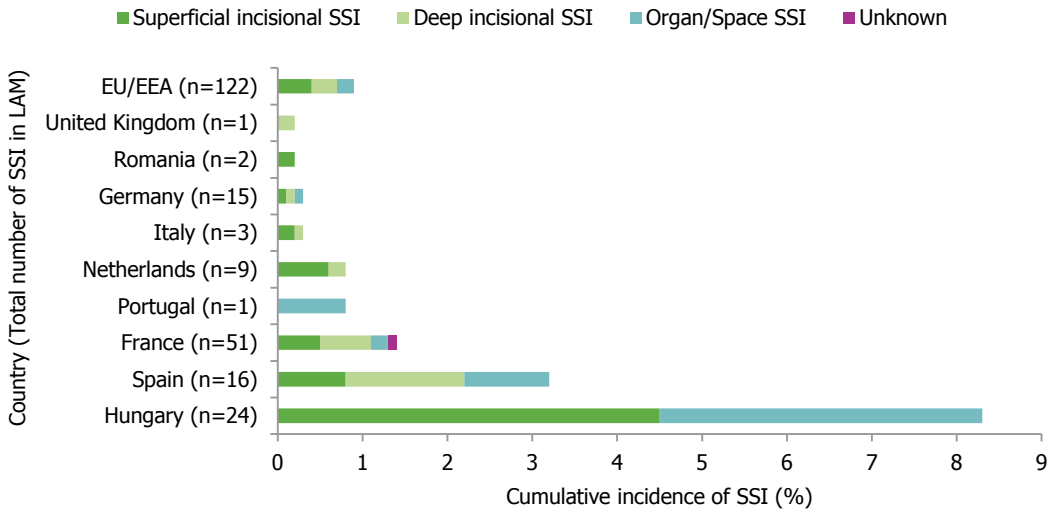
Figure 10.1. Cumulative incidence of SSI in LAM operations by country, 2008–2011



Data source: ECDC, HAI-Net SSI patient-based data 2010–2011.

Note: Trend analysis was not performed for countries reporting data for less than three years. Post-discharge surveillance methods and practices differ considerably among countries.

Figure 10.2. Cumulative incidence of SSI in LAM operations by type of SSI and country, 2010–2011



Data source: ECDC, HAI-Net SSI patient- based and unit-based data 2010–2011.

Note: The Netherlands reports organ/space SSI together with deep incisional SSI as deep incisional.

General discussion

Data on surveillance of SSI for 2011 (with partial follow-up of patients who had undergone orthopaedic surgery until December 2012) were received from 20 surveillance networks in 16 countries and included 424 871 surgical operations from 1 635 hospitals (compared with 386 597 surgical operations from 1 557 hospitals in 2010). Three countries (the Czech Republic, Romania and Slovakia) reported SSI data for the first time in 2011 and three networks reported SSI surveillance data for the first time according to the unit-based ('light') version of the protocol (the Czech Republic, Romania and UK-Scotland).

Two of the three countries that collected data for the first time in 2011 used the unit-based ('light') version of the protocol, indicating that, as anticipated, the light protocol is important to facilitate new national initiatives for surveillance of surgical site infections [8]. In the light protocol denominator, data for operations without SSI should only be collected and reported in an aggregated way [4]. The light protocol allows accounting for two of the main sources of variation of the incidence of SSI (e.g. the differences in post-discharge surveillance). ECDC recommends the patient-based protocol over the unit-based protocol for surveillance of SSI.

The cumulative incidence of SSI, which includes in-hospital and post-discharge diagnosed SSI, varied according to the type of operation with the highest percentages in colon surgery (9.6%) and the lowest in knee prosthesis (0.8%). The incidence density followed the same distribution (highest in COLO with 6.2 SSI per 1 000 post-operative patient-days and the lowest in KPRO with 0.3 in-hospital SSI per 1 000 post-operative patient-days). As expected and previously described [8, 9], endoscopic CHOL and COLO operations showed a lower incidence of SSI than non-endoscopic (open) operations within the same type of operation. The cumulative incidence of SSI was 4.1% and 1.0% in open and endoscopic CHOL operations, respectively. After COLO, cumulative incidence was 10.6% in open and 7.1% in endoscopic operations. The data therefore support the recommendation that, as far as the prevention of SSI is concerned, endoscopic operations should be preferred whenever possible, taking into account the clinical status of the patient, the technical feasibility of an endoscopic procedure and the risk for other adverse outcomes.

Trends were analysed for the last four years (2008–2011) for networks that participated for at least three years during this period, for the cumulative incidence of SSI (adjusting for NHSN risk index) and for the in-hospital incidence density of SSI (SSI registered only in-hospitals and adjusting for the length of post-operative stay in hospitals). Significant overall decreasing trends for the cumulative incidence of SSI as well as for the in-hospital incidence density were observed for CSEC and HPRO. The trend analysis of the in-hospital incidence density showed significant decreasing trends after CHOL ($p=0.001$) and COLO ($p=0.005$) and an increasing trend after KPRO ($p=0.047$), whereas the cumulative incidence after KPRO decreased ($p<0.001$). After LAM was observed decrease of the cumulative incidence ($p=0.024$). No trends were observed for CABG.

Even though the overall trend analyses only included countries that contributed data every year in 2008–2011, results need to be interpreted with caution because the participating hospitals within each county vary from one year to another. It has so far not been possible to only include hospitals that participated continuously (or at least three years out of four for example) because some countries did not consistently use the same unique hospital identifiers during the last four years. In addition, the results of the trend analyses are very much dependent on the choice of the statistical method and the level of aggregation of the data. In the current report, logistic regression was performed for trend analysis of the cumulative incidence, assuming that the follow-up time was constant and applied as in the case definition of SSI for all operations. Poisson regression was used for trend analysis of trends of the in-hospital incidence density, using postoperative patient-days until discharge date as denominator and with correction of the variance estimator because SSI is a dichotomous outcome. Both analytical methods, however, were applied at the operation level, resulting in large sample sizes and therefore even small trends reach the level of statistical significance.

In order to better understand the true (clinical or epidemiological) significance of the observed trends, the current SSI surveillance data should be complemented with data on SSI prevention measures, such as peri-operative antimicrobial prophylaxis and/or a selection of other structure or process indicators relevant for the prevention of SSI. In addition, data from repeated validation studies would be needed to determine if an observed increase or decrease of the cumulative incidence over the years within the same country.

Comparisons of SSI indicators between countries (and between hospitals within a country) must be performed with caution. The various factors that affect comparisons are discussed under the section 'interpretation of the results,' and are categorised in factors that can totally, partially or not be adjusted or accounted for during analysis.

