swissnoso

National Center
for Infection Control

Swissnoso Annual Report

Epidemiology of healthcare-associated infections and their prevention and control in Swiss acute care hospitals in 2023

20 September 2024 | On behalf of the FOPH

Main authors

Alexandra Scherrer

Marcus Eder

Hugo Sax

Contributing authors

Delphine Berthod

Andrea Büchler

Judith Maag

Jonas Marschall

Christelle Perdrieu

Mathias Schlegel

Alexander Schweiger

Rami Sommerstein

Nicolas Troillet

Danielle Vuichard-Gysin

Walter Zingg

For Swissnoso*

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* Members of Swissnoso include: Dr Carlo Balmelli, Lugano; Dr Delphine Berthod, Sion; PD Dr Niccolò Buetti, Geneva; Prof. Stephan Harbarth, Geneva; Dr Philipp Jent, Bern; Prof. Jonas Marschall, Bern; Prof. Hugo Sax, Zurich; Dr Matthias Schlegel, St. Gallen; Dr Alexander Schweiger, Zug; PD Dr Laurence Senn, Lausanne; Prof. Rami Sommerstein, Lucerne; Prof. Nicolas Troillet, Sion; Prof. Sarah Tschudin Sutter, Basel; PD Dr Danielle Vuichard Gysin, Frauenfeld; Prof. Andreas Widmer, Basel; PD Dr Aline Wolfensberger, Zurich; PD Dr Walter Zingg, Zurich

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Executive Summary

Aim and Scope

Aim: The 2023 Epidemiology Report by Swissnoso highlights advancements in preventing hospital-acquired infections (HAIs) in Swiss acute care hospitals.

Purpose: To guide upcoming initiatives in reaching the operational goals declared by the NOSO Strategy, targeting national HAI point prevalence of 5% by 2030 and 4% by 2035 (from 6% in 2022)[1] through, for example, the implementation of the minimum structural requirements for prevention and control of HAI in Swiss hospitals.[2]

Structure: This report is organised according to Donabedian's model of «structure», «process», and «outcome» quality, applied at healthcare worker (HCW) and patient levels, encompassing established infection prevention and control (IPC) structures at hospital level (structure), adherence to prevention protocols by hospital collaborators (process), and patient HAI prevalence or rate (outcome).[3]

Available metrics data: In 2023, Swissnoso had three primary outcome metrics: Swiss national point prevalence surveys on HAI and antimicrobial use (CH-PPS), surgical site infection (SSI) surveillance, and catheter-associated urinary tract infection (CAUTI) surveillance. IPC structures and process quality can be estimated from annual surveys, data from surveillance modules, and observations using the Swissnoso Clean Care Monitor (CCM) app. Additional data on antimicrobial prophylaxis or treatment prevalence is collected through CH-PPS and the Swiss Centre for Antibiotic Resistance (ANRESIS). In addition, data on healthcare-associated viral respiratory infections is gathered through the CH-SUR network.

More detailed information: Specific annual reports of Swissnoso modules provide in-depth details.

What we observed

What to be aware of: Highlighted limitations under the heading «What to be aware of» ensure cautious interpretation of the findings.

Overall trends of HAI prevalence (outcome quality): The crude prevalence of HAI has remained stable over the past seven years, with a spike in 2022. Large hospitals[4] consistently show a higher HAI prevalence.

SSI prevention (process quality): Bundle adherence (antibiotic prophylaxis, skin disinfection, correct hair removal) has stagnated at 70% since 2019. Newly introduced measures show low individual adherence rates (30%–65%). In 2023, the adherence observation app was used by 14 hospitals (seven participants in the SSI Intervention module and seven non-participants), while 152 hospitals contributed to the SSI Surveillance module in 2022.

SSI rates (outcome quality): SSI rates have significantly decreased in eight surgery types but remained unchanged or increased in five others.

CAUTI prevention (process quality): Up to 23% and 13% overall of urinary catheters were placed without justification.

CAUTI rates (outcome quality): The 2023 CAUTI rate was 1.43 per 1,000 catheter days.

Healthcare-associated COVID-19: The CH-SUR Surveillance system reports a high proportion of healthcare attribution among hospitalised COVID-19 patients.

Antimicrobial use (process quality): The proportion of patients on antimicrobial medication has increased significantly in the last two years to 33% in 2023.

Hand hygiene adherence: This indicator increased from 75% in 2019 to 80% in 2023. Nurses show higher adherence rates than doctors. Adherence of hand hygiene indications for HCW self-protection is higher than that for patient protection.

What it means

Overall interpretation and outlook: Swiss hospitals have not reliably institutionalised all evidence-based prevention measures. In the absence of relevant data, we speculate that IPC teams lack the necessary resources, the commitment and support of the hospital management, or both. On the upside, a considerable proportion of HAIs remains preventable; thus, reaching the prevalence target within six years seems feasible with substantial efforts at the local, cantonal and federal levels.

HAI prevalence: HAI prevalence has not decreased over the past seven years. Targeted multimodal interventions, education, training, and adherence monitoring should be strengthened, supported by effective surveillance.

SSI: SSI rates decreased for most surveyed surgery types, but some show an increase. Identifying reasons for these variations remains challenging. The predominant decrease could result from the awareness of being observed (Hawthorne effect), public reporting, or an independent secular trend (missing control group). Data suggests hospitals do not apply all evidence-based prevention measures to each patient undergoing surgery. It is currently impossible to link process quality (adherence) with outcome quality (infection rates) at the hospital level because of the siloed Swissnoso metric systems. The shift to ambulatory surgery might increase an unfavourable case mix in in-patient surgery.

CAUTI: Limited participation in CAUTI surveillance does not yet provide reliable trend data. Process and outcome data suggest room for improvement.

Healthcare-associated viral infections: Due to non-standardised testing procedures for SARS-CoV-2, misclassification cannot be excluded, and the situation (high proportion of healthcare-associated cases) can, therefore, not be clarified based on the available data.

Antimicrobial resistance: While we lack hospital-level data on antimicrobial use and resistance patterns, structure and process show room for improvement: one third of Swiss acute care hospitals do not have written guidelines on antimicrobial use, and the hands of the HCW are not cleaned one in five times before touching a patient.

Available metrics data: The current system has yet to be optimised for national HAI prevention. Challenges include 1) low HAI event numbers (i.e. large confidence intervals), 2) non-random inclusion processes in observation data, and discontinuous hospital participation (i.e. changing case mix and participation effects).

Statistical challenges in HAI surveillance: HAI rates are typically in a few percentage ranges, making longitudinal annual data comparisons difficult at the hospital level. HAI prevalence is affected by the same challenge and does not correlate directly with HAI incidence.

Cross-topic correlation: Correlating data across different Swissnoso modules is difficult due to segregated databases and differing data collection methods.

Recommended actions

Improve the national IPC metrics system: Improve the Swissnoso metrics system to make it more efficient and effective, considering hospital size, meaningful process data, data interoperability, and cost-efficient national surveys. Explore methods to better illustrate random rate and proportion variations as products of chance. The following questions might guide these reflections:

- From what hospital size and for what HAI type do HAI rates become meaningful indicators for guiding improvement initiatives at the hospital level?
- Which meaningful process data (adherence rates) could be collected automatically?
- How can we more effectively correlate data between modules to learn more about hospital performance? How can Swissnoso facilitate the collection of more specific data on improvement efforts undertaken by hospitals?

1 FOPH: «In order to realise the aim of the NOSO Strategy to reduce HAIs and prevent the spread of potentially dangerous pathogens, the federal government, working together with the Swiss Conference of the Cantonal Ministers of Public Health (CMPH) and H+ (the Hospitals of Switzerland), published recommendations in February 2024 aimed at sustainably reducing HAIs over the next ten years. The so-called operational targets establish guidelines at the national level and make reference to the structural minimum standards for the prevention and control of HAIs in Swiss acute hospitals. With these national goals, the partners involved in implementation will create a common vision of how the overall HAI rate is to be reduced in Switzerland.» More information can be found here.

2 The document «Strukturelle Mindestanforderungen» in German.

3 NB: The level of application of the Donabedian model matters. If it were applied at the hospital level, the establishment of guidelines for adequate IPC staffing and the launch of multimodal improvement initiatives would become a process quality under the responsibility of the IPC team and the hospital leadership. Donabedian, A. (1988). The quality of care: How can it be assessed? *JAMA,* 260(12), 1743-1748.

4 In this report, we use the term «hospital» also for hospital networks whenever they appear as one entity.

- What is the most cost-effective, robust way to survey HAIs at the national level in view of the 5% prevalence goal for 2030? Could the effect of the efforts by Swissnoso and the NOSO Strategy be measured by prevalence surveys alone? Can incidence rates guide national prevention efforts and, if so, how?[5]
- How can we link structure, process, and outcome data at the hospital, patient, and HCW levels to learn more about the effect of prevention efforts and the proportion of preventable HAIs?

Automate data processes: Automate data processes to simplify and automate data collection and analysis (after successful validation), broaden participation, cover all major HAI types, enable cross-module analysis, and reduce reporting delays. This is the aim of the Swissnoso Digital IPC Platform project, which is planned to integrate the existing and planned modules.

Enhancing adherence monitoring: Improve adherence monitoring to guide improvement strategies at the hospital level (where HAI confidence intervals are too large).

Hand hygiene and antimicrobial resistance: Consider sensor-based, automated hand hygiene monitoring systems to replace manual observation and focus on the spread of antimicrobial resistance as a major process quality indicator. Discuss sustaining the established CH-CCM observation tool for its benefits. The respective strategies of Swissnoso, StAR, and the NOSO Strategy must be proactively synergised in the field of antimicrobial resistance.

Integration of intervention and surveillance modules: Combine intervention and surveillance modules. This will increase the number of hospitals collecting data and engaging in improvement initiatives.

Operationalising goals: Support operationalising hospital-level IPC goal setting to reach the national prevalence goal of 5% in six years, recognising the low HAI incidence (large confidence intervals) in mid-size and small hospitals. This would make monitoring and feedback of process indicator metrics more adequate for most Swiss hospitals.

Estimate severity: In future analyses and reports, include quality- (QALY) or disability-adjusted life years (DALY), loss of income, and excess healthcare costs. However, additional data and resources will be required to obtain high-quality data.

Recommendations for FOPH and the NOSO Strategy

National support and incentives: Launch national initiatives to transition IPC efforts from habitual practices to goal-oriented system redesign and quality improvement. These initiatives should align the work of Swissnoso, the Federal Office of Public Health (FOPH), the NOSO Strategy, and cantonal health authorities to achieve the strategy's declared goals.

Support the Swissnoso Digital IPC Platform project: When implemented successfully, this will reduce hospital IPC teams' manual workload by supporting daily IPC activities and will facilitate the realisation of data collection at a national level through data standardisation. Hospitals using other IPC software shall be able to deliver data using API (Application Programming Interface) or manual data entry.

5 Bragge P et al. AIMD – a validated, simplified framework of interventions to promote and integrate evidence into health practices, systems, and policies. BMC Med Res Methodol, 2017. https://doi.org/10.1186/s12874-017-0314-8

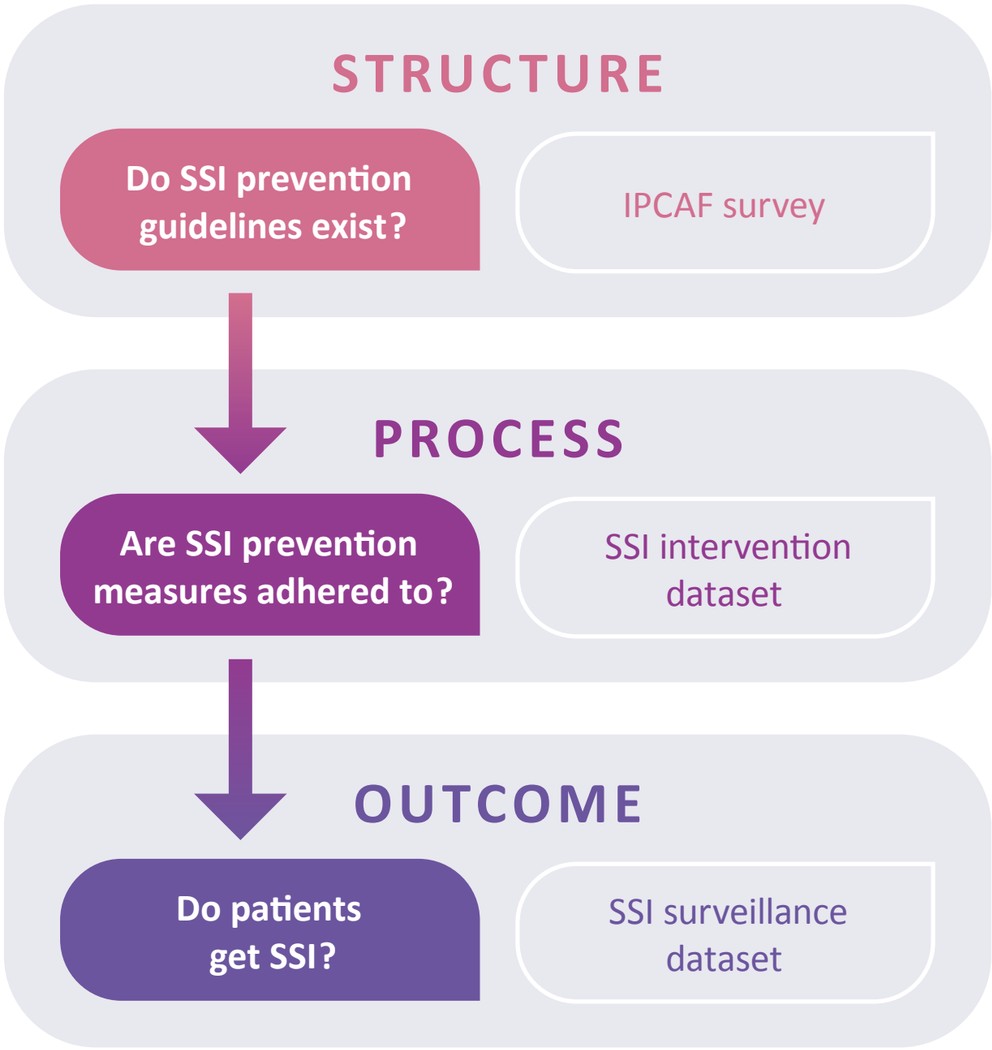


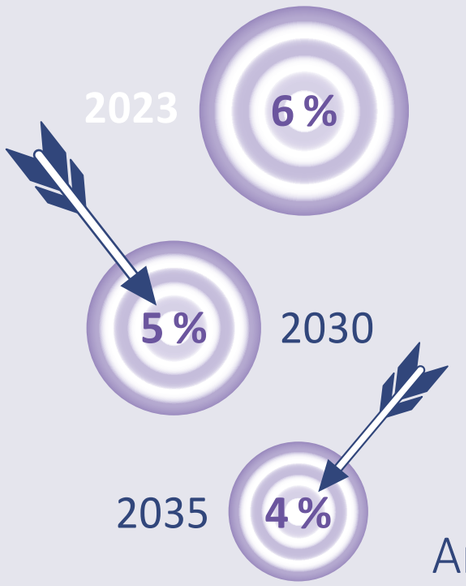
Figure 1. Donabedian's quality improvement framework applied to this report (example: surgical site infections).