The most important factor influencing the cumulative incidence of SSI (but not the in-hospital incidence density) is the difference in post-discharge surveillance intensity and methods. Variations in the intensity of post-discharge surveillance between countries were indeed very important, as can be deducted from the percentage of SSI detected after discharge from the hospital.

Overall, this percentage was 54% in 2011 (all operation types combined), the highest in CSEC (84%) and the lowest in COLO (20%), and generally higher in Italy (network "ISChIA"), Norway and The Netherlands. It should be noted that the percentage of in-hospital SSI is also influenced by the completeness of data, because SSIs are stratified into in-hospital and post-discharge diagnosed SSI according to the discharge date and date of onset of infection. However, for 8% of SSI, the discharge date or date of onset of the SSI were unknown.

Another indicator of the effectiveness of post-discharge surveillance is the follow-up time after discharge from the hospital. Incomplete follow-up after discharge occurs when post-discharge information was not obtained at the end of the follow-up period for each operation under surveillance, but it may also occur when the national surveillance network recommends a different (shorter) follow-up time than the one defined by the European case definitions of SSIs (30 days follow-up for surgery without implant or one year in case of surgery with implant, e.g. orthopaedic surgery). However, the indicator 'cumulative incidence' (or percentage of operations with at least one surgical site infection) assumes that the follow-up time is equal and complete for all operations under surveillance. In order to take into account differences in follow-up time after discharge from the hospital, it would be possible to calculate the incidence density of SSI for the entire follow-up time (including post-discharge diagnosed SSI) using the variable 'date of last follow-up post-discharge'. However, this was not done because the variable is still optional in the European protocol and was only available for 65% of operations in the database. In addition, this indicator would only take into account differences in follow-up time, but not the other characteristics of the post-discharge surveillance process. Some information on post-discharge methods is collected in the HAI-Net surveillance of SSI since 2010, but these data were so far only provided by eight countries. From these data, it appeared that three methods for obtaining post-discharge information were used most frequently in European countries:

- Hospital surveillance staff obtains information from the patient using telephone or additional questionnaires: four networks (Italy ISChIA, Malta, Norway, UK-Northern Ireland).
- Detection of post-discharge SSI on re-admission to the hospital: three networks (The Netherlands, UK-England and UK-Northern Ireland)
- Hospital surveillance staff obtains information from the surgeon: three networks (Czech Republic, the Netherlands, Romania)

The variation of post-discharge surveillance methods between countries further supports the fact that the indicator 'in-hospital incidence density of SSI' is one of the indicators for inter-country comparisons, because the case finding process within the hospital is likely to be more homogeneous than after discharge from the hospital and, in addition, differences in length of follow-up until discharge from the hospital can be taken into account.

A second factor of major influence on the incidence of SSI is the sensitivity of reporting SSI, in particular of superficial incisional SSI. Large differences were observed between countries with regard to the percentage of superficial SSI as opposed to the more serious deep incisional and organ/space SSI. While the percentage of superficial SSI may be an indicator of higher sensitivity of surveillance of SSI overall, validation studies are needed in order to better understand how SSI are classified in different countries, in order to assess the sensitivity and specificity of SSI surveillance by country and at the EU level and, as mentioned above, to assess whether observed trends within one country may be explained by changes in sensitivity and specificity throughout the years. Therefore, a standardised European validation protocol should be developed and countries should be encouraged to perform validation studies of their national surveillance systems and to intensify training of hospital staff in surveillance methods.

Furthermore, it should be emphasised that the number of hospitals participating in the national surveillance networks is often very low and not representative for the country, in particular when looking at the results for a single operation type (Table 3.2). Results can be heavily biased because of this selection, for example if hospitals decide to participate because they are aware of infection prevention problems with a particular operation type in their setting. This selection bias cannot be controlled for in the analysis and can only be tackled through an increase of the coverage of the national surveillance networks. Several national surveillance networks are still in the start-up (or pilot) phase with few hospitals participating. In other countries the landscape of surveillance of SSI is scattered over several different networks (e.g. different regional surveillance networks in Spain) and data submitted to ECDC only come from one or two regional networks. More efforts are needed at the national level to either increase the number of participating hospitals and/or to join regional or other sub-national surveillance efforts (including standardisation of methods taking into account the ECDC surveillance methods).

Finally, representativeness at the European level of the results of the HAI-Net SSI surveillance is influenced by the few countries (France, Germany and United Kingdom) contributing the majority of data on operations. Despite the steady increase of the number of participating countries, hospitals and number of included operations in the European surveillance over the past eight years (with more than 424 871 operations from 1635 hospitals in 2011 compared to 102 209 operations from 655 hospitals in 2004 [8, 10], there is still a long way to go with 14 EU/EEA Member States still having no national surveillance of SSI in place.

Conclusion and recommendations

In conclusion, the results of SSI surveillance showed in this report represent an essential contribution to our knowledge of SSI in the participating European countries for the period 2010–2011. The number of reported operations increased. The Czech Republic, Romania and Slovakia reported data for the first time in 2011. The European point prevalence survey of healthcare-associated infections (HAIs) and antimicrobial use showed that surgical site infections are the second most frequent HAI in European hospitals [10]. SSI have been shown to be among the most preventable HAI types [11, 12] and are one of the targeted HAI types to be prioritised for surveillance as recommended by the Council. Surveillance of SSI is a crucial tool for the prevention and control of SSI at the hospital level [11]. The ECDC HAI-Net surveillance of SSI has supported Member States to start up new surveillance initiatives and has established European reference data for different SSI incidence indicators in selected operation types, allowing participating hospitals, in particular those from smaller countries or surveillance networks, to compare local surveillance results as a measure of their own performance and to guide and evaluate local SSI prevention efforts. The surveillance results also showed decreasing trends in SSI incidence in several operation types (CSEC, HPRO and LAM), suggesting that prevention efforts, including surveillance, are successful in participating hospitals. Nevertheless, many of the occurring SSI are still preventable and still much need to be done to maximise the prevention of SSI in European hospitals.

In order to enhance the prevention of SSI through surveillance, ECDC in collaboration with Member States should propose a set of evidence-based key interventions for the prevention and control of SSI and monitor their implementation through structure and process indicators integrated in the ECDC SSI surveillance protocol, e.g. in accordance with recent guidelines [13] and as recommended by the Council. This will also allow improving the interpretation of observed SSI incidence trends.

In addition, since the implementation of surveillance at the hospital level as such is a crucial measure for SSI prevention [1, 2], ECDC will continue to support Member States in setting up new surveillance systems or increasing the participation in existing national surveillance networks as well as in further harmonising SSI surveillance methods and improving data quality. Therefore, conditional on the approval of the ECDC work plans and the availability of funding, ECDC will consider to:

- Develop a European validation protocol and support Member States to perform regular validation studies of national SSI surveillance results to improve the interpretation of inter-country differences and of intra-country trends over time and to identify priority areas for training in SSI surveillance methods.
- Improve the free ECDC hospital software tool for SSI surveillance (HELICSWin) and promote the use of the less labour-intensive light SSI surveillance protocol to support the creation of new national surveillance initiatives and increase the number of participating hospitals within existing networks.
- Share training material for SSI surveillance between networks and/or develop common training material to improve surveillance skills among hospital staff, improve data quality and increase the number of participating hospitals.
- Continue the process of harmonisation of SSI surveillance protocols where needed, both between and within countries, to improve the comparability of the data and increase the number of regional networks contributing data to the ECDC surveillance.

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Annex 1: Percentage and characteristics of the missing values

Table A1.1. Percentages of missing values by TESSy variable and year, HAI-Net, 2010–2011

Variable	Name of TESSy variable	Missing values (%), by year		
		2010*	2011†	2010–2011‡
Gender	Gender	0.1	0.2	0.2
In-hospital outcome	OutcomeHospital	35.2	38.2	36.8
Date of operation	DateofOperation	0	0	0
Date of hospital admission	DateofHospitalAdmission	29.0	30.5	29.8
Date of hospital discharge	DateofHospitalDischarge	9.5	9.8	9.7
Date of last follow-up	DateofLastFollowup	34.8	35.0	34.9
Operation code	OPCode	0	0	0
ICD-9-CM code	ICD9CMCode	47.3	48.4	47.9
Endoscopic procedure	EndoscopicProc	1.0	1.0	1.0
Wound class	WoundClass	1.0	1.0	1.0
Duration of operation	OperationDur	0.5	1.5	1.0
Urgent operation	UrgentOperation	20.8	20.9	20.9
ASA score	ASAClassification	3.5	4.1	3.8
Prophylaxis	Prophylaxis	54.2	56.9	55.6
Surgical site infection	SurgicalSiteInfection	0	0	0
Type of infection	SSIType	0.7	0.5	0.6

**2010: n=386 597 operations and n=7 738 SSI*

† 2011: n=409 898 operations and n=7 515 SSI

‡ 2010–2011: n=796 495operations and n=15 253 SSI

Annex 2: Microorganisms isolated from surgical site infections

Table A2.1. Number of SSI with known microbiological results by type of operation, 2010–2011

	Number of reported surgical site infections, by operation type							
	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Total
Total number of SSI	1 467	1 149	4 893	4 894	2 788	1 340	122	16 653
Number of SSI with microbiological data (% of all SSI)	1 294 (88%)	742 (65%)	4 121 (84%)	3 588 (73%)	2 495 (89%)	1 319 (98%)	113 (93%)	13 672 (82%)
Number of SSI with reported positive microbiological results (% of all SSI)	798 (54%)	470 (41%)	2 526 (52%)	372 (8%)	1 531 (55%)	667 (50%)	71 (58%)	6 435 (39%)
Number of microorganisms	983 (a)	663 (b)	3 943 (c)	462 (d)	1 920(e)	779 (f)	82 (g)	8 832(h)
with one single micro-organism	654	325	1 492	295	1 220	572	63	4 621
with two micro-organisms	103	97	667	64	234	78	5	4 585
with three or more micro-organisms	41	46	347	13	77	17	3	544

Number of reported microorganisms by reporting country:

a. AT (n=1), DE (n=603), ES (n=55), FR (n=51), HU (n=11), IT (n=9), LT (n=30), MT (n=16), UK (n=207).
b. AT (n=3), DE (n=241), ES (n=157), FR (n=114), HU (n=20), IT (n=3), LT (n=20), NL (n=64), PT (n=29), RO (n=6), SK(n=6).
c. AT (n=15),CZ (n=56) DE (n=1134), ES (n=494), FR (n=740), HU (n=22), IT (n=76), LT (n=119), NL (n=660), PT (n=200), RO (n=12), UK (n=415).
d. AT (n=5), DE (n=158), ES (n=24), FR (n=179), HU (n=12), IT (n=2), LT (n=13), MT (n=9), NL (n=57), PT (n=3).
e. AT (n=32), DE (n=650), ES (n=94), FR (n=389, HU (n=17), IT (n=13), LT (n=6), MT (n=40), NL (n=286), PT (n=23), RO (n=4), UK (n=366).
f. DE (n=217), ES (n=27), FR (n=84), HU (n=3), IT (n=6), LT (n=3), NL (n=121), PT (n=15), UK (n=303).
g. DE (n=12), ES (n=22), FR (n=33), HU (n=4), NL (n=8), PT (n=1), RO (n=2).
h. Sum for all types of operations in all countries (a)(b)(c)(d)(e)(f)(g).

Table A2.2. Identified microorganisms in SSI for which at least one microorganism was reported, by operation type, pooled data from 10 countries, 2010–2011 (n=8 832)