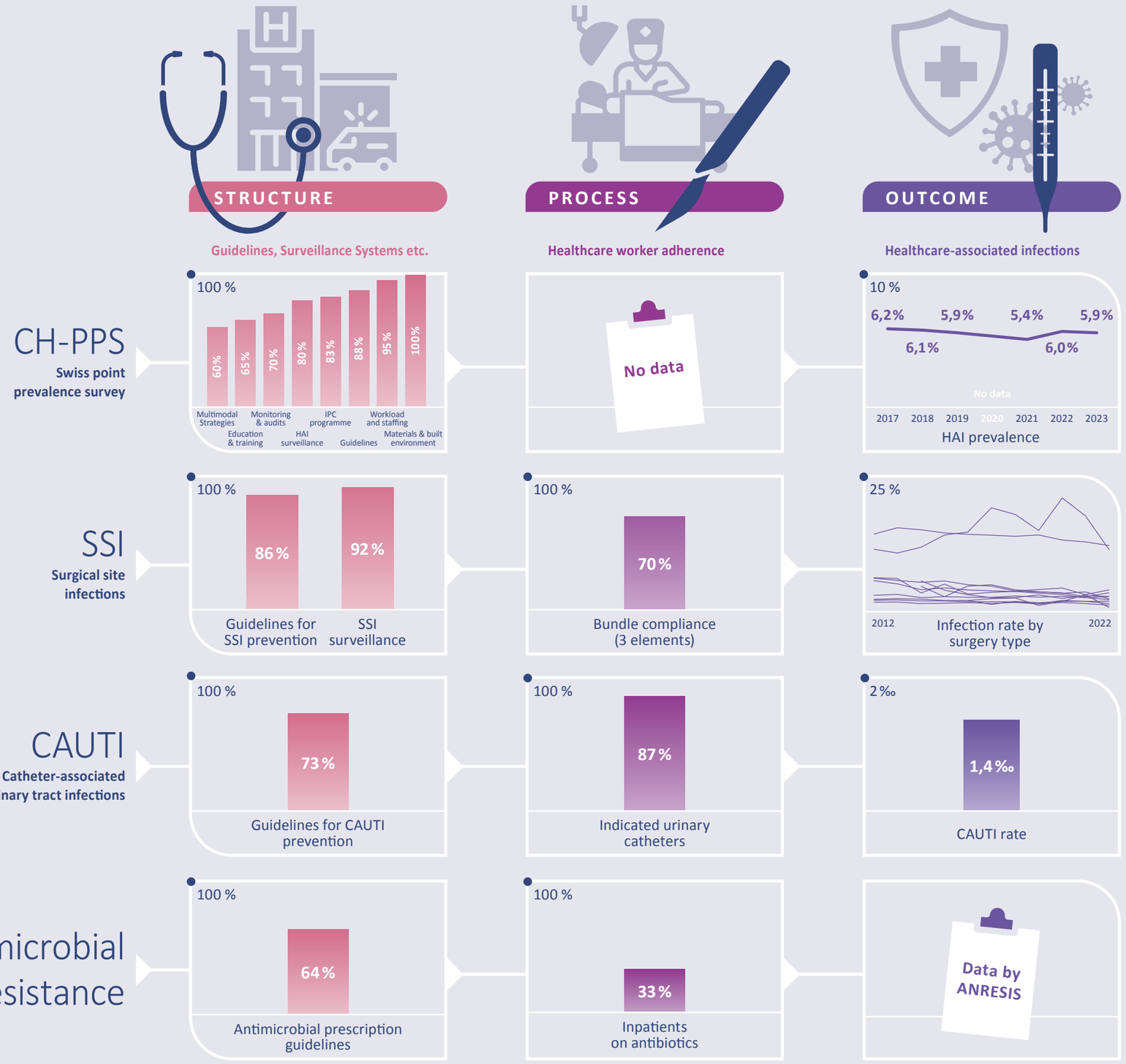
The Donabedian quality model is a framework for evaluating healthcare quality by examining three key areas: structure (the setup and resources), process (how care is delivered), and outcomes (the results of care). Donabedian, A. (1988). The quality of care: How can it be assessed? JAMA, 260(12), 1743-1748

Healthcare-associated infections and their prevention in Swiss acute care hospitals 2023

- **HAI prevalence has remained unchanged over the past 7 years.**
- **SSI rates have decreased in 8 types of surgery but not yet in 5 others.**
- **Every patient has yet to benefit from all recommended prevention measures.**

Swiss HAI prevalence goals





1. Infection prevention and control of HAI in Swiss acute care hospitals

The ***Minimum structural requirements for the prevention and control of HAIs in Swiss acute care hospitals*** were developed by Swissnoso and other key actors and published in 2021.[1] Aiming to advance the local implementation of IPC in acute care hospitals, they support the national NOSO Strategy (reducing HAIs) and Strategy on Antimicrobial Resistance (StAR; reducing antimicrobial resistance). The standards strongly encourage hospitals to participate in the yearly point prevalence survey (CH-PPS[2]) on HAI and antimicrobial use. The national point prevalence survey on HAI and antimicrobial use (CH-PPS) 2022 was a national survey synchronised with the European point prevalence study (ECDC, 2022–23).

The declared goal of the NOSO Strategy is to reach 5% prevalence by 2030, six years from now.

STRUCTURE

IPC structures in Swiss acute care hospitals

CH-PPS 2022 and 2023 featured a self-evaluation survey on the structural IPC elements of Swiss acute care hospitals. A member of the hospital IPC team completed a questionnaire, a translated version of the World Health Organization's Infection Prevention and Control Assessment Framework (IPCAF) survey instrument **(Annex 1).**

For each of the eight core components (i.e. multimodal strategies for implementing IPC activities; education and training; monitoring and audits of IPC practices with feedback; HAI surveillance; IPC programmes; workload, staffing and bed occupancy; and built environment, materials and equipment) a score of 100 could be reached, adding up to a maximum of 800 points overall.

What we observed

In 2022 and 2023, IPC team members from 98 acute care hospitals provided self-evaluation feedback.

Overall, the median score per hospital was 640 [IQR: 585-680] out of 800 maximum points.

Overall scores reached by smaller vs larger hospitals were similar **(Figure 2).**

Median component scores gradually increased from «Multimodal strategies» (60 points) to «Material» (100 points) **(Figure 3).**

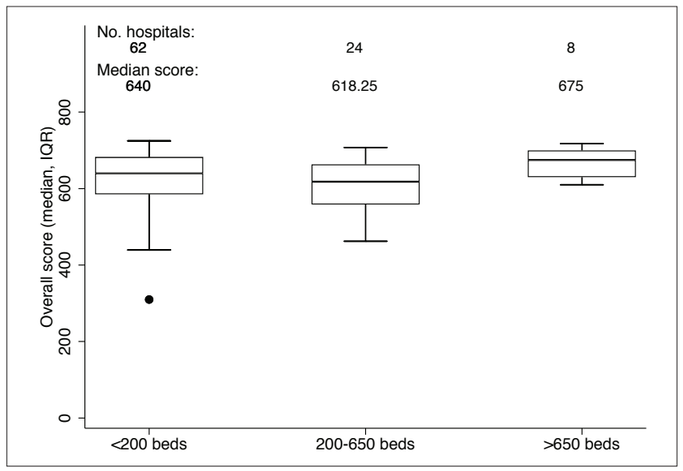


Figure 2. Overall score (maximum 800) per hospital in 2022 and 2023.

Based on the IPCAF tool, the survey featured eight IPC core components with a maximum score of 100 points for each component.

1 *Minimum structural requirements for the prevention and control of HAIs in Swiss acute care hospitals.* Full information available here (in French, German and Italian).

2 Point prevalence survey (CH-PPS). Information with full reports and useful links (also to the ECDC PPS) available here (in French, German and Italian).

What to be aware of

The IPCAF survey is a self-evaluation tool without external validation. Desirability bias and misclassification cannot be excluded.

The Swissnoso IPCAF survey instrument did not match the content of the ***Minimum structural requirements for the prevention and control of HAIs in Swiss acute care hospitals*** developed by Swissnoso and other key actors and published in 2021.

These values are independent of the size of the hospital since one questionnaire was returned per hospital.

What it means

We see considerable diversity between Swiss hospitals regarding IPC structural components **(Figure 3).**

Room for improvement was identified for the core components of «Multimodal Strategies», «Education and Training», «Monitoring and Audit», and «HAI Surveillance». These areas typically require commitment, resources, and expertise from IPC teams and top-down support from hospital leadership.

What to do next

More emphasis must be placed on proactive quality improvement projects, IPC knowledge at the frontline, and feedback on adherence to best practices by frontline healthcare workers (HCWs).

IPC teams and hospitals appear to need more external incentives and guidance. The Swissnoso Digital IPC Platform project is designed to free IPC resources for promotional activities. The 2024 ***Handbook for the self-evaluation of the Minimum structural requirements for the prevention and control of HAIs in Swiss acute care hospitals***[3] will help IPC teams to more accurately identify priorities and needs for the local implementation of IPC structures.

Further investigation into challenges for IPC teams and hospitals to adopt a more proactive stance could be beneficial. The ETH/Swissnoso Social Network Analysis project is expected to provide some helpful insights.[4]

PROCESS

Swissnoso does not dispose of data on the overall process quality of HCWs' adherence to prevention measures in Swiss acute care hospitals.

OUTCOME

Swiss Point Prevalence Surveys (CH-PPS)

Swissnoso has invited Swiss acute care hospitals to participate in Swiss national point prevalence surveys (CH-PPS)[5] on HAI since 2018. Detailed information on survey methodology can be found in **Annex 2.**

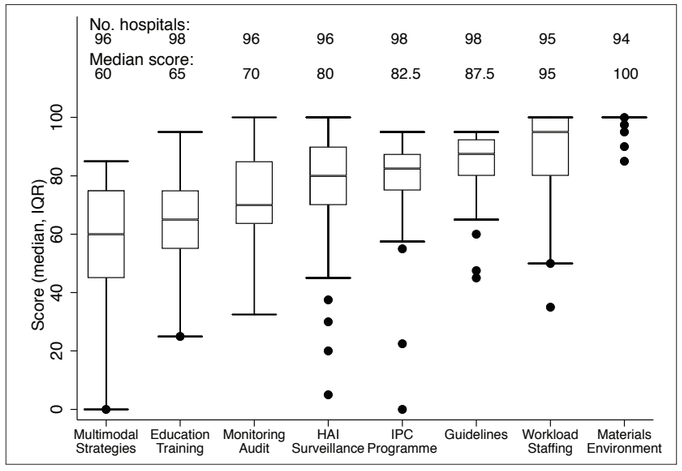


Figure 3. Scores of hospitals reached for each core component in 2022 and 2023.

Based on the IPCAF tool, the survey featured eight IPC core components, with a maximum score of 100 points for each component.

3 Swissnoso. Handbook for the Self-evaluation of *Minimum structural requirements for the prevention and control of HAIs in Swiss acute care hospitals.* Available here.

4 **Exploring Social Network Dynamics in Swiss Hospitals to Prevent Surgical Site Infection"** *This Ph.D. project uses social network analysis to understand collaboration and information flow in Swiss hospitals to prevent surgical site infections. Surveys, interviews, observations, and organisational chart analysis will be conducted. All hospitals and participants will give informed consent. The projyect aims to improve information flow, guide targeted interventions, and promote evidence-based practices for patient safety.*

5 Swissnoso point prevalence surveys. Full information available here.

Following a break between 2004 and 2016 and methodology changes from period-prevalence to point-prevalence according to the ECDC protocol in 2017, the CH-PPS has been conducted yearly, except from a pandemic-related break in 2020.

The years 2017 and 2022 were «national» surveys with broader hospital participation. However, in the intervening years, a similar number of hospitals participated in the survey.

What we observed

HAI prevalence has remained around 6% in the yearly CH-PPS since 2017 in the entire dataset of all (inconsistently) contributing hospitals, with a significantly lower prevalence in 2019 **(Figure 4).**

HAI prevalence among the nine all-time participating hospitals remained slightly lower than 6%, with a significantly higher prevalence in 2022 **(Figure 5).**

What to be aware of

Hospital participation has varied over the years. In 2023, only nine hospitals had participated every year (of which five were from the same canton).

Prevalence surveys overestimate HAI rates because patients with a longer length of stay are more likely to suffer from HAI and be detected. HAI with longer duration of symptoms is overrepresented. Furthermore, patients with HAI acquired in another hospital or transferred to another hospital after HAI acquisition in the surveyed hospital can be misclassified.

Differences in the severity of HAI types are not captured in the overall prevalence result; for example, the overall HAI prevalence may stay the same despite a shift from a large proportion of CAUTI (a less severe HAI type) to a large proportion of SSI (a more severe HAI type).

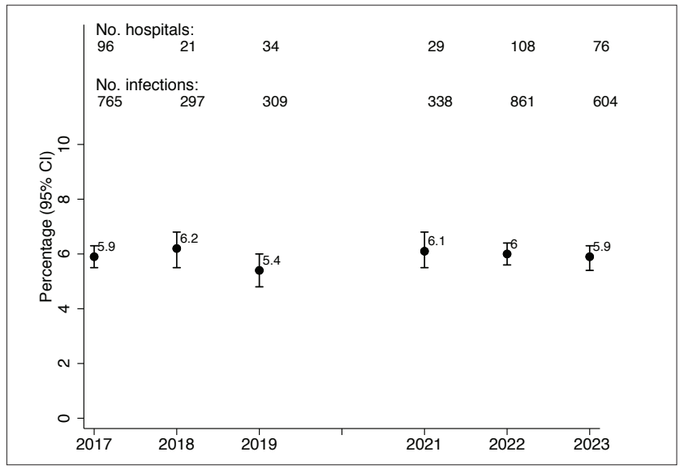


Figure 4. Swiss Point Prevalence Survey (CH-PPS) – Evolution 2017–2023 in all participating hospitals.

HAI prevalence from 2017 to 2023. Note: In 2020, CH-PPS was skipped due to COVID-19 workload.

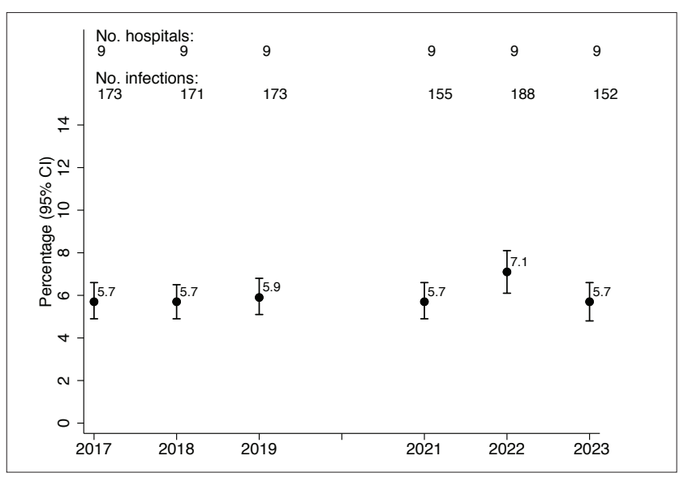


Figure 5. Swiss Point Prevalence Survey (CH-PPS) – Evolution 2017–2023 among hospitals participating every year.

HAI prevalence results for the nine hospitals participating in every survey since 2017. Five of the nine hospitals that have participated every year since 2017 are located in the same canton. Note: In 2020, CH-PPS was skipped due to COVID-19 workload.

CH-PPS results are not case-mix adjusted, which would be necessary for inter-hospital comparison. In-patient case mix might evolve unfavourably due to a shift to outpatient care for less severe cases.

Many HAIs are linked to specific risk factors (e.g. device-associated infections, surgery); however, including patients in the denominator who do not share these risk factors can dilute prevalence estimates.

What it means

According to the annual prevalence surveys, HAIs have not decreased in Switzerland **(Figure 4 and Figure 5).** Additional specific efforts are necessary to reach the 5% goal set by the NOSO Strategy for 2030 – in six years.

What to do next

A clear focus must be generated and maintained on reducing the most prevalent HAI by monitoring and improving adherence to the corresponding evidence-based prevention measures nationally and at the hospital level.

Swissnoso and the NOSO Strategy must support hospitals with leadership and material for multimodal HAI-specific national prevention programmes (campaigns).

At the hospital level, frontline HCW teams (and management) must receive timely and personalised feedback on adherence to evidence-based SSI prevention measures.

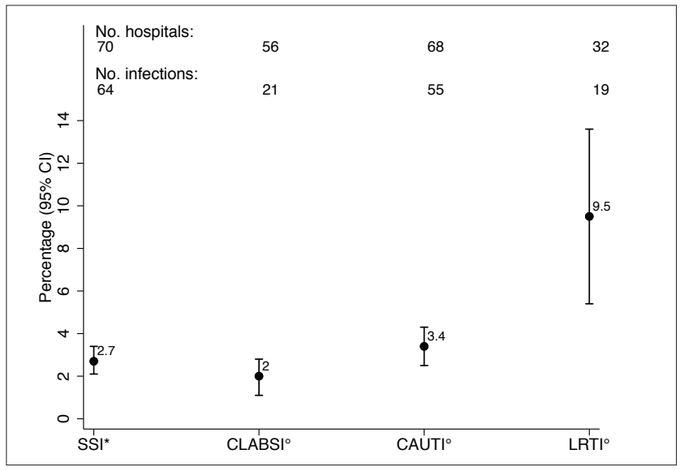


Figure 6. Swiss Point Prevalence Survey (CH-PPS) 2023 – SSI and device-associated HAI.

Device-associated HAI and surgical site infections in patients at risk (* number of surgical site infections occurring during present hospital stay as per NHSN (national healthcare safety network) surgeries during current hospital stay; ° number of infections as per patients having a relevant medical device in place at survey; CAUTI: catheter-associated urinary tract infection; CLABSI: central line-associated (bloodstream) infection; LRTI: lower-respiratory tract infection; SSI: surgical site infection).

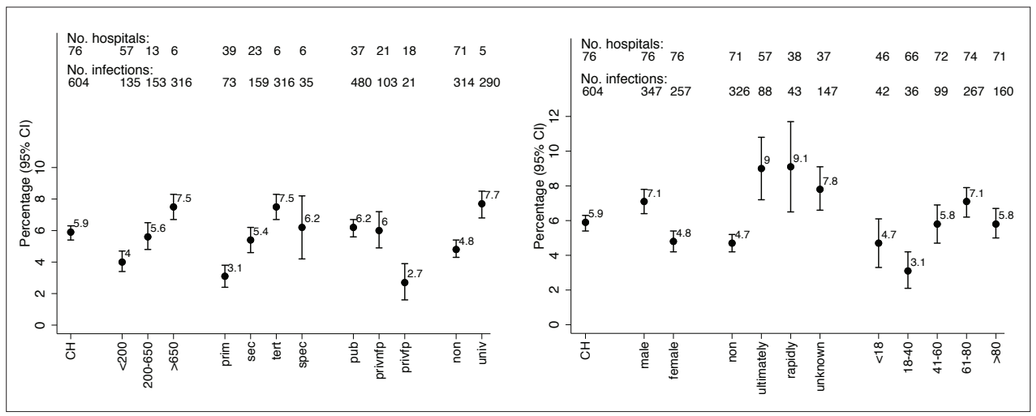


Figure 7. HAI prevalence by hospital type (left) and by intrinsic risk factor (right).

CH: Switzerland; hospital size: <200 beds (small), 200-650 beds (medium size), >650 beds (large); hospital type: primary care, secondary care, tertiary care, specialised hospital, paediatric clinics (n=2) are not shown; hospital ownership: pub (public), privnfp (private, not-for-profit), privfp (private, for-profit); university-affiliation: not affiliated (non), affiliated (univ); McCabe: non-fatal, rapidly-fatal, ultimately-fatal, unknown; age: <18 years, 18-40 years, 41-60 years, 61-80 years, >80 years.

2. Surgical site infections

In addition to SSI-related structural components (e.g. SSI prevention guidelines, surgical prophylaxis guidelines) provided by the IPCAF tool, the Swissnoso SSI modules generate process data (SSI intervention and SSI surveillance modules) and outcome data (SSI surveillance module).

STRUCTURE

IPC structures for SSI prevention

What we observed

Swissnoso has access to data on two SSI-related structure quality elements in Swiss acute care hospitals based on the answers of a member of the IPC teams to the IPCAF survey instrument, the existence of guidelines for SSI prevention[1] and the existence of an SSI surveillance scheme.

What to be aware of

Since the SSI prevention structure quality data come from the IPCAF survey tool, they are prone to desirability bias and potential misclassification.

What it means

Most Swiss acute care hospitals feature written guidelines on SSI prevention measures **(Figure 8).**

However, Swissnoso has no data on the content, quality, timeliness, and accessibility of these documents where they exist.

What to do next

As of 2024, the IPCAF survey tool has been replaced by the survey tool and handbook «Self-evaluation framework on the ***Minimum Structural Requirements for the Prevention and Control of Healthcare-Associated Infections»,*** which will provide Swissnoso with more detailed data on structures in place for SSI prevention. It will also guide hospital IPC teams in optimising guideline content, quality, timeliness, and accessibility.

For the forthcoming annual reports, we foresee correlating the existence of written SSI prevention guidelines with SSI rates at the hospital level.

PROCESS

Adherence to SSI prevention measures

The Swissnoso SSI Intervention module was created in 2019 to accelerate the decline of SSI by providing Swiss hospitals with guidance and tools for multimodal interventions. The module promotes the

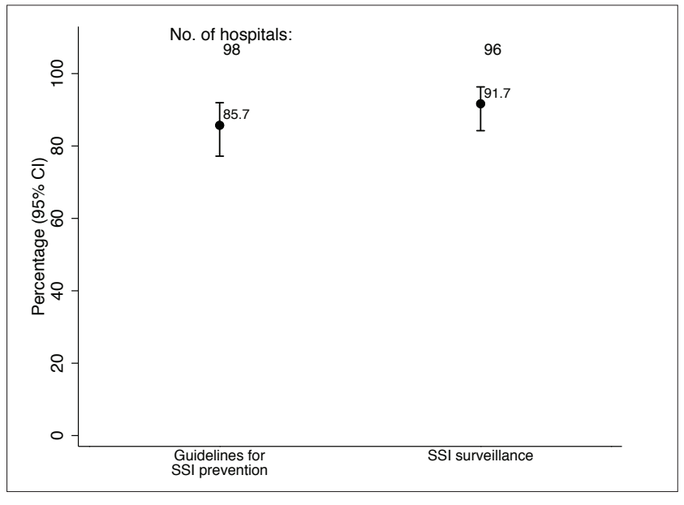


Figure 8. Hospitals reporting on the structure for the prevention of SSI.

Based on selected questions in the IPCAF survey tool distributed with the point prevalence survey in 2022 and 2023.

1 Swissnoso guidelines on surgical antibiotic prophylaxis are available on the Swissnoso website.


Photo by National Cancer Institute on Unsplash

three SSI prevention measures: «timely antibiotic prophylaxi», «correct skin disinfection», and «adequate hair removal». In 2023, three more measures were added: «preoperative gut decolonisation», «preoperative ***Staphylococcus aureus*** decolonisation», and «perioperative Glucose control».

IMPORTANT: The datasets used here originate from two different sources: the Clean Care Monitor-SSI mobile app (all measures) and the SSI Surveillance dataset (timely antibiotic prophylaxis). In 2023, the app was used by 14 hospitals (seven participants in the SSI Intervention module and seven non-participants), while 152 hospitals contributed to the SSI Surveillance module in 2022.

What we observed

The bundle adherence of the three initial bundle elements, defined as «all three prevention measures applied to a patient», did not change significantly between 2019 and 2021, peaked in 2022, and decreased significantly in 2023 against 2022 (returning to the 2019 level) **(Figure 9).**

Among the three initial bundle elements, adherence to hair removal guidance is satisfactory. At the same time, skin disinfection would still benefit from correct required exposure time (data not shown) and surgical antibiotic prophylaxis from correct timing in 15–20% of patients.

Data collected by the SSI Surveillance module (instead of the SSI Intervention module) showed a significant overall increase in the correct timing of antibiotic prophylaxis (i.e. within one hour before surgery) from 77.6% (95% CI: 77.2-78.0) in 2013 to 83.1% (82.8-83.5) in 2022. However, there are some surprising evolutions over time in some types of surgery, e.g. in laminectomy with implant.

Adherence to the three newly introduced SSI prevention elements in 2023, «preoperative gut decolonisation», «preoperative ***Staphylococcus aureus*** decolonisation», and «perioperative glucose control», is unacceptably low in the first assessment in 2023. Despite the low number of hospitals delivering the corresponding data, it can be cautiously hypothesised that these evidence-based prevention measures in international SSI prevention guidelines (e.g. by the WHO) have not been recognised or introduced by Swiss hospitals.

According to the SSI Surveillance dataset **(Figure 10 and Figure 11),** after a major improvement up to 2019, the timing of antibiotic prophylaxis before caesarean sections steadily declined. However, this can be explained by the fact that delayed antibiotic prophylaxis after cord clamping means that the newborn is not exposed to antibiotics, or at least less so. This measure is associated with, at best, only a slight increase in wound infections in the mother. The timing for this type of surgery has been controversial for years.[2]

2 https://aricjournal.biomedcentral.com/articles/10.1186/s13756-020-00860-0

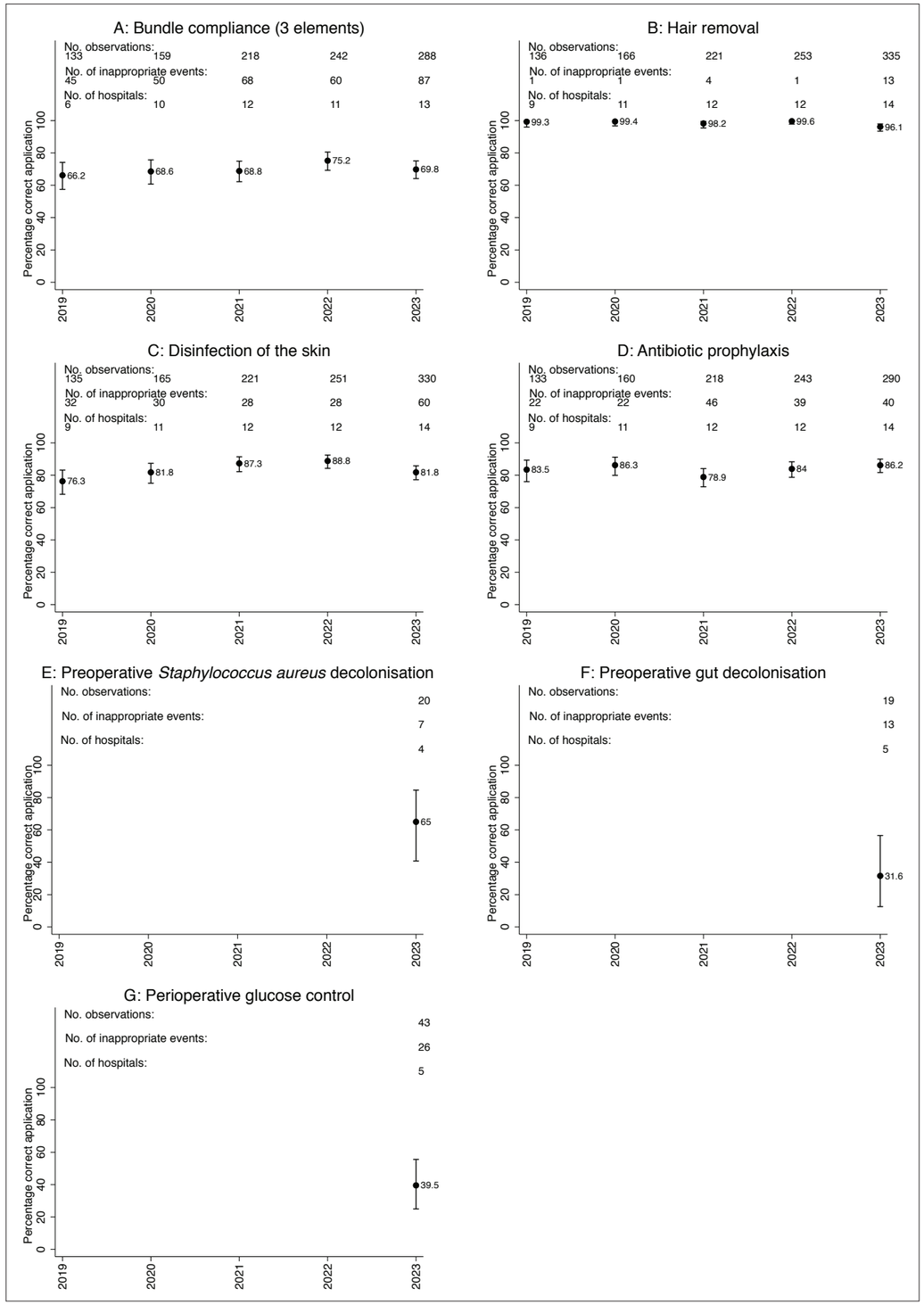


Figure 9. Results of monitoring SSI prevention measures with the CCM-SSI tool.

Panel A shows bundle adherence to the three elements – hair removal (B), skin disinfection (C), and antibiotic prophylaxis (D). The three elements «preoperative gut decolonisation» (F), «preoperative *Staphylococcus* aureus decolonisation» (E), and «perioperative glucose control»≠ (G) were only introduced in 2023.

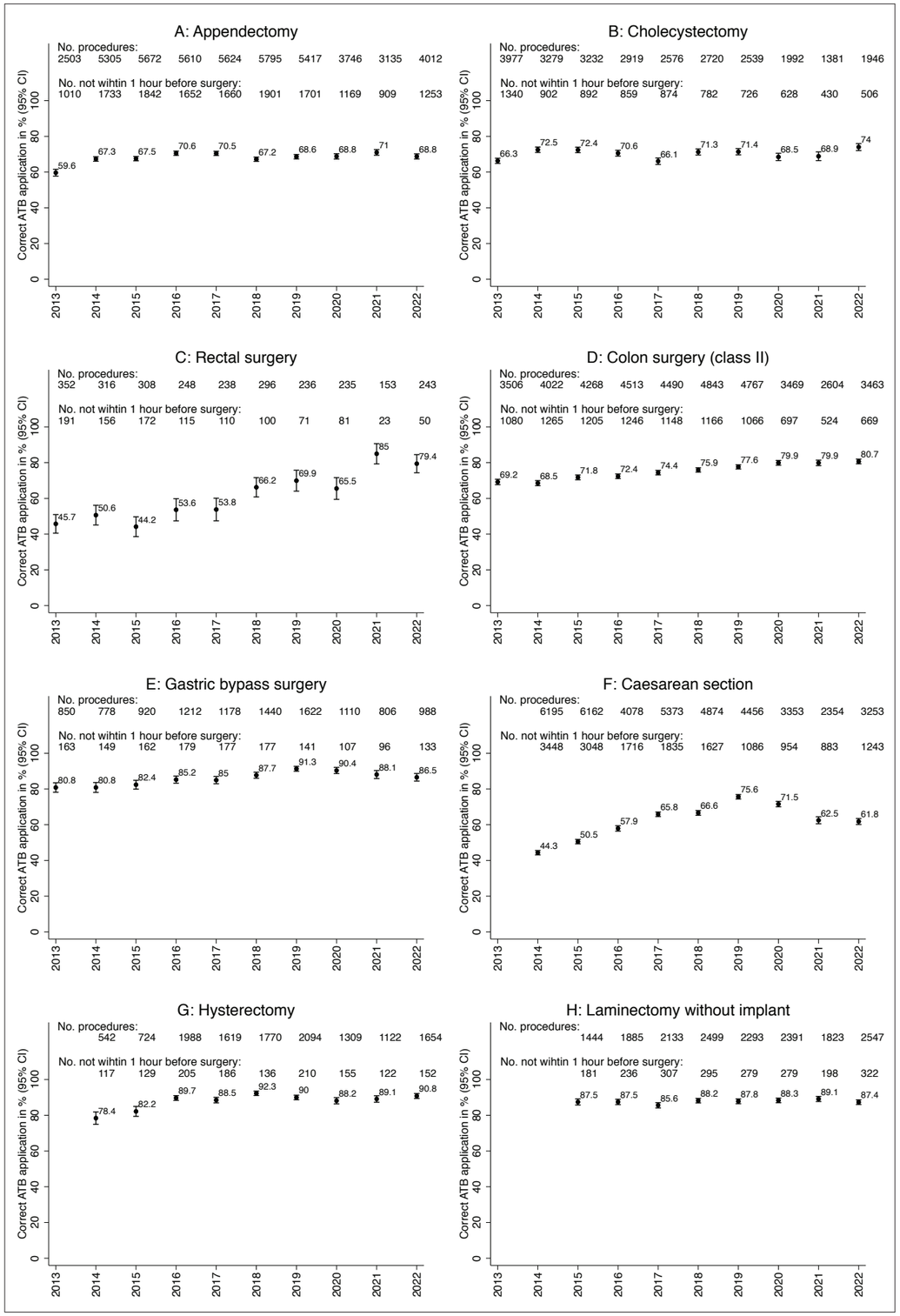


Figure 10. Surgery without implant. Administration of antimicrobial prophylaxis ≤1h before incision.

Data is based on the SSI Surveillance module. The measured period lasts from 1 October of the previous year to 30 September.