	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Total
Number of identified microorganisms	983	663	3 943	462	1 920	779	82	8 832
Gram-positive cocci (%)	60.6	36.8	30.0	53.6	66.1	74.1	57.4	47.2
Staphylococcus aureus	21.6	7.1	4.5	25.1	34.0	38.6	36.6	17.4
Coagulase-negative staphylococci	30.0	7.1	2.8	12.3	18.4	23.8	11.0	12.0
Enterococcus species	8.2	18.9	19.6	8.4	10.3	6.0	3.7	14.3
Streptococcus species	0.7	3.6	3.1	7.8	2.9	5.3	4.9	3.3
Other Gram-positive cocci	0.1	0.2	<0.1	0	0.5	0.4	1.2	0.2
Gram-negative cocci (%)	0.1	0.2	0.1	0	0.2	0	0	0.1
Gram-positive bacilli (%)	1.2	1.1	0.4	2.4	2.1	2.6	1.2	1.2
Gram-negative bacilli *Enterobacteriaceae* (%)	22.0	50.2	47.3	29.2	17.8	12.2	23.1	34.1
Escherichia coli	5.4	25.3	29.0	17.8	5.7	3.1	12.2	18.0
Citrobacter species	1.1	2.7	1.4	0.9	0.6	0.3	1.2	1.2
Enterobacter species	4.2	6.8	4.0	2.8	4.1	4.1	4.9	4.2
Klebsiella species	2.6	10.1	4.5	1.5	1.3	1.0	0	3.5
Proteus species	3.9	2.1	3.7	4.3	2.8	1.7	2.4	3.3
Serratia species	2.2	1.1	0.4	0.4	0.9	0.3	1.2	0.8
Other *Enterobacteriaceae*	2.5	2.1	4.3	1.5	2.4	1.7	1.2	3.1
Gram-negative non-fermentative bacilli (%)	6.3	2.6	8.3	4.4	5.8	3.9	13.5	6.7
Acinetobacter species	0.7	0.3	0.3	0.9	1.0	0.5	3.7	0.6
Haemophilus species	0.2	0	<0.1	0.2	0	0.1	0	0.1
Pseudomonas aeruginosa	3.7	2.0	7.0	3.3	4.2	2.6	9.8	5.1
Pseudomonadaceae family, other	1.5	0	0.7	0	0.6	0.6	0	0.7
Stenotrophomonas maltophilia	0.2	0.3	0.1	0	0	0	0	0.1
Other Gram-negative non-fermentative bacilli	0	0	0.2	0	0	0.1	0	0.1
Anaerobes (%)	0.5	4.1	7.4	4.4	1.3	0.7	3.7	4.2
Bacteroides species	0.1	2.6	5.4	2.4	0.4	0.3	0	2.8
Other anaerobes	0.4	1.5	2.0	2.0	0.9	0.4	3.7	1.4
Other bacteria (%)	8.4	3.0	3.7	5.6	6.3	5.8	1.2	5.0
Fungi, parasites (%)	0.8	2.2	2.9	0.4	0.4	1.1	0	1.7
Candida species	0.8	2.0	2.7	0.4	0.4	1.0	0	1.6
Other fungi / parasites	0	0.2	0.2	0	0	0.1	0	0.1

Addendum

United Kingdom

In the United Kingdom, surveillance of SSI is coordinated at regional level (England, Northern Ireland, Scotland and Wales) by four independent surveillance networks. As a consequence, the data are collected following different protocols and uploaded to TESSy as four different and independent data sources.

In the main part of the report, ECDC included combined results for the United Kingdom. In this addendum, and as a courtesy to the United Kingdom, regional results from the four surveillance networks are presented separately.

Table 3.1a. Number of reported operations by data source, type of operation and country in UK, 2010–2011

Country	Number of reported surgical operations, by type of operation							
	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Total
Patient-based data								
England	11 747		7 259		71 437	81 114		171 557
Northern Ireland				11 566	3 469	2 388	661	18 084
Scotland				23 058	12 579	8 065		43 702
Wales				14 775	6 692	5 617		27 084
Subtotal	**11 747**	**0**	**7 259**	**49 399**	**94 177**	**97 184**	**661**	**260 427**
Unit-based data								
Scotland				6 663	2 938	2 001		11 602
Subtotal				**6 663**	**2 938**	**2 001**		**11 602**
United Kingdom Total	**11 747**	**0**	**7 259**	**56 062**	**97 115**	**99 185**	**661**	**272 029**

Coronary artery bypass graft (CABG) and colon surgery (COLO)

CABG and COLO data were only provided by England. These results are presented in the main report and are not repeated in this addendum.

Caesarean section (CSEC)

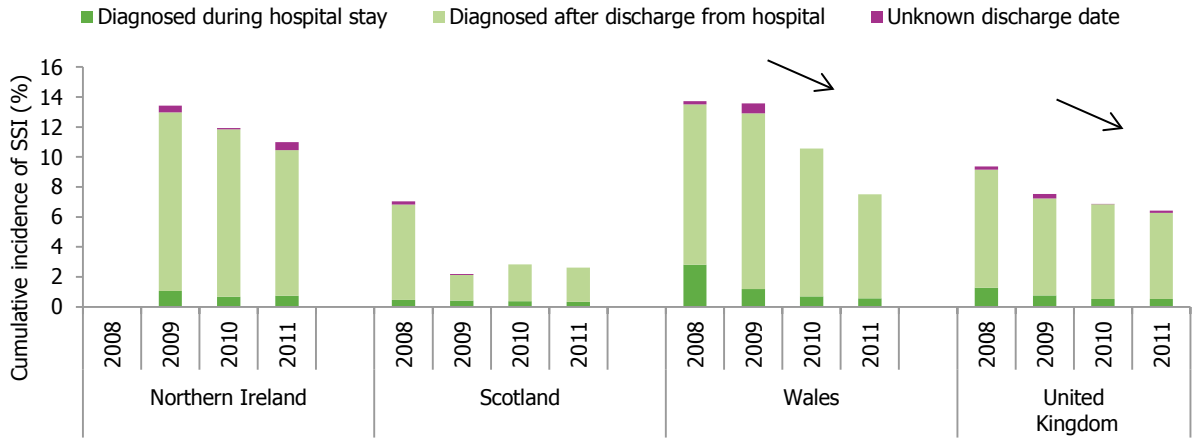
Table 7.2a. Cumulative incidence of SSI (diagnosed within 30 days of surgery) and incidence density of SSI (diagnosed during hospital stay within 30 days of surgery) after CSEC operations by country in UK, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
England	0						
Northern Ireland	11 566	1 328	11.5 [10.9-12.1]	11 128	43 635	82	1.9 [1.5-2.3]
Scotland	23 058	633	2.7 [2.5-3.0]	23 022	96 787	84	0.9 [0.7-1.1]
Wales	14 775	1 334	9.0 [8.6-9.5]	14 775	56 098	94	1.7 [1.4-2.1]
Subtotal	**49 399**	**3 295**	**6.7 [6.4-6.9]**	**48 925**	**196 520**	**260**	**1.3 [1.2-1.5]**
Unit-based data							
Scotland	6 663	102	1.5 [1.2-1.9]	n/a	n/a	n/a	n/a
Subtotal	**6 663**	**102**	**1.5 [1.2-1.9]**	**n/a**	**n/a**	**n/a**	**n/a**
United Kingdom	**56 062**	**3 397**	**6.1 [5.9-6.3]**	**48 925**	**196 520**	**260**	**1.3 [1.2-1.5]**

(1) Only SSI diagnosed within 30 days of the operation are included; (2) Cumulative incidence SSI = (Number of SSI x 100)/Number of operations; (3) Operations with missing discharge dates are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within 30 days of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/ Number of postoperative patient-days.

UK-Scotland data contains part patient-based and part unit-based data.