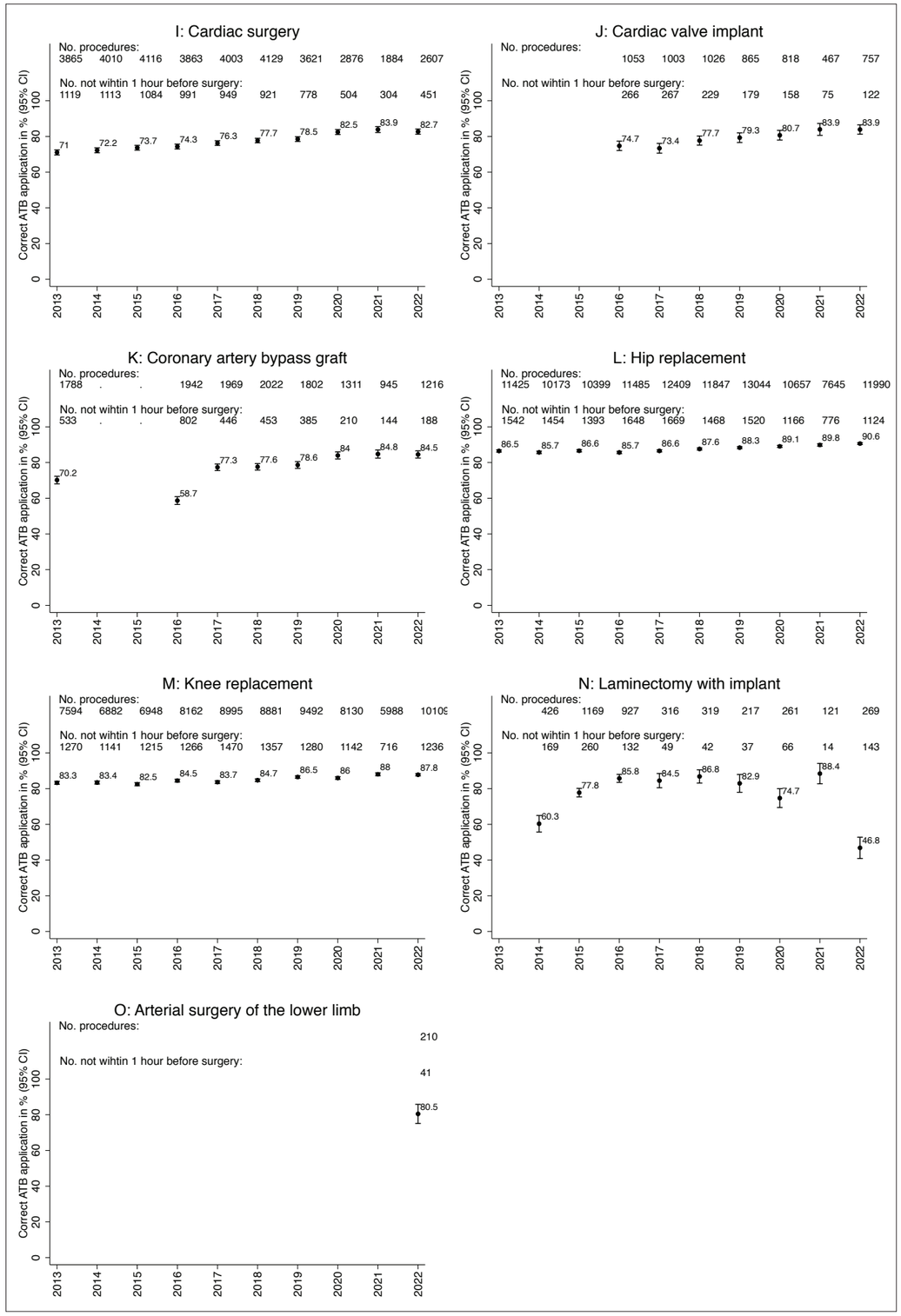


Figure 11. Surgery with implant: administration of antimicrobial prophylaxis within one hour before incision.

Data is based on the SSI Surveillance module. The measured period lasts from 1 October of the previous year to 30 September.

What to be aware of

CCM-SSI mobile app data (Figure 9):

- The number of observations per hospital and year is low (on average, 18 observed surgical interventions per hospital for 2023), causing large confidence intervals in hospital-level data.
- Observations are non-randomised, which can introduce bias. Information on why and where observations took place is not available.
- The supposed drop in process quality in 2023 was exaggerated by the introduction of the three new prevention measures with low adherence rates.

SSI Surveillance antibiotic prophylaxis timing data (Figure 10 and Figure 11):

- Adherence data for antimicrobial prophylaxis does not account for those cases where antimicrobial prophylaxis was not indicated, e.g. if the patient was already under antimicrobial treatment. These cases were falsely counted as a failure to give antimicrobial prophylaxis.

What it means

Only seven out of ten surgical patients benefit from all three original SSI prevention measures. This process quality has not relevantly improved since the start of the SSI Intervention module in 2019.

However, in the nine hospitals newly contributing to the dataset in 2023 (two joining SSI Intervention and seven using only the observation), bundle adherence was 58.7%, which explains the drop in 2023.

Adherence to the three newly introduced prevention measures needs to be higher. This becomes apparent even if the number of observations and participating hospitals is low for the three newly introduced SSI prevention measures. This result might suggest that Swiss hospitals do not follow international SSI prevention guidelines, e.g. those published by the WHO in 2016 (and update 2018) and elaborated with the participation of Swissnoso members.[3] The reason for this remains elusive. It seems that there is no normative pressure to follow international guidelines.

Given this assumed suboptimal SSI prevention in Swiss hospitals, it remains unclear why some Swiss hospitals do not participate in the Swissnoso SSI Intervention module. However, Swissnoso does not possess data on how many hospitals undertake improvement initiatives independently of Swissnoso.

What to do next

Guidance and exchange on promotional strategies must be increased, e.g. fostering interdisciplinary collaboration between surgeons, anaesthetists, and IPC, the lack of which is often cited as a barrier (anecdotal evidence).

The merging of SSI Surveillance and SSI Intervention must be discussed to benefit from related data and provide guidance on improving adherence to more Swiss hospitals. We suggest the goal of a bundle adherence with the six SSI prevention measures featured in the Swissnoso SSI Intervention module of ≥ 90%.

3 https://www.who.int/publications/i/item/9789241550475

SSI prevention measure adherence data must be linked to patients in the SSI Surveillance module. This is one of the aims of the Swissnoso Digital IPC Platform.

Ideally, SSI prevention measure adherence data must be collected automatically for each patient, using data in electronic patient record systems (e.g. timing of antibiotic prophylaxis, body temperature, glucose levels, ***S. aureus*** decolonisation, etc.). This will create valid data for promotional purposes.

Data on antibiotic prophylaxis collected by the SSI Surveillance module must be improved by only counting prophylaxis as failed when this was indicated.

OUTCOME

SSI rates

SSI Surveillance was the first HAI incidence surveillance module introduced in Switzerland. It was developed in Valais and first used in western and southern Switzerland in 1998. The hospitals in Valais, Vaud, Neuchâtel, Fribourg, Jura, Geneva (HUG), Ticino, and Emmental joined the surveillance first. The programme was transferred to Swissnoso in 2010 and became mandatory in 2011.

Based on the national quality agreement, each hospital is required to monitor at least three of the above-mentioned types of surgery for adults. Hospitals must perform surveillance for colon surgery if they offer this procedure but can freely select the other types of surgery. In addition, the monitoring of appendectomies is mandatory for children and adolescents up to the age of 16.

What we observed

Over the years, SSI rates have **significantly decreased** for eight types of surgery in the overall population of changing hospitals **(Figure 12 and Figure 13):**

- appendectomy,
- colon surgery,
- cholecystectomy,
- gastric bypass surgery (see comment below),
- cardiac surgery,
- laminectomy with implant,
- hip replacement,
- knee replacement.

Over the years, SSI rates have **not decreased or increased** for five types of surgery:

- cardiac valve implant surgery,
- rectal surgery,
- caesarean section,
- hysterectomy,
- laminectomy without implant.

The evolution of SSI rates for some types of surgery warrants special mention:

- SSI in **appendectomy** was exceptionally high in the first two years (with lower hospital participation), followed by a steady decline.
- SSI in **rectal surgery** doubled between 2012 and 2020, decreasing sharply to the initial rate in 2022 while maintaining the same number of hospitals but a decreasing number of interventions.
- The decline in SSI rates in **gastric bypass surgery** happened after the first two years without any further decline since.
- SSI in **hysterectomy** saw an increase in the last two years.
- The point estimate SSI rate for **cardiac surgery with a valve implant** decreased to less than half in 2022 compared to 2021 without reaching statistical significance (and even more compared to the first years).
- The extreme drop in SSI in **laminectomy with implant** coincided with a drop in participating hospitals and surveyed intervention.

The evolution of deep and organ/space SSI rates follows the SSI rates when superficial SSIs are included.

In 2021/22, overall, 50.8% of SSIs were detected only **after patient discharge,** of which 39.9% were superficial, 10.6% were deep wound, and 50.1% were organ-space infections.

What to be aware of

In 2021, the follow-up period for implant surgery (including cardiac surgery because of cerclages) was reduced from one year to three months. This could theoretically lead to an artificial decrease in SSI from 2022 onwards, as seen in cardiac surgery with implant and laminectomy with implant.

The results displayed here are crude SSI rates. They do not account for changing patient case mix, changes in surgical technique (minimally invasive or robotic surgery), or a shift of surgery to an ambulatory setting.

The participation of Swiss hospitals has not changed significantly over time due to the mandatory nature of the module. However, the number of participating hospitals has declined due to hospital mergers and the closure of small hospitals.

Except for colon surgery and appendectomy in children, which are mandatory, the choice of additional surgical procedures to include on the hospital level can bias the results for better or worse at the hospital and national levels. Allegedly, some of these additional choices are decided by cantonal health authorities.

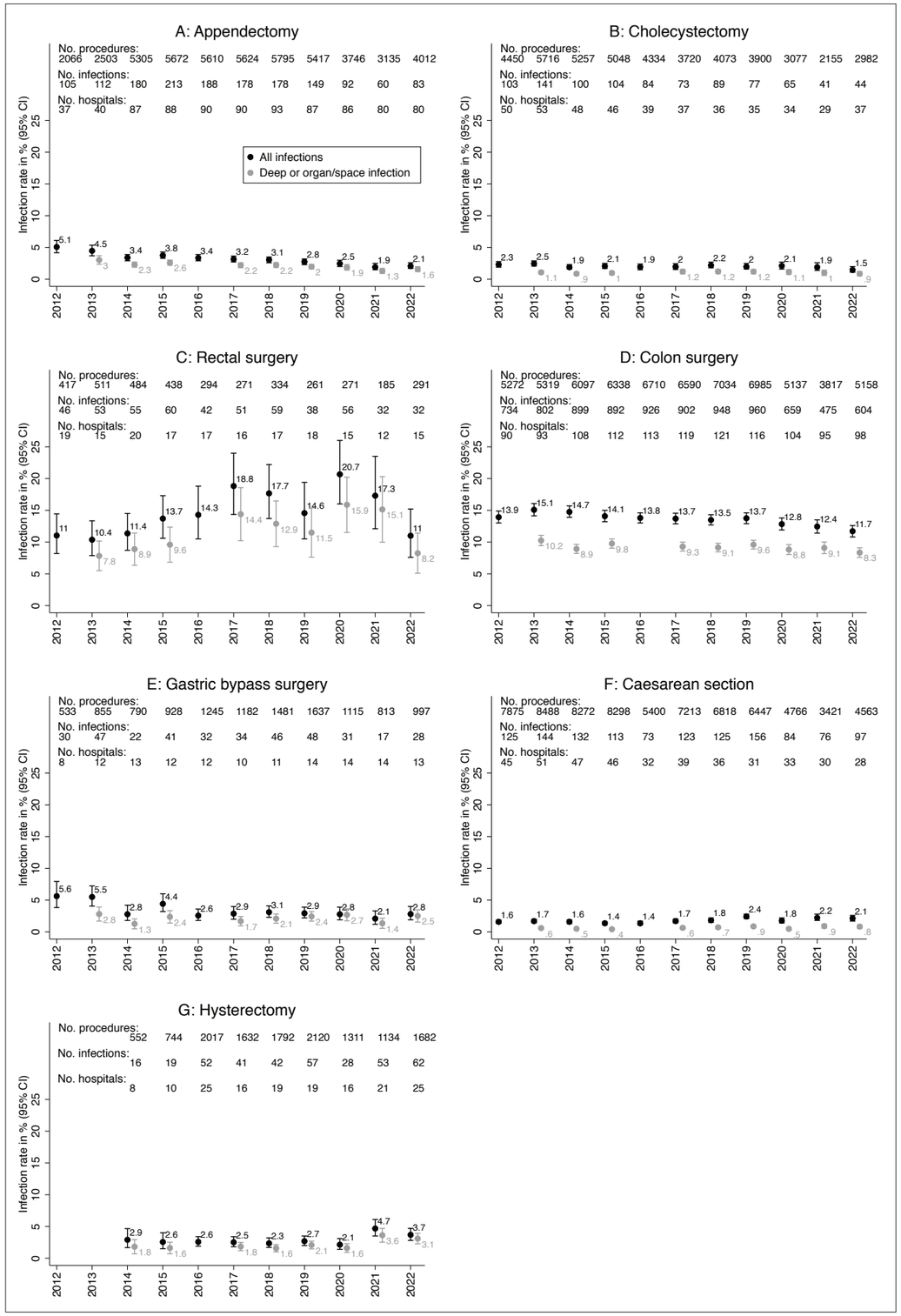


Figure 12. Surgery without implant. Surgical site infection rate.

Data is based on the SSI Surveillance module. The measured period lasts from 1 October of the previous year to 30 September.

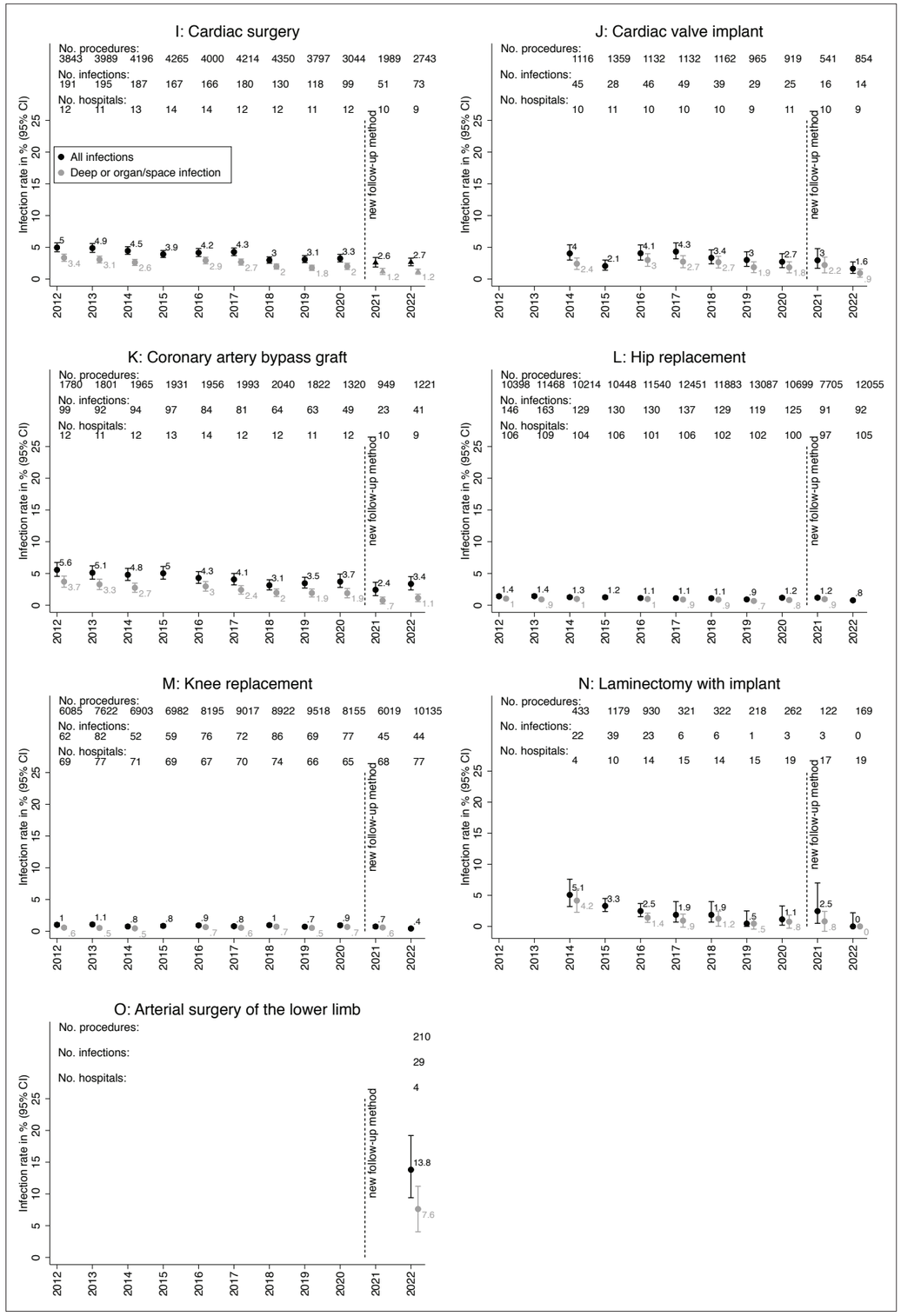


Figure 13. Surgery with implant. Surgical site infection rate.

Data is based on the SSI Surveillance module. The measured period lasts from 1 October of the previous year to 30 September.

What it means

SSI rates have decreased significantly over the years for most surgery types and overall. Participation in the Swissnoso Surveillance module can be assumed to have contributed to this trend. An alternative interpretation cannot be refuted since participation in SSI surveillance is mandatory and comparisons with non-participating Swiss hospitals are thus lacking.

In some cases, prominent patterns (as described above) in SSI rates over time are poorly understood. The steep decline in SSI following rectal surgery is encouraging and might be due to the concentration of rectum surgery in fewer hospitals since it has been considered a «highly specialised surgery» that only authorised hospitals can perform.

Many hospitals experience such a low number of SSIs per year (due to a low caseload) that their SSI rates show considerable confidence intervals. This challenges SSI rates as the primary metric to steer improvement initiatives at the hospital level. Process quality indicators (adherence rates) would be more adequate and effective.

What to do next

Ramp up the Swissnoso Intervention module to advocate for improvement strategies beyond monitoring adherence rates. Prioritise those surgery types with increasing or elevated SSI rates.

Semi-automate SSI Surveillance through digitalisation efforts, as with the planned Swissnoso Digital IPC Platform to:

- Free hospital IPC team time to run multimodal improvement projects.
- Improve the impact of SSI results by real-time feedback of SSI and adherence rates.

Steer improvement initiatives at the hospital level with adherence rates since SSI rates show overly large confidence intervals. Potentially merge the Intervention module with the Surveillance module.

Benefit from the Social Network Analysis PhD project's insights on how information about evidence-based SSI prevention measures spreads to frontline HCWs and how improvement initiatives succeed.

To find and advise outlier hospitals (over- and under-performers), it is advisable to collate SSIs over several years to counteract the small-number problem.

Considering case-mix adjustment over time would be valuable in better understanding the natural trend of SSI rates versus the effect of improvement efforts

3. Catheter-associated urinary tract infections (CAUTI)

Catheter-associated urinary tract infections (CAUTI) are among the most common healthcare-associated infections. They are associated with increased morbidity and mortality, increased healthcare costs and prolonged hospitalisation. Epidemiological surveillance is a critical component in the prevention and control of CAUTI.

In addition to structural components of CAUTI provided by the IPCAF tool, the Swissnoso CAUTI modules generate process data (CAUTI prevention) and outcome data (CAUTI surveillance).

STRUCTURE

IPC structures for CAUTI prevention

What we observed

Of the 98 hospitals that answered the IPCAF survey instrument in 2022 or 2023, 71 (72.5%) confirmed the existence of CAUTI prevention guidelines in their hospitals.

What to be aware of

Answers to the IPCAF instrument might be affected by desirability bias. However, this is less likely for the existence or non-existence of an artefact (guidelines) than for activity.

What it means

One in five hospitals does not dispose of written guidelines for CAUTI prevention.

We do not have data on the content, quality, and accessibility of CAUTI guidelines in Swiss acute care hospitals.

Photo by Getty Images on Unsplash

What to do next

Broader knowledge of the existence and quality of structural elements of CAUTI prevention in Swiss hospitals would be desirable and might help increase social norm pressure, as will be the case with the new survey instrument introduced in 2024.

PROCESS

Adherence to CAUTI prevention measures

The CAUTI Intervention module was introduced in the spring of 2023. It features the Clean Care Monitor (CCM-CAUTI), a mobile instrument for on-site observation of urinary catheter insertions.

The Swissnoso CAUTI Surveillance module also delivers data on catheter utilisation density (as a proxy for cautionary catheterisation) and adequacy of the reason for catheterisation (correct indication).

What we observed

The percentage of indicated catheters did not decrease between 2022 and 2023 in the subgroup of five hospitals that recorded data on indications continuously **(Figure 14, grey labels).**

While catheter utilisation density decreased in surgical wards between 2022 and 2023, it increased significantly in medical wards **(Figure 15).**

What to be aware of

The number of participating hospitals is small and changed between the two years. Therefore, the results must be considered cautiously to represent the overall situation in Swiss hospitals.

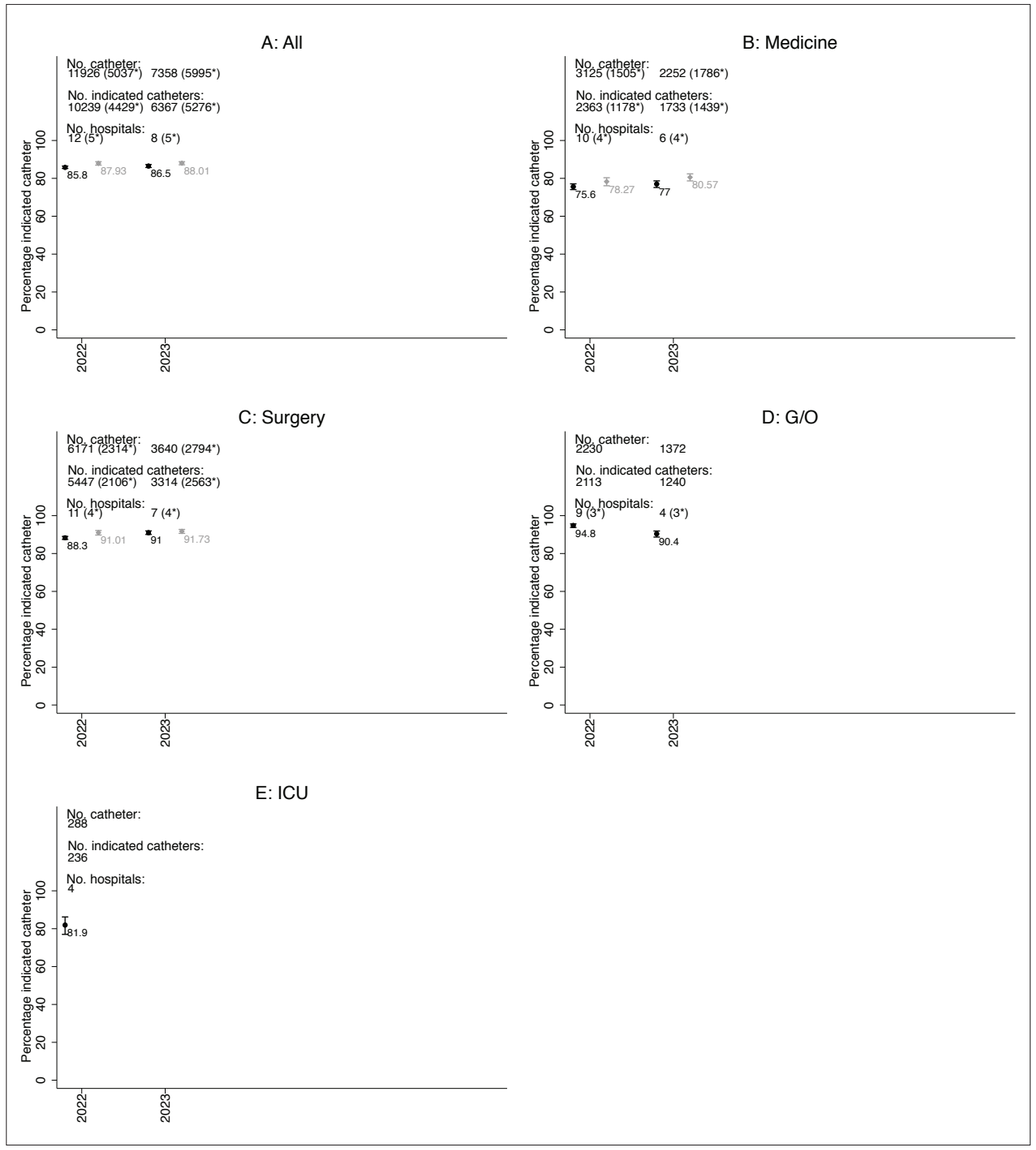


Figure 14. Percentage of indicated catheters based on CAUTI surveillance data.

Numbers in brackets (*) and grey symbols show the numbers from those hospitals that reported data in 2022 and 2023.
Data is only displayed if at least four hospitals participated.

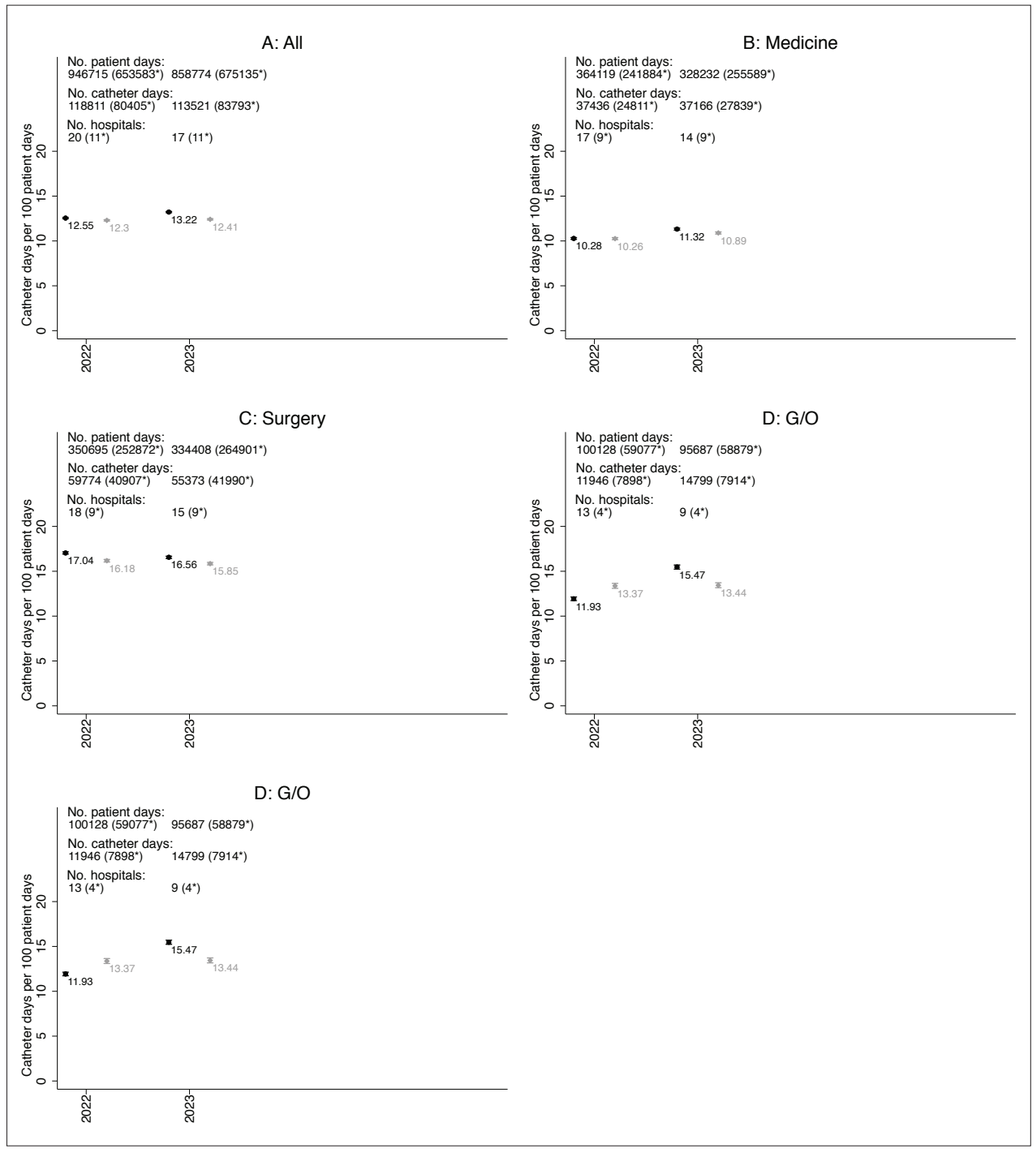


Figure 15. Catheter density based on CAUTI surveillance data.

Numbers in brackets (*) and grey symbols show the numbers from those hospitals that reported data in 2022 and 2023. Data is only displayed if at least four hospitals participated.

What it means

Overall, 14% of urinary catheters are still used without justifiable indication; in internal medicine, even every fifth catheter!

The catheter utilisation density increased and decreased dramatically in some speciality units between 2022 and 2023. This is likely due to a change in participation since the value for participants taking part every year stayed the same.

The number of participating hospitals is too small to consider the data as nationally representative. It remains unclear why so few IPC teams and hospitals proactively engaged in CAUTI prevention.

What to do next

Indications for urinary catheterisation can be captured from the electronic patient record system. Together with automatically captured catheter utilisation density, this will provide near-real-time data for process quality feedback and benchmarking.

In 2024, three hospitals started using the CCM-CAUTI instrument to observe the preventive quality of catheter insertions. It will constitute a formidable tool to boost the quality of this process wherever the promotional presence of IPC team members and feedback is necessary.

OUTCOME

CAUTI rates

The Swissnoso CAUTI Surveillance module was introduced in 2022 after a pilot phase.

What we observed

CAUTI rates were comparable between 2022 and 2003, around 1.5% per 1,000 catheter days **(Figure 16).**

The rates of hospitals participating in both years were comparable to those of all participating hospitals, which speaks against a major bias introduced by changing participation.

What to be aware of

A major limitation in the longitudinal data comparison is that the participating hospitals' overall numbers changed in composition, thus leading to potential bias.

The dataset is (still) too small to draw conclusions on the effect of participating in the CAUTI Intervention module (three hospitals). Additionally, we do not dispose of reliable information on what promotional activity is undertaken by hospitals not participating in the Intervention module.

Catheter utilisation density depends on specific medical care and, therefore, differs naturally between specialities.

The proportion of urinary catheters with an established indication might be overestimated since «urine output monitoring», one of the accepted reasons for catheterisation, might be chosen too liberally.

What it means

The 2023 CAUTI rate in the Swissnoso CAUTI Surveillance module of 1.5 per 1,000 catheter days is higher than the 2021 rate of 0.9 per 1,000 catheter days reported from approximately 3,700 acute care hospitals in the US[1] using the same CAUTI definition as Swissnoso.

Outlier hospitals with low catheter utilisation density are under investigation for data quality by the module coordinator team.

The annual number of CAUTIs in most hospitals is too low to serve as a steering quality indicator for preventive interventions.

What to do next

The central pillar of CAUTI prevention remains the restrictive use of urinary catheters. Swissnoso collects the process indicators «indication» and «catheter utilisation density» that best represent these process qualities. These indicators should be used to drive and monitor improvement at the hospital level.

With digitalisation efforts, as with the Swissnoso Digital IPC Platform project, this data could be automatically produced and available to hospitals almost in real time against a national benchmark. The number of hospitals delivering data to the national dataset will most likely also increase.

Enforcing device stewardship as a means of reducing overall morbidity and mortality due to HAI and other device-associated complications[2]

1 CDC NHSN. 2021 National and State HAI Progress Report: Acute Care Hospitals: CAUTI observed events and device days (Table 2a-ii). Available here [accessed on 24 June 2024].

2 Advani, Sonali D. et al. The next frontier of healthcare-associated infection (HAI) surveillance metrics: Beyond device-associated infections. Infection Control & Hospital Epidemiology (2024): 1-5. Available here. [accessed on 24 June 2024].

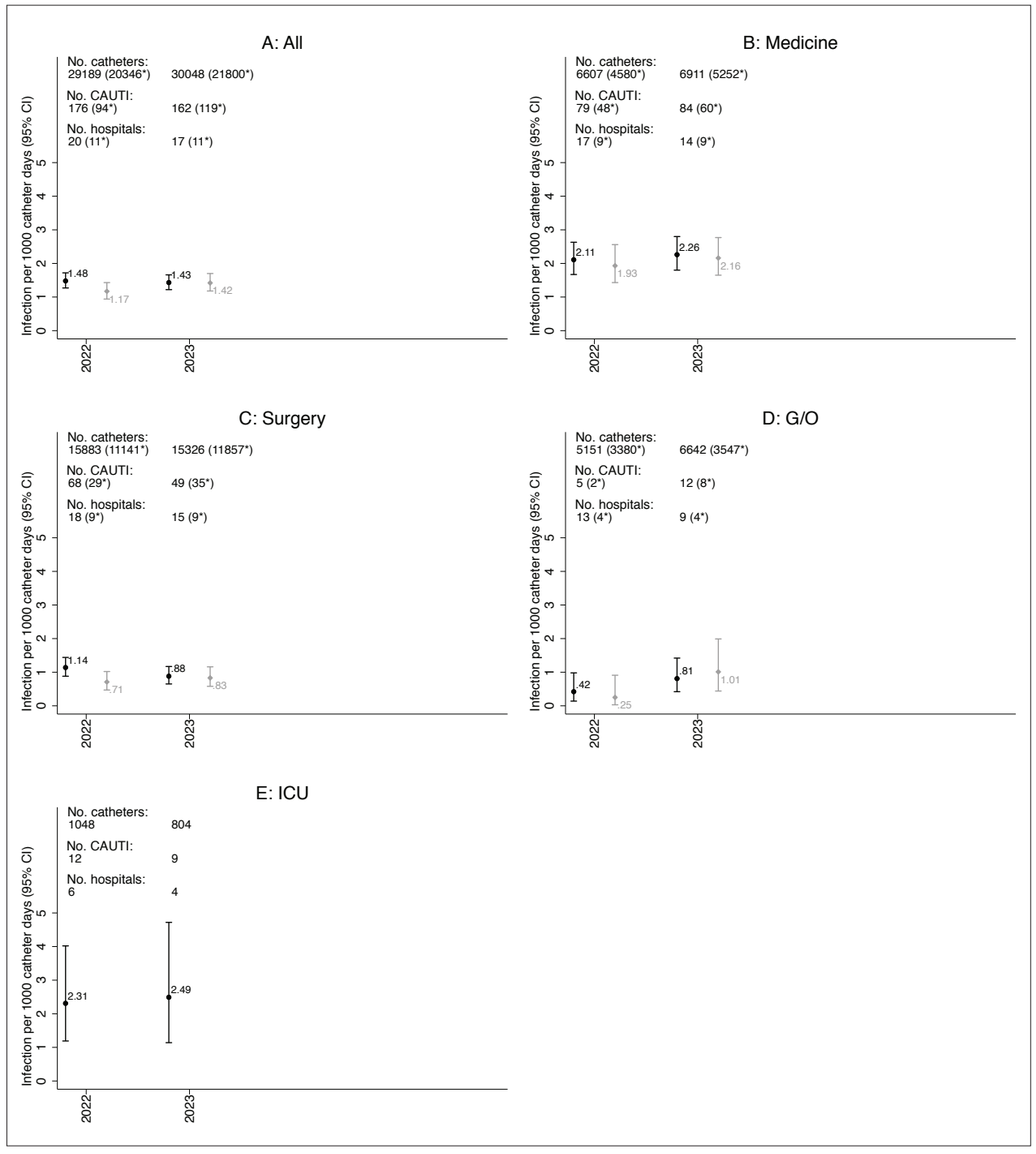


Figure 16. CAUTI infections per 1,000 catheter days based on the CAUTI surveillance.