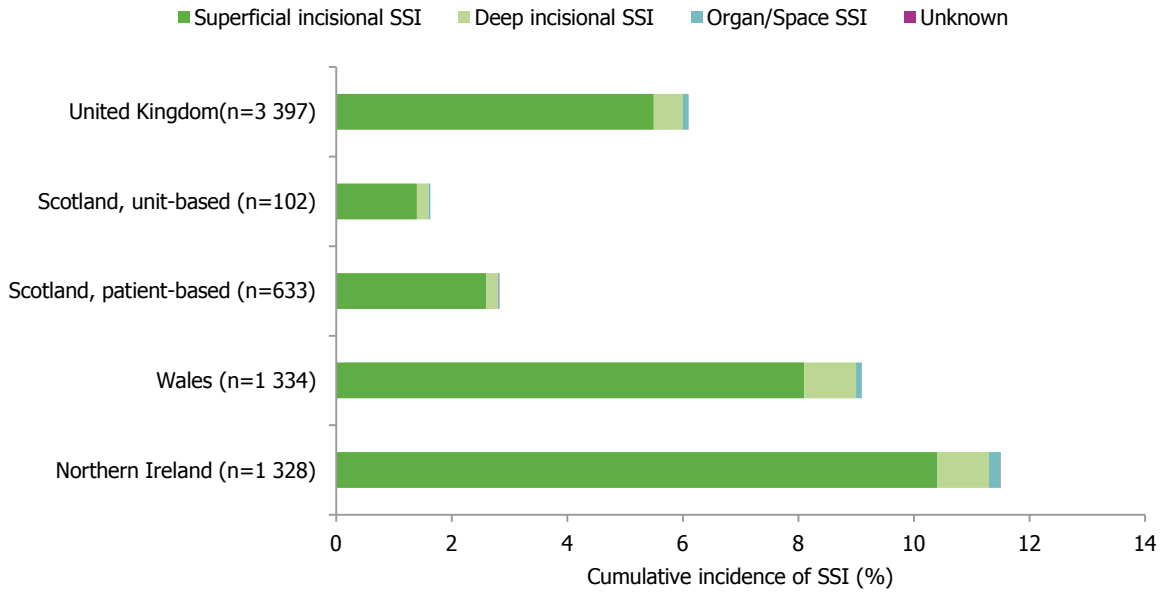
Figure 7.1a. Cumulative incidence of SSI in CSEC operations by country in UK, 2010–2011



Data source: HAI-Net SSI patient-based data, 2008–2011.

Note: From 1 April 2009, follow-up in Scotland changed from 30 days to 10 days (mandatory reporting). The arrows indicate a significant trend for both cumulative incidence and incidence density ($p < 0.05$).

Figure 7.2a. Cumulative incidence of SSI in CSEC operations by type of SSI and country in UK, 2010–2011



Data source: HAI-Net SSI patient-based data, 2010–2011 and HAI-Net SSI unit-based data, 2010–2011

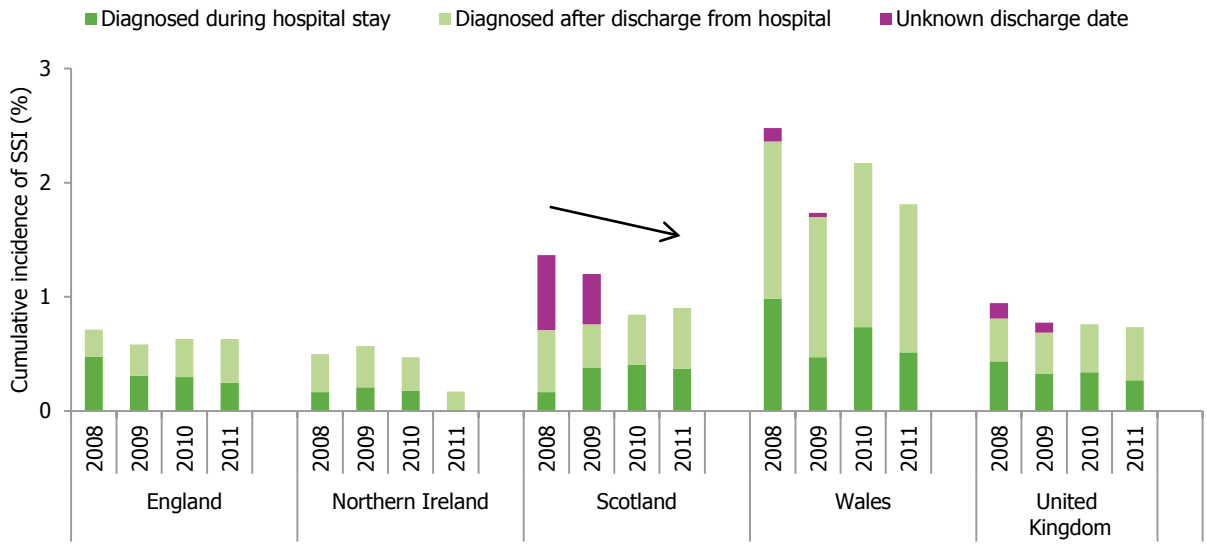
Hip prosthesis (HPRO)

Table 8.2a. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after HPRO operations by country in UK, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
England	71 437	451	0.6 [0.6-0.7]	71 437	501 533	193	0.4 [0.3-0.4]
Northern Ireland	3 469	11	0.3 [0.2-0.6]	3 418	21 492	3	0.1 [0-0.4]
Scotland	12 579	109	0.9 [0.7-1.0]	12 321	92 888	49	0.5 [0.4-0.7]
Wales	6 692	132	2.0 [1.7-2.3]	6 689	47 335	41	0.9 [0.6-1.2]
Subtotal	**94 177**	**703**	**0.7 [0.7-0.8]**	**93 865**	**663 248**	**286**	**0.4 [0.4-0.5]**
Unit-based data							
Scotland	2 938	22	0.7 [0.5-1.1]	n/a	n/a	n/a	n/a
Subtotal	**2 938**	**22**	**0.7 [0.5-1.1]**	**n/a**	**n/a**	**n/a**	**n/a**
United Kingdom	**97 115**	**725**	**0.7 [0.7-0.8]**	**93 865**	**663 248**	**286**	**0.4 [0.4-0.5]**

(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI x 100)/Number of operations; (3) Operations with missing discharge dates are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/ Number of postoperative patient-days.