Numbers in brackets (*) and grey symbols show the results of hospitals reporting data for 2022 and 2023.
Data are only displayed if at least four hospitals participated.

4. Healthcare-associated viral respiratory infections

Compared to 2022, which was substantially marked by the Omicron SARS-CoV-2 equally affecting the community and hospitals and aggravating the staffing crisis, in 2023, acute care hospitals increasingly headed towards «normality». Early and late («cold») seasons of 2023 still saw increased cases of COVID-19 and influenza in adults,[1] and a spike in children admitted with RSV.[2] In the ECDC PPS 2022-23, COVID-19 had a vast proportion of 7% of all HAIs, highlighting the ongoing need for surveillance of nosocomial transmission of respiratory viruses.

This document refers to reports of the CH-SUR sentinel network tasked with monitoring the epidemiology of SARS-CoV-2 and influenza in the acute care setting.

At the beginning of 2023, Swissnoso recommendations on the management of suspected or confirmed cases of COVID-19 were still in place, aiming to protect the most vulnerable. Broader testing and upscaling of measures were to be considered primarily according to local epidemiology and needs. In contrast, systematic screening at admission had already been discontinued in line with the lifting of general measures in 2022.

In September 2023, Swissnoso published recommendations on infection prevention and control measures for acute viral respiratory infections in acute care hospitals. They cover SARS-CoV-2, influenza, respiratory syncytial virus (RSV), and other viruses that cause acute respiratory infections in a single overview, particularly for the upcoming fall/winter season. Focusing on general precautions such as respiratory etiquette, personal protective equipment, and hand hygiene, the document features additional recommendations for managing adult, paediatric, and severely immunocompromised patients, healthcare-associated respiratory virus outbreaks, and occupational health aspects.

STRUCTURE

Structures for the prevention of viral respiratory infections

What we observed

Swissnoso does not have access to data on hospital structural elements preventing and controlling viral respiratory infections.

What to do next

The revised survey on the ***Swiss Minimum Structural Requirements for IPC*** includes questions on influenza vaccine rates for staff and will be in use from 2024.

Photo by Getty Images on Unsplash

1 CH-SUR. Hospital based sentinel surveillance of COVID-19 and influenza, week 2023-52 report. Available here [accessed on 24 June 2024].
2 PIGS. Respiratory viral infections in children. Available online under https://pigs.ch/ [accessed on 24 June 2024].

PROCESS

Swissnoso does not have access to specific HCW adherence data for healthcare-associated viral respiratory infections, such as HCW vaccination rates, observed mask use, adherence to screening protocols, etc.

OUTCOME

Healthcare-associated SARS-CoV-2 and influenza rates

The CH-SUR hospital-based Sentinel Surveillance System has monitored hospital admissions due to influenza (since 2018) and COVID-19 (since 2020). While the primary aim was to determine the burden and outcome of those infections, the network also provided estimated proportions of nosocomial infections.

In 2023, 18 hospitals (from 1 December 2023 onwards, a reduced number of six hospitals) provided weekly data on influenza hospitalisations (during the winter season between week 40 to week 20) and COVID-19 hospitalisations (throughout the year).

Detailed information on survey methodology can be found in **Annex 3.**

What we observed

According to the final report of 2023,[3] the participating hospitals detected up to one hundred COVID-19 cases per week overall for most of the year before numbers began to rise from September onwards **(Figure 17).** Influenza activity was detected very early and found to rise again late in 2023.

According to the same report, the proportions of nosocomial cases among overall COVID-19 detections ranged between 25% and 50%. The proportions of nosocomial influenza infections were slightly lower, around 5% to 25% of overall detections for most of the surveillance time.

What to be aware of

Important limitations apply due to the low case ascertainment in Swiss acute care hospitals, given the absence of systematic (admission) screening in 2023, for which COVID-19 and influenza overall detections were likely underestimated.

A considerable proportion of nosocomial cases was likely misclassified, and possibly overestimated, due to the lack of standardised testing strategies when

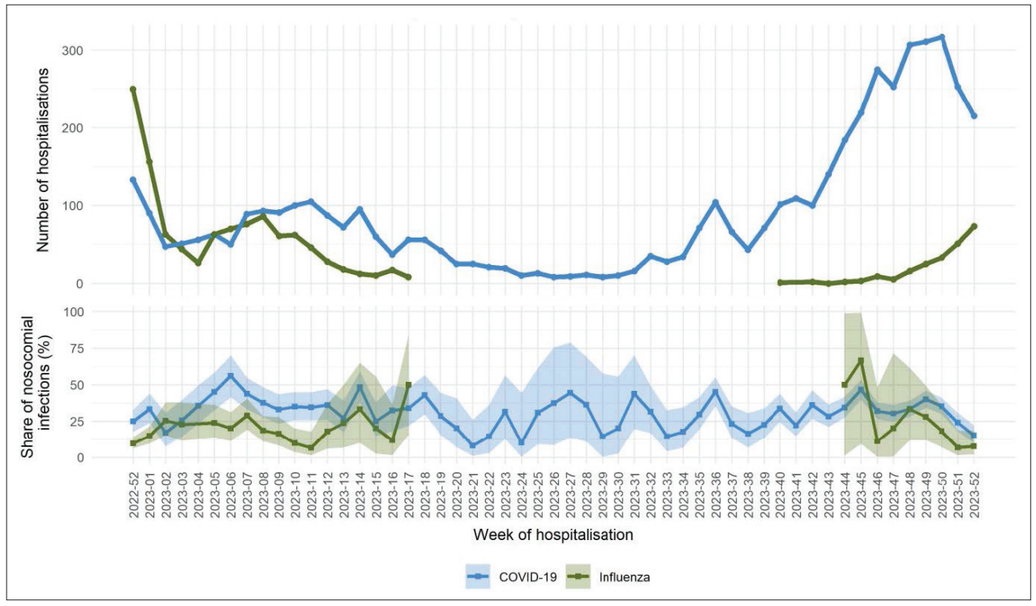


Figure 17. COVID-19 and influenza in CH-SUR hospitals per week [as shown in the CH-SUR report[4]].

Upper: Number of COVID-19 and influenza hospitalisations in CH-SUR network hospitals per week. Lower: Share of nosocomial infections among COVID-19 and influenza hospitalisations per week (n=17, from 1 Dec 2023 onwards n=6 hospitals).

3 FOPH. Hospital Based Sentinel Surveillance of COVID-19/Influenza Week 2023-52 (9 Jan 2024), published here.

4 CH-SUR. Hospital based sentinel surveillance of COVID-19 and influenza, week 2023-52 report. Available here [accessed on 24 June 2024].

testing of infected patients was missed on admission and done only after the fifth day of the hospital stay.

Data representativeness for Swiss hospitals is limited due to differences in geography, size, and case mix of sentinel hospitals (one of them featuring a large geriatric hospital reporting high numbers of nosocomial cases) – even more so after the number of participating sites was reduced from 18 to six starting from December 2023.

As a result, data must be interpreted with caution as it represents gross estimates at best.

What it means

Increased detection of COVID-19 among CH-SUR network hospitals from September 2023 mirrors the high virus activity in the general population reported by the national reference laboratory late in 2023. Given high levels of vaccine- and infection-derived population immunity at that time, increasing transmissions were likely due to new Omicron subvariants.[5]

Notwithstanding the data limitations, a high proportion of nosocomial cases was observed in 2023 out of the total number of COVID-19 cases reported from participating hospitals, warranting continuous monitoring of hospital transmissions and review of the potential need for interventions according to local epidemiology and setting.

Proportions of nosocomial infections vs overall detection on admission appear higher for COVID-19 than for influenza, which would be consistent with the higher infectivity of SARS-CoV-2 compared to influenza.

What to do next

CH-SUR is conducting a scientific analysis to determine relevant factors in nosocomial transmission of SARS-CoV-2 and influenza. Based on the resulting proportion of healthcare-associated cases, permanent surveillance would be indicated.

Hospitals must continue to ensure HCWs follow current precaution measures that align with the Swissnoso healthcare-associated respiratory virus recommendations.[6]

National strategies and mechanisms should support hospital-based surveillance for respiratory viruses, which can be expanded according to epidemiological needs and other high-consequence pathogens, whenever needed. The Swissnoso Digital IPC Platform project could provide the necessary surveillance data.

5 CRIVE. Swiss national SARS-CoV-2 genomic and variants surveillance programme. Report October 2023 available here [last accessed on 24 June 2024].

6 Swissnoso recommendations on respiratory virus infections in acute care hospitals, available online under https://swissnoso.ch/guidelines-publikationen/guidelines

5. Antimicrobial resistance

Measures to prevent and mitigate the effect of antimicrobial resistance are inseparably connected to IPC. Swissnoso and project partners, under the national strategy against antimicrobial resistance (StAR) support implementing **antimicrobial stewardship programmes (ASP) in Swiss acute care hospitals (StAR-3).**[1] ASPs focus on adequate prescribing but also include governance, guidelines, education & training, and audits, all representing critical areas of synergy with the implementation of the Swiss Minimum Structural Requirements for IPC (NOSO Strategy).

The IPCAF tool provides information on **structural** components for IPC. They include room disinfection & cleaning, hand hygiene, IPC staffing levels, hospital isolation capacity, and multimodal intervention bundles, the implementation of whose components is associated with reducing antimicrobial resistance, as highlighted in the recent ECDC report.[2] In 2023, a **survey was conducted to collect additional structural information** on the proportion of acute care hospitals adhering to the national MDRO control guidelines.

The CH-PPS provides **outcome data on antimicrobial use,** although only on a point-prevalence basis.

In addition, ANRESIS, the Swiss Centre for Antibiotic Resistance, collects yearly data on antibiotic use provided to their platform by the participating Swiss hospitals, which receive a benchmarking report. (Yearly antimicrobial use data can be accessed via the ANRESIS webpage).[3]

The Swissnoso National nosocomial outbreak investigation centre, on behalf of the FOPH, collaborates closely with ANRESIS and other relevant partners to monitor **important trends in drug resistance and epidemiology of MDRO** in Swiss acute care hospitals. Resistance data in human medicine can be accessed via the ANRESIS webpage.

STRUCTURE

Structures for the prevention of antimicrobial resistance

The IPCAF tool provided information pertinent to the prevention of antimicrobial resistance. ANRESIS provided information on the number of hospitals participating in monitoring antibiotic use and laboratories participating in monitoring resistance via their platform.

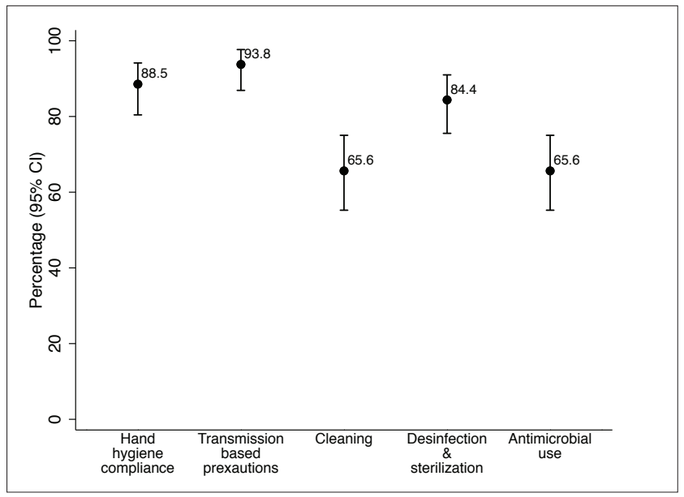


Figure 18. Hospitals reporting audit programmes relevant for antimicrobial resistance (n=98).

Based on selected questions in the IPCAF tool in 2022 and 2023.

1 StAR-3 (Swissnoso and partner organisations). Full information available here.

2 European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals. ECDC; 2024, report available here. [last accessed on 24 June 2024].

3 ANRESIS, the Swiss Centre for Antibiotic Resistance. More information and reports on inpatient antibiotic consumption can be found here.

To determine hospital application of the national guidelines on MDRO prevention and control in a non-outbreak situation (published in October 2021), Swissnoso circulated a survey to IPC teams of 142 Swiss acute care hospitals between 11 May and 7 July 2023. Detailed information on survey methodology can be found in **Annex 4.**

What we observed

According to IPCAF 2022 and 2023, 64.3% of hospitals (63/98) provide guidelines for correct antibiotic treatment.

Isolation measures for preventing MDRO transmission (93.8%) and hand hygiene compliance (88.5%) were reported to be most often monitored in the hospitals. By contrast, cleaning (65.6%) and desinfection of patient areas/wards (84.4%) and antimicrobial use are monitored less often (65.6%; **Figure 18).**

ANRESIS records suggest that most acute care hospitals participated in their national monitoring system for antimicrobial use in 2023, i.e. 72.5% (74/102) of Swiss acute care hospitals (ANRESIS, personal communication). Of those 74 institutions, 67 (91%) provide yearly data on antimicrobial use and seven (9%) monthly data (not shown). In parallel, the resistance data provided by laboratories to ANRESIS represents approximately 90% of annual hospitalisation days.

Data from nearly half (63 of 142 (i.e. 44%) of Swiss acute care hospitals showed that most of them (≥90%) had screening protocols in place for priority MDROs (Methicillin-resistant ***S. aureus,*** Vancomycin-resistant enterococci, Extended-spectrum beta-lactamase-producing Enterobacterales, and Carbapenemase-producing Enterobacterales) in patients transferred from hospitals abroad. Lower proportions of hospitals screened patients for ***Candida auris*** following transfer from high-risk units abroad (despite being strongly indicated) or patients with other healthcare interactions abroad within the previous 12 months for priority MDROs **(Figure 19 — left).** Importantly, even fewer hospitals screened for priority MDROs for in-country transfers, e.g. from centres with known MDRO outbreaks **(Figure 19 – right).** Insufficient staff compliance was deemed as the principal barrier to local guideline adherence, followed by staff/laboratory costs and patient non-compliance (data not shown).

What to be aware of

Limitations of IPCAF data (e.g. bias related to variations in participation and due to self-reporting). Moreover, the IPCAF doesn't provide data on the proportion of multiple-patient rooms, a risk factor for nosocomial MDRO transmission.

Similarly, the survey on hospital implementation of screening procedures according to national MDRO guidance was prone to bias due to self-declaring responses. It did not distinguish between private and public hospitals, thus potentially overestimating the adherence to priority MDROs.

What it means

35% of hospitals still need to implement guidelines on antimicrobial use.

Two-thirds of Swiss acute care hospitals participate in the ANRESIS network to monitor antimicrobial use continuously.

Whereas most hospitals had guidelines to screen patients transferred from abroad for priority

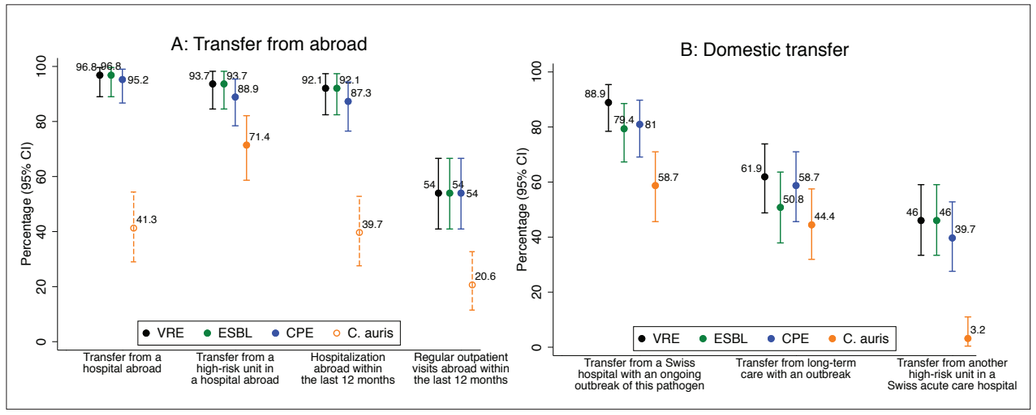


Figure 19. Implementation of national MDRO guidelines in Swiss hospitals (n=63).

Self-declaration of the presence of respective guidelines in the hospital. Results are based on the survey on adherence to national MDRO guidelines in 2021.

Photo by Getty Images on Unsplash

MDROs, optimisation is needed for specific screening indications regarding the patient transfer from abroad and from Swiss healthcare institutions with uncontrolled outbreaks.

What to do next

The evolving StAR-3 project *Implementing antimicrobial stewardship programmes (ASPs) in Swiss hospitals*[4] will provide hospitals with structured guidance on implementation stewardship locally, including practical tools for clinicians, pharmacists and other healthcare staff involved in prescribing and administering antibiotics.

The project encourages hospitals to enrol in the ANRESIS monitoring of antimicrobial use, among several other relevant structures and processes to be implemented locally. Moreover, importance is given to providing feedback to local teams (ASP, IPC, and prescribing doctors), e.g. monitoring data (e.g. of antimicrobial use).

The new questionnaire on *Swiss Minimum Structural Requirements for IPC*, which has been in use since 2024 (see above, Chapter 1) will also monitor IPC-relevant structures. This will support the optimisation of local IPC guideline access and the use of education and training of HCWs. This will increase the proportion of hospitals with protocols in line with national guidelines, which is critical given the increasing prevalence of MDRO and emerging nosocomial threats such as ***Candida auris.*** The integration of structure elements developed by StAR-3 in this survey will be discussed.

PROCESS

The optimal process quality consists of making the medically correct diagnostic and therapeutic decision for each individual patient based on antimicrobial treatment guidelines. The rate of antimicrobial use is a surrogate marker (similar to the urinary catheter use density) to measure the effect of interventions over time.

Additionally, hand hygiene adherence data can be used to estimate the hospital's performance in preventing MDRO spread.

Lack of staff adherence to the established MDRO screening procedures was reported to be very low in the survey reported above, but no data are available on this process quality.

4 Starting in September 2023, StAR-3 is led by a consortium of seven organisations (Swissnoso and six partner organisations – SSI, SSHH, GSASA, SSM, ANRESIS and FMH). With the purpose of supporting hospitals in starting and improving ASPs to optimise inpatient antimicrobial use, the key output is a handbook (the first edition was published in 2024, and the second will be published in 2026) with practical tools for clinicians, pharmacists and other healthcare staff involved in prescribing and administering antibiotics. StAR-3 will furthermore monitor the status of Swiss-wide implementation of ASPs and recommend policy strategies to strengthen the nationwide adoption of ASPs.

Prevalence of antimicrobial use in Swiss hospitals

What we observed

The prevalence of antimicrobial use in 2023 was 32.6% **(Figure 20).**

What to be aware of

Potential methodological limitations relate to CH-PPS (see Chapter 1).

Information needs to be complemented by antimicrobial use monitoring data from ANRESIS, which provides a more granular comparison by standardised metrics (DDD (defined daily dose, DDD[5]) as the assumed mean daily maintenance dose for a main indication of a drug in adults) by year or even shorter time intervals, for a proportion of hospitals stratified by type of ward or speciality.

What it means

The proportion of patients on antimicrobial medication increased in 2022 and 2023 compared to previous years (Figure 20). This appeared not to depend on hospital category/size, except for lower antimicrobial use in specialised hospitals (which mainly offer elective surgery and use antimicrobials largely for surgical prophylaxis; **Figure 21).**

No major change was seen regarding indications for antimicrobial use in 2023 compared to 2022. Middle-size and large hospitals use more antimicrobials for therapeutic purposes, while small hospitals use more antimicrobials for surgical prophylaxis **(Figure 22).**

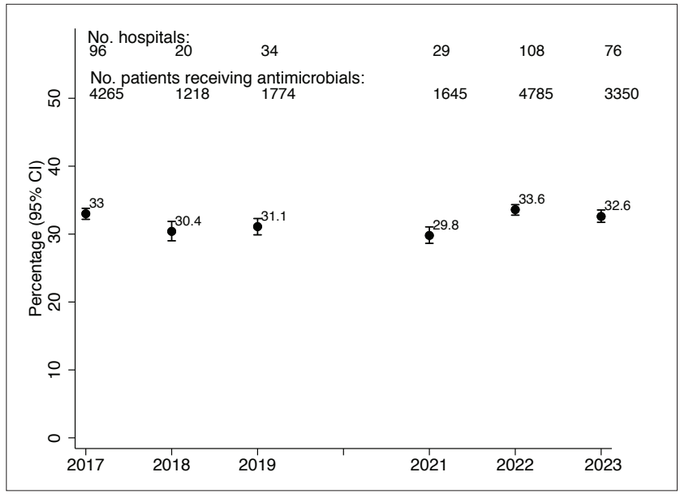


Figure 20. Prevalence of antimicrobial use over time in all hospitals.

Proportion of hospitalised patients receiving antimicrobials. Data source: CH-PPS 2017-2023.

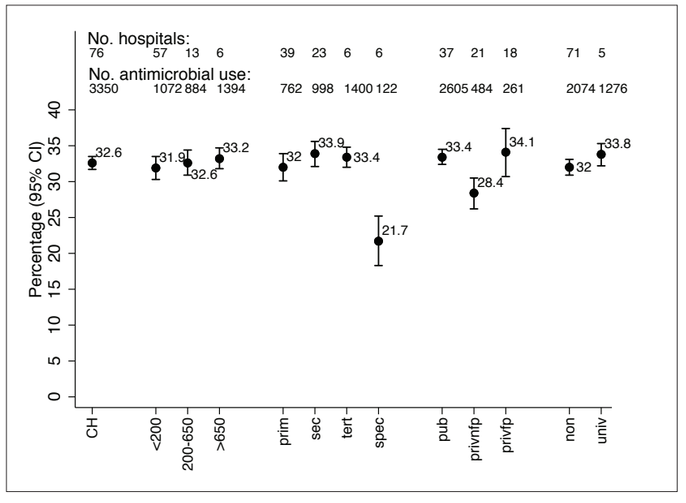


Figure 21. Antimicrobial use by hospital size, hospital type and university affiliation.

Proportion of hospitalised patients receiving antimicrobials. Data source: CH-PPS 2017-2023. Legend: CH: Switzerland; hospital size: <200 beds (small), 200-650 beds (medium size), >650 beds (large); hospital type: primary care, secondary care, tertiary care, specialised hospital, paediatric clinics (n=2) are not shown; hospital ownership: pub (public), privnfp (private, not-for-profit), privfp (private, for-profit); University-affiliation: not affiliated (non), affiliated (univ).

5 Further information available on the ANRESIS website. How is the consumption of antibiotics measured? https://www.anresis.ch/antibiotic-consumption/methods/

What to do next

Point prevalence data on antimicrobial use needs to be correlated with ANRESIS data, which provides a more granular comparison by standardised metrics (DDD, as above) by yearly or even shorter time intervals for a proportion of hospitals stratified by type of ward or speciality. This will allow identifying key areas (hospitals, wards) with the highest use and/or highest potential to optimise antimicrobial use.

In addition, antimicrobial use data should include patient-specific information. Such metrics would help in evaluating local hospital (departments, wards) processes regarding the quality of antimicrobial prescribing (adequate decision, starting, review, and stopping, as covered in the concept of ***Start smart, then focus*** that is promoted in the StAR-3 ASP handbook, see above). This will help identify further opportunities for interventions to optimise local antimicrobial therapy accordingly. However, ANRESIS has no patient-specific data, and valuable information on use and data protection of patients will remain a challenge.

Hand hygiene

Hand hygiene is regarded as the most effective means of mitigating pathogen transmission. Therefore, it is a good indicator of the between-patient spread of MDRO rather than HAI risk.

Many hospitals collect hand hygiene data using the Swissnoso CCM-Clean Hands mobile observation tool,[6] which was introduced in 2012.

The instrument supports the observation according to the WHO «My Five Moments for Hand Hygiene»[7] concept and method.

A «Four Moment concept» is also available with an additional indication of «Before touching the patient's immediate environment», merging it with «Before touching a patient» to constitute Moment 1 – and merging «After touching the patient's immediate environment» with «After touching the patient» as Moment 4.

Additionally, the correct use of gloves can be monitored (not shown in this report).

What we observed

In 2023, IPC teams collected 42,813 hand hygiene opportunities for the ***Five Moments*** concept and 5,049 for the ***Four Moments*** concept **(Figure 23).**

Hand hygiene adherence was ~ 80% in both observation concepts, with a descending trend since 2020 (after an increase in the year before).

What to be aware of

Data quality is limited due to the non-methodologic data collection.

The instrument does not capture HCW identity, which precludes clustering correction at the HCW level (design effect).

What it means

Hand hygiene adherence, as observed in Swiss hospitals with the CCM-Clean Care Monitor, is deemed acceptable, but still, one-in-five moments is missed.

Overall, hand hygiene adherence in participating hospitals shows a weak declining trend after a steep improvement between 2019 and 2020.

The difference between professional categories and moments has not changed over time **(Figure 24).** Nurses are better than doctors and «others». The self-protecting moments («After touching a patient»; «After touching the immediate environment of the patient») are better than the patient-protecting moments («Before touching a patient»).

What to do next

Consider establishing and managing hand hygiene observations as a major process indicator in the spread of antimicrobial-resistant pathogens in acute care hospitals within the StAR programme.

Consider switching from manual hand hygiene observations to a sensor-based automated approach limited to a One-Moment concept «Before approaching a patient» with anonymous identifiers of patients and HCWs. This would deliver large unbiased datasets, better reflecting the patient-level risk of contamination with relevant (multi-resistant) pathogens. Furthermore, HCWs could learn about their own hand hygiene performance anonymously.

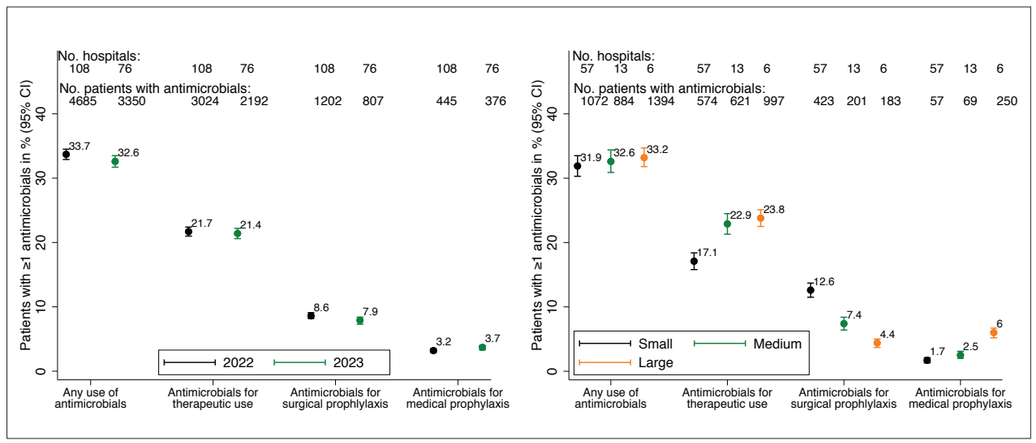


Figure 22. Indication for antimicrobial use.

Data from CH-PPS 2023. Indications for antimicrobial use in 2023 compared to 2022 in all participating hospitals (left) and indications for antimicrobial use by hospital size (right).

6 https://www.swissnoso.ch/module/ccm-cleanhands/ccm-cleanhands/das-modul

7 WHO «My Five Moments for Hand Hygiene» Sax H, et al. «My five moments for hand hygiene»: a user-centred design approach to understand, train, monitor and report hand hygiene. Journal of Hospital infection. 2007 Sep 1;67(1):9-21.

OUTCOME

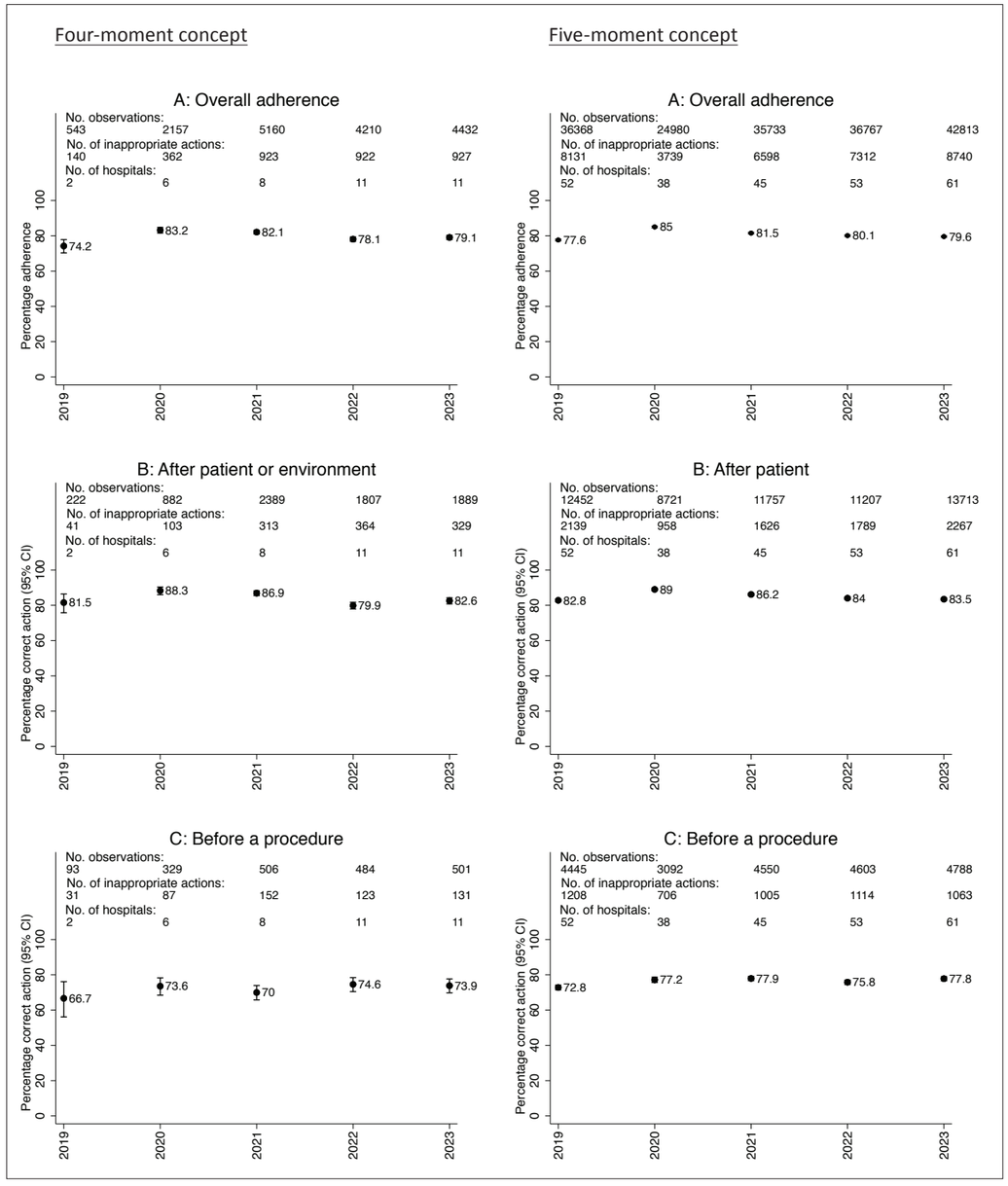
Antibiotic resistance proportions of indicator pathogens and number of hospital-associated MDRO clusters

ANRESIS provides resistance data with inpatient/outpatient and regional stratification. However, Swissnoso does not dispose of data per hospital regarding the proportion of MDRO among relevant indicator pathogens, e.g. Methicillin resistance in all isolated S. aureus. Such data could serve as outcome data on the hospitals' efforts to control antimicrobial resistance. The data could be displayed in boxplot charts with hospital results as data points. Swissnoso also lacks the declaration data for MDRO clusters.

What to do next

Consider integrating data as described above in next year's report.