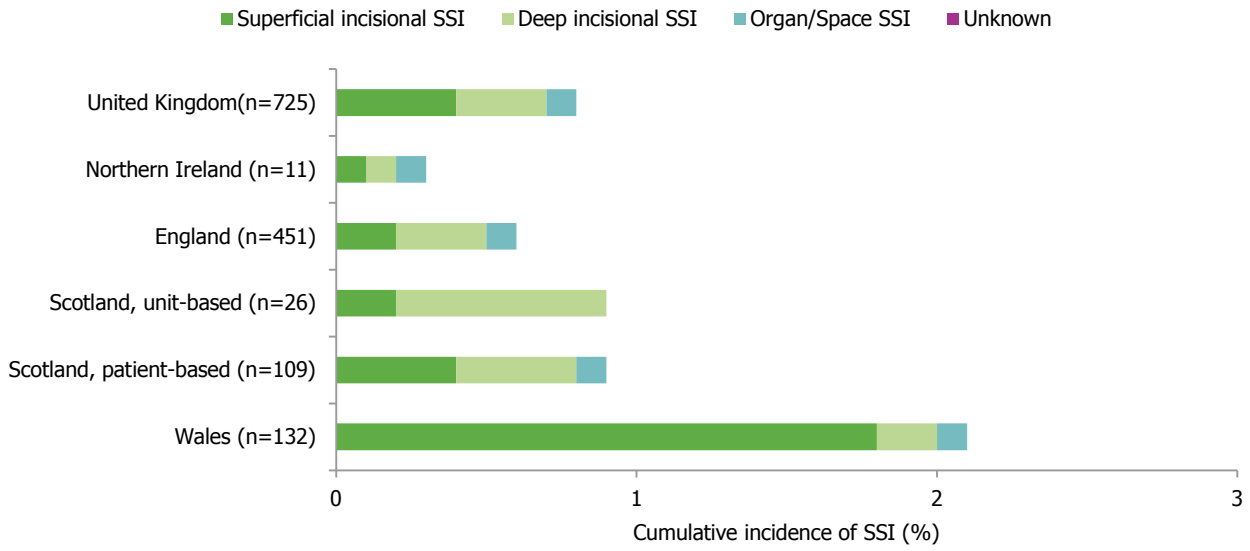
Figure 8.1a. Cumulative incidence of SSI in HPRO operations country in UK, 2010–2011



Data source: HAI-Net SSI patient-based data, 2008–2011.

Note: Post-discharge surveillance methods and practices differ considerably among countries. The arrow indicates a significant trend for both cumulative incidence and incidence density ($p < 0.05$). Scottish data with unknown discharge dates include SSI diagnosed during hospital stay that are only documented by a specific variable ('detection') in the national protocol.

Figure 8.2a. Cumulative incidence of SSI in HPRO operations by type of SSI and country in UK, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based and unit-based data, 2010–2011.

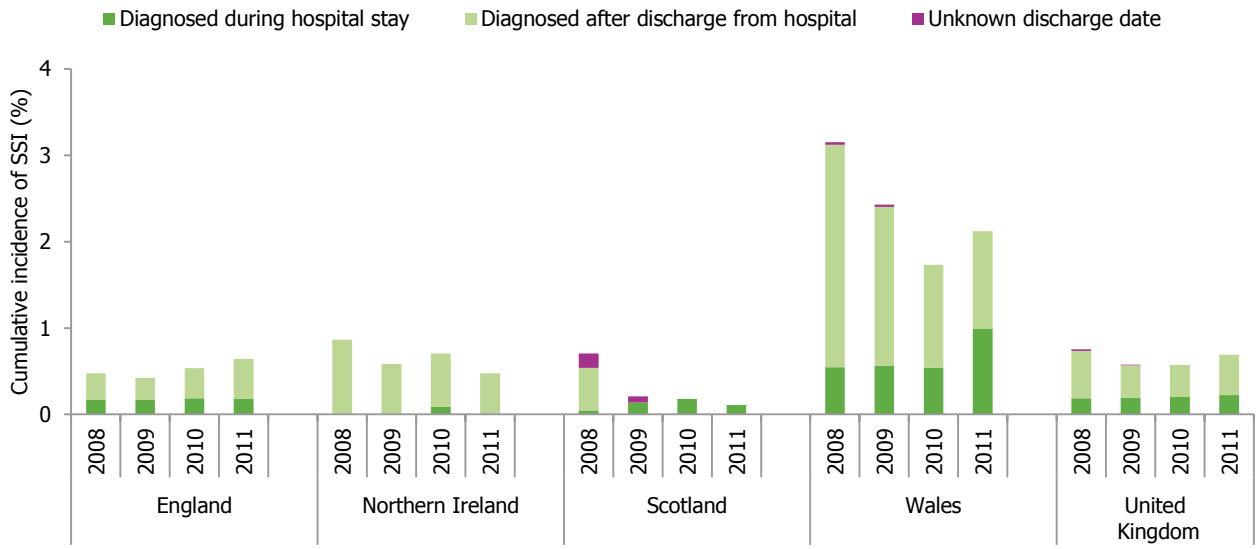
Knee prosthesis (KPRO)

Table 9.2a. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after KPRO operations by country in UK, 2010–2011

Country	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
England	81 114	480	0.6 [0.5-0.6]	81 114	535 923	150	0.3 [0.2-0.3]
Northern Ireland	2 388	14	0.6 [0.3-1.0]	2 361	13 592	1	0.1 [0-0.4]
Scotland	8 065	12	0.1 [0.1-0.3]	8 019	52 339	12	0.2 [0.1-0.4]
Wales	5 617	109	1.9 [1.6-2.3]	5 616	41 251	44	1.1 [0.8-1.4]
Subtotal	**97 184**	**615**	**0.6 [0.6-0.7]**	**97 110**	**643 105**	**207**	**0.3 [0.3-0.4]**
Unit-based data							
Scotland	2 001	2	0.1 [0-0.4]	n/a	n/a	n/a	n/a
Subtotal	**2 001**	**2**	**0.1 [0-0.4]**	**n/a**	**n/a**	**n/a**	**n/a**
United Kingdom	**99 185**	**617**	**0.6 [0.6-0.7]**	**97 110**	**643 105**	**207**	**0.3 [0.3-0.4]**

*(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations. Note: Some countries do not recommend follow-up to one year and post-discharge surveillance methods and practices differ considerably between countries; (3) Operations with missing discharge dates are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1; (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of postoperative patient-days. *One-sided confidence interval.*

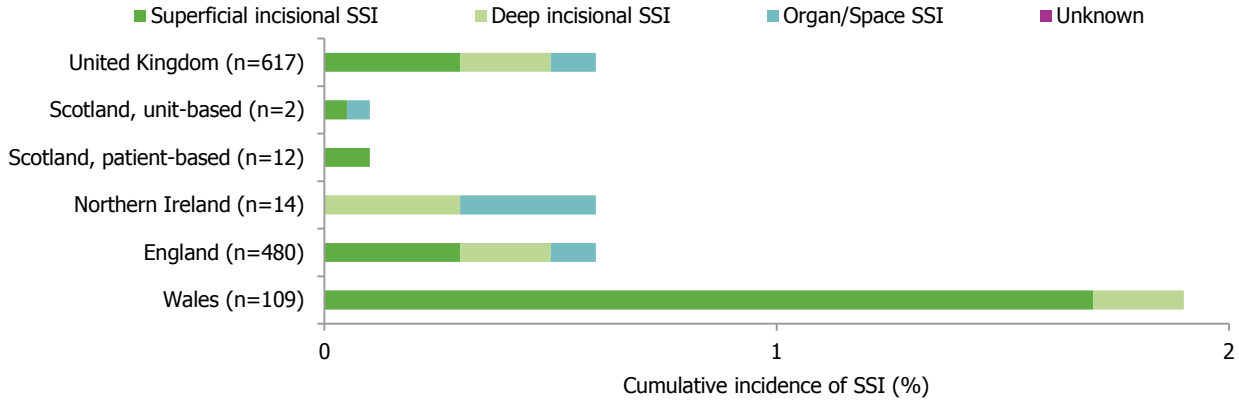
Figure 9.1a. Cumulative incidence of SSI in KPRO operations by country in UK, 2010–2011



Data source: HAI-Net SSI 2008–2011 patient-based data. Total number of patients was 185 132; total number of infections was 1 195.

Note: Post-discharge surveillance methods and practices differ considerably between countries. Scottish data with unknown discharge dates include SSI diagnosed during hospital stay, that are only documented by a specific variable ('detection') in the national protocol.

Figure 9.2a. Cumulative incidence of SSI in KPRO operations by type of SSI and country in UK, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based data, 2010–2011.

Laminectomy (LAM)

LAM data were only provided by Northern Ireland. These results are presented in the main report and are not repeated in this addendum.

Italy

In Italy, surveillance of SSI is coordinated at regional level by two independent surveillance networks (ISChIA and SNICh). As a consequence, data are collected following different protocols and uploaded to TESSy as two different and independent data sources.

In the main part of the report, ECDC included combined results for Italy. In this addendum, and as a courtesy to Italy, regional results from the two surveillance networks are presented separately.

Table 3.1b. Number of reported operations by data source and type of operation, Italy, 2010–2011

Country	Number of reported surgical operations, by type of operation							
	CABG	CHOL	COLO	CSEC	HPRO	KPRO	LAM	Total
Patient-based data								
ISChIA					1 027	878		1 905
SNICh	1 533	7 210	4 761	8 842	5 791	2 119	1 107	31 363
Italy	**1 533**	**7 210**	**4 761**	**8 842**	**6 818**	**2 997**	**1 107**	**33 268**

CABG, CHOL, COLO, CSEC, LAM data provided by one network (SNICh). These results are presented in the main report and are not repeated in this addendum.

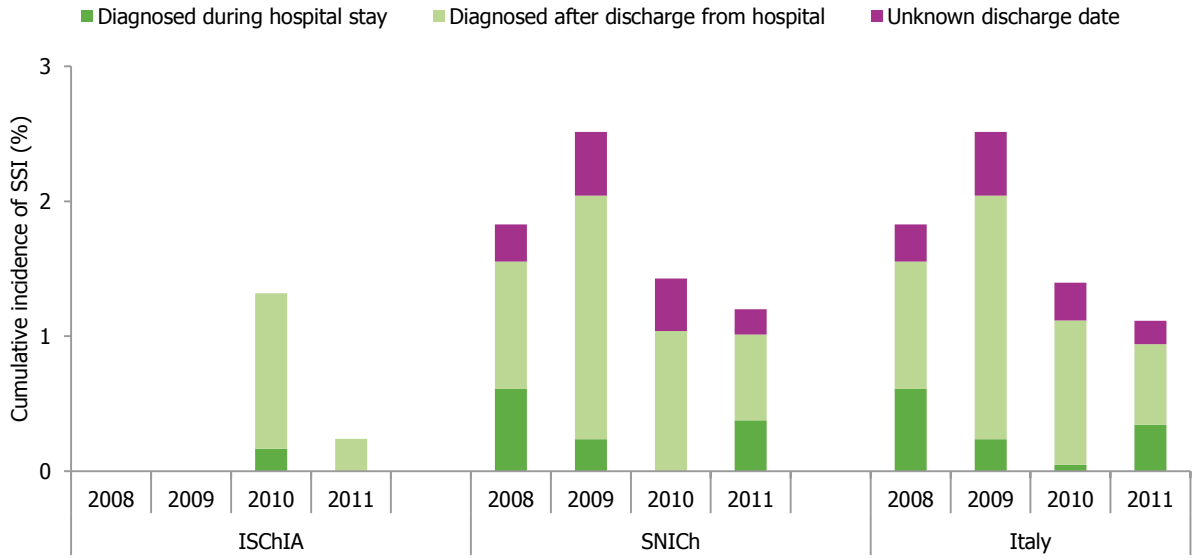
Hip prosthesis (HPRO)

Table 8.2b. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after HPRO operations by network, Italy, 2010–2011

Network	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days (4)	No. of in-hospital SSI (5)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (6)
Patient-based data							
ISChIA	1 027	9	0.9 [0.4-1.7]	949	9 396	1	0.1 [0-0.1]
SNICh	5 791	73	1.3 [1.0-1.6]	4 807	56 925	16	0.3 [0.2-0.5]
Italy	**6 818**	**82**	**1.2 [1.0-1.5]**	**5 756**	**66 321**	**17**	**0.3 [0.1-0.4]**

(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI × 100)/Number of operations. Note: Some countries do not recommend follow-up to one year and post-discharge surveillance methods and practices differ considerably between countries; (3) Operations with missing discharge dates are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of postoperative patient-days.

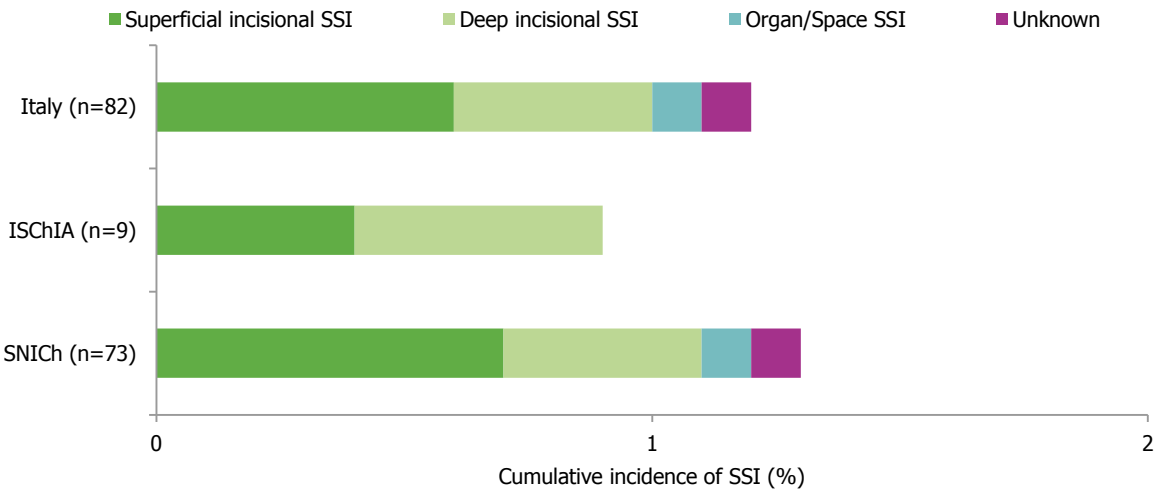
Figure 8.1b. Cumulative incidence of SSI in HPRO operations by network, Italy, 2010–2011



Data source: HAI-Net SSI patient-based data, 2008–2011.

Trend analysis was performed only with data from networks, participating at least three year during 2008–2011. Data from ISChIA network were excluded from Italian trend analysis.

Figure 8.2b. Cumulative incidence of SSI in HPRO operations by type of SSI and network, Italy, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based data, 2010–2011.

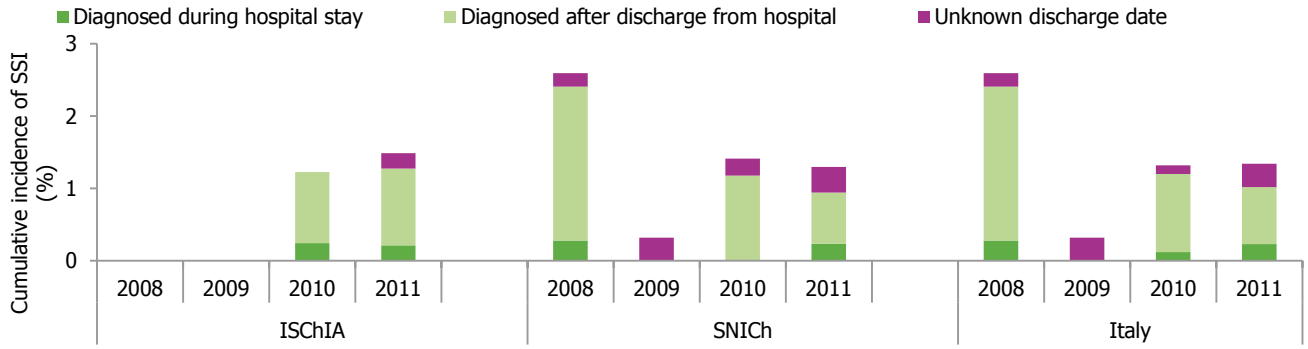
Knee prosthesis (KPRO)

Table 9.2b. Cumulative incidence of SSI (diagnosed within one year of surgery) and incidence density of SSI (diagnosed during hospital stay within one year of surgery) after KPRO operations by network, Italy, 2010–2011

Network	No. of operations	No. of SSI (1)	Cumulative incidence of SSI (per 100 operations) [95% CI] (2)	No. of operations with a known discharge date (3)	No. (sum) of post-operative patient-days	No. of in-hospital SSI (4)	Incidence density of SSI (per 1 000 post-operative patient-days) [95% CI] (5)
Patient-based data							
ISChIA	878	12	1.4 [0.7-2.4]	823	7 311	2	0.3 [0-1.0]
SNICh	2 119	28	1.3 [0.9-1.9]	1 783	20 685	4	0.2 [0.1-0.5]
Italy	**2 997**	**40**	**1.3 [1.0-1.8]**	**2 606**	**27 996**	**6**	**0.2 [0.1-0.4]**

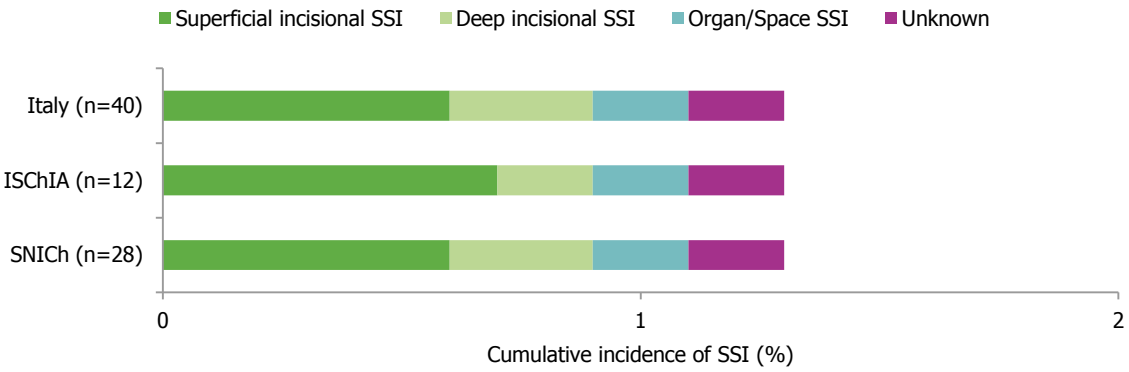
(1) Only SSI diagnosed within one year of the operation are included; (2) Cumulative incidence SSI = (Number of SSI ×100)/Number of operations. Note: Some countries do not recommend follow-up to one year and post-discharge surveillance methods and practices differ considerably between countries; (3) Operations with missing discharge dates are excluded; (4) Post-operative patient days = Date of discharge – date of operation +1 ; (5) Only in-hospital diagnosed infections occurring within one year of the operation are included. SSI reported after discharge from hospital or with an unknown discharge date are excluded; (6) Incidence density = (Number of in-hospital SSI × 1000)/Number of postoperative patient-days.

Figure 9.1b. Cumulative incidence of SSI in KPRO operations by network, Italy, 2010–2011



Data source: HAI-Net SSI 2008–2011 patient-based data.

Figure 9.2b. Cumulative incidence of SSI in KPRO operations by type of SSI and network, Italy, 2010–2011



Data source: ECDC, HAI-Net SSI patient-based data, 2010–2011.