Photo by Kelly Sikkema on Unsplash



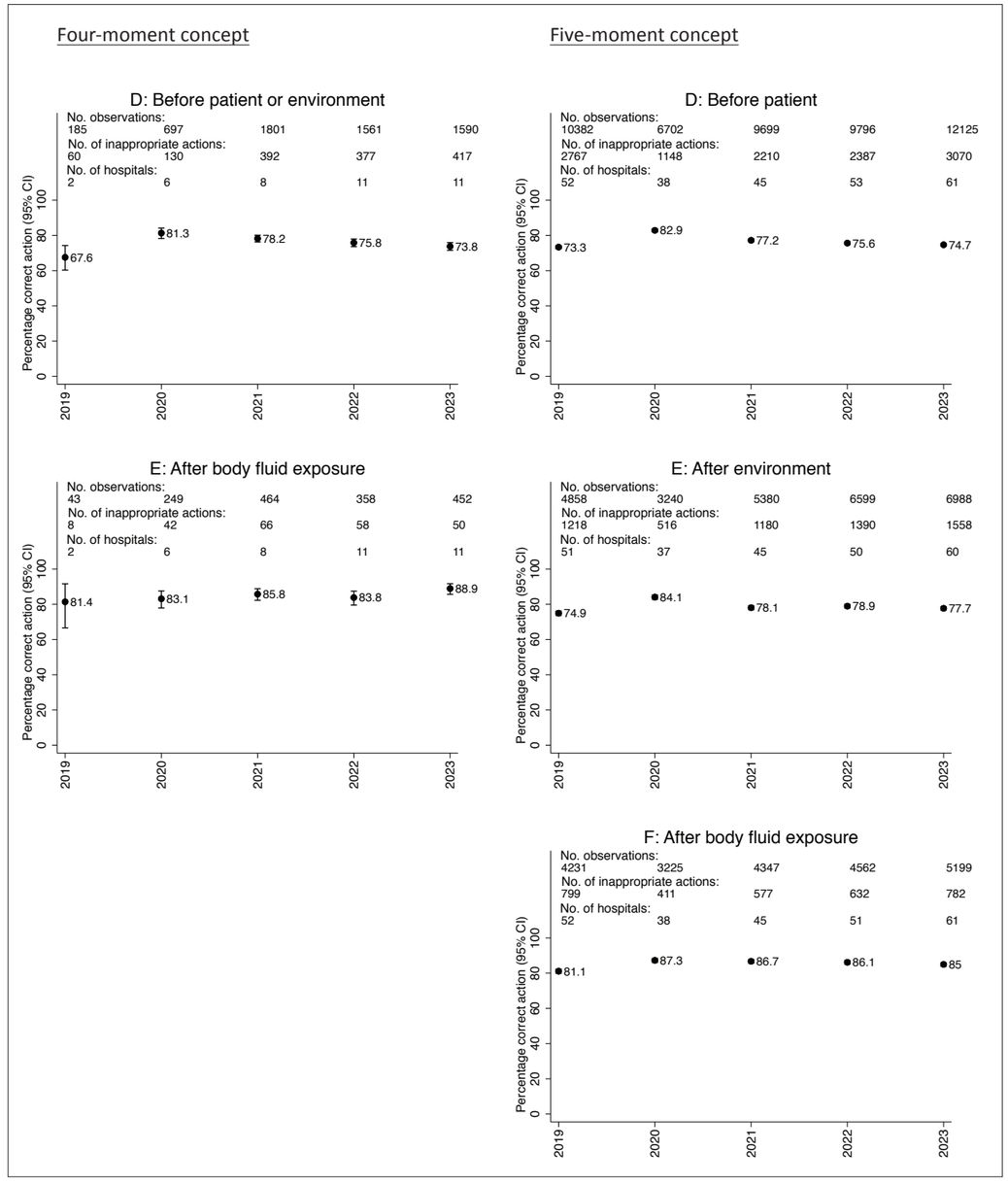
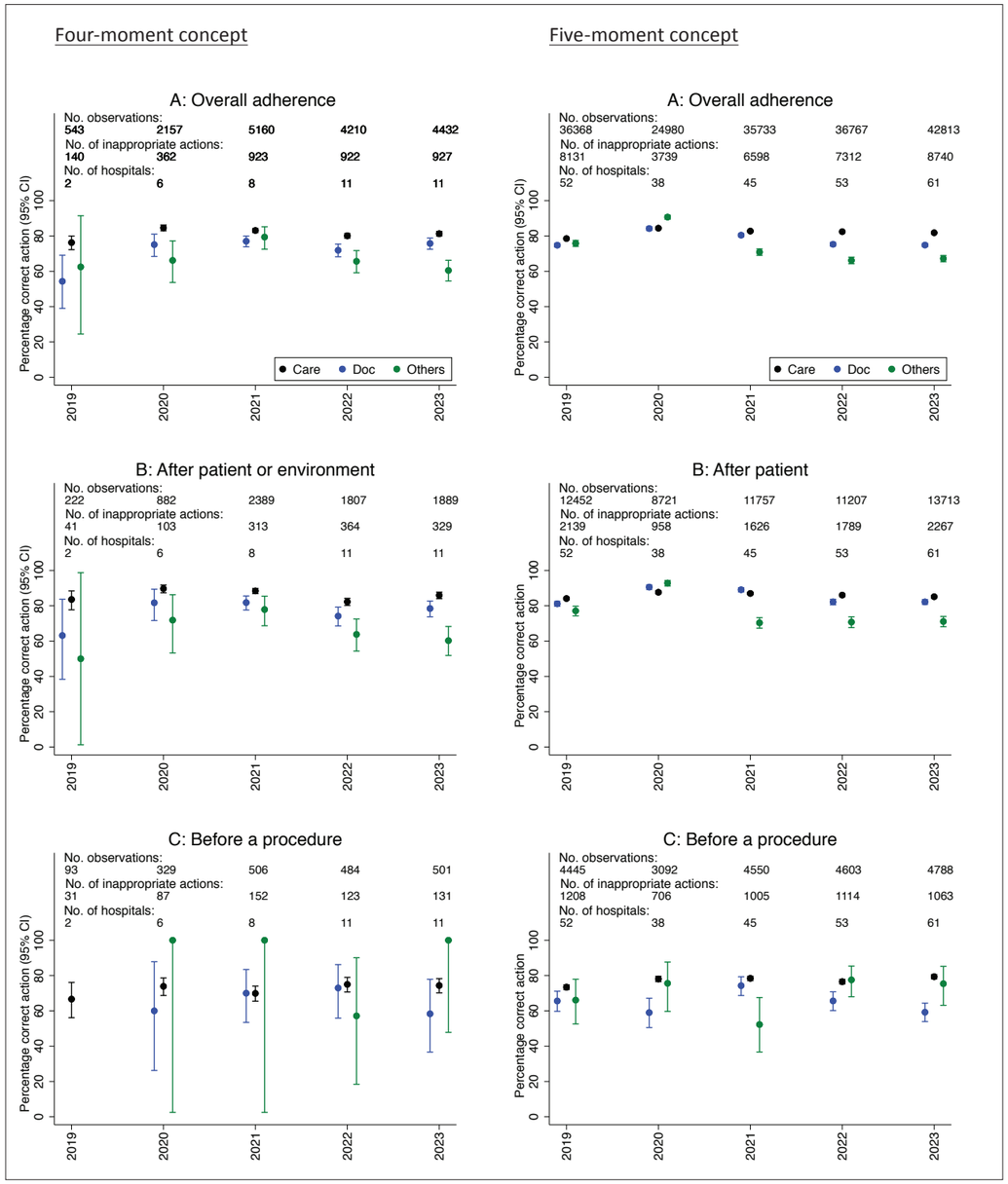


Figure 23. Results of monitoring hand hygiene with the CCM-CleanHands tool.

Only hospitals with one hundred or more observations on the inpatient ward per year were included. Observations during operations were excluded. The left panel shows the observations according to the four-moment concept, and the right panel according to the five-moment concept.



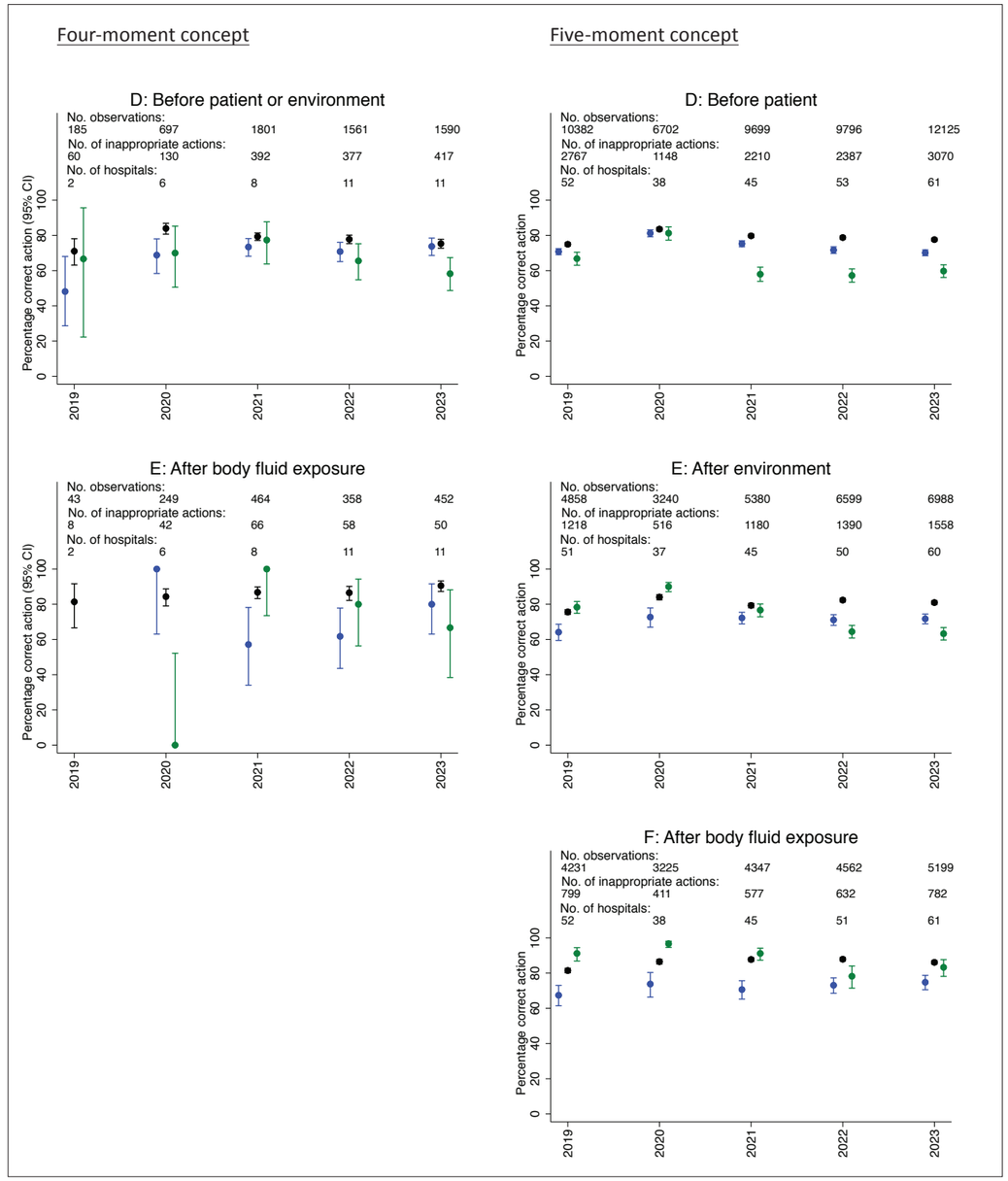


Figure 24. Results of monitoring hand hygiene with the CCM-CleanHands tool stratified by profession.

Only hospitals with one hundred or more observations on the inpatient ward per year were included. Observations during operations were excluded. The left panel shows the observations according to the four-moment concept, and the right panel according to the five-moment concept.

6. *Clostridioides difficile* surveillance

Clostridioides difficile is a frequent gastrointestinal healthcare-associated infection. In 2017, Swissnoso collaborated with ANRESIS to launch a laboratory-based surveillance system. However, too few laboratories participated to generate valid national estimates. Therefore, data from a questionnaire survey sent to 129 Swiss acute care hospitals was used, to which 67 (52%) responded.

What we observed

In 2022, the incidence of ***C. difficile*** episodes per 10,000 patient days was estimated at 3.8 (Poisson 95% CI, 3.2-4.5%).

Laboratory test methods, diagnostic criteria, and IPC practices vary considerably between hospitals.

What to be aware of

These estimates are based on a questionnaire survey with variable completeness in answers.

The diversity prohibits a clear overview of the incidence of ***C. difficile*** infections, particularly severe ones.

What it means

The estimated incidence ***C. difficile*** lies just above the mean rate reported by the European Centre for Disease Prevention and Control (ECDC).

What to do next

The planned Swissnoso Digital IPC Platform would be ideally situated to deliver laboratory-based incidence rates at very low additional cost, in collaboration with ANRESIS.

Implementing surveillance with data from the Federal Statistical Office (FSO) could complement laboratory data as they are prone to serious bias, e.g. colonization vs infection. FSO provides data on infection rather than results from the laboratory. 5-10% of patients are PCR positive on admission.

A proposal to fill this gap has been generated and will be submitted to StAR3.

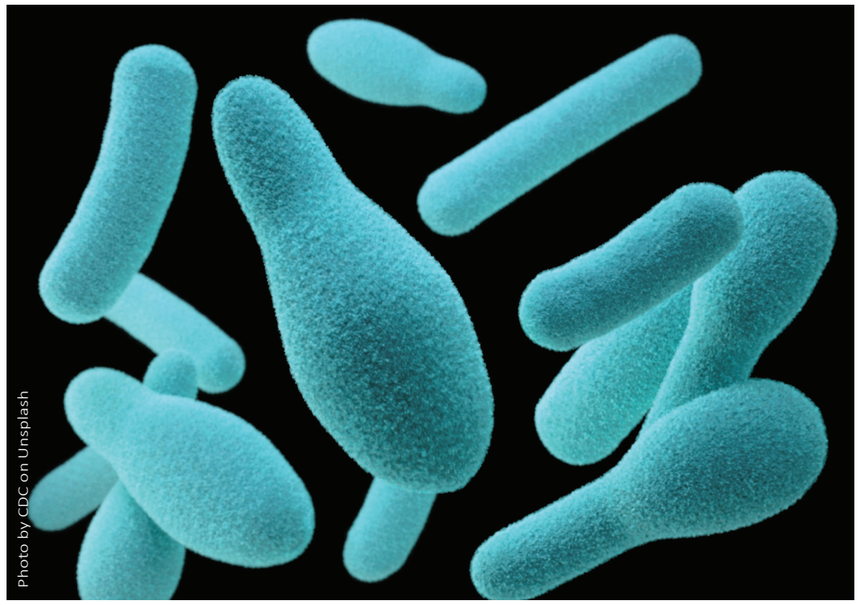


Photo by CDC on Unsplash

7. Abbreviations

ANRESIS	Swiss Centre for Antibiotic Resistance
AU	Antimicrobial use
CAUTI	Catheter-associated urinary tract infection
CCM	Swissnoso Clean Care Monitor measurement tool for IPC interventions
CH-PPS	Swiss Point Prevalence Survey
CH-SUR	Hospital-based sentinel surveillance
CLABSI	central line-associated (bloodstream) infection
COVID-19	Coronavirus disease 2019
ECDC	European Centre for Disease Prevention and Control
FOPH	Federal Office of Public Health
FSO	Federal Statistical Office
IPC	Infection prevention and control
IPCAF	Infection Prevention and Control Assessment Framework
HAI	Healthcare-associated infection
HCW	Healthcare worker
MDRO	Multidrug-resistant organism
NOSO	National Strategy for the Monitoring, Prevention and Control of HAIs
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SSI	Surgical site infection
StAR	Strategy on Antibiotic Resistance
WHO	World Health Organization

8. Annexes

Annex 1. Infection prevention and control assessment framework (IPCAF)

A screenshot of the IPCAF tool is shown below, an example of core component 2 (Infection Prevention and Control (IPC) guidelines). Answers add up to a maximum score of 100 (in each of the eight core components). Full information and the complete IPCAF questionnaire can be found online under https://www.who.int/publications/i/item/WHO-HIS-SDS-2018.9. Translated documents used as part of the Swiss PPS can be accessed online, in German and French.

Core component 2: Infection Prevention and Control (IPC) guidelines		
Question	**Answer**	**Score**
1. Does your facility have the expertise (in IPC and/or infectious diseases) for developing or adapting guidelines?	☐ No	0
	☐ Yes	7.5
2. Does your facility have guidelines available for:		
Standard precautions?	☐ No	0
	☐ Yes	2.5
Hand hygiene?	☐ No	0
	☐ Yes	2.5
Transmission-based precautions?[6]	☐ No	0
	☐ Yes	2.5
Outbreak management and preparedness?	☐ No	0
	☐ Yes	2.5
Prevention of surgical site infection?[7]	☐ No	0
	☐ Yes	2.5
Prevention of vascular catheter-associated bloodstream infections?	☐ No	0
	☐ Yes	2.5
Prevention of hospital-acquired pneumonia ([HAP]; all types of HAP, including (but not exclusively) ventilator-associated pneumonia)?	☐ No	0
	☐ Yes	2.5
Prevention of catheter-associated urinary tract infections?	☐ No	0
	☐ Yes	2.5
Prevention of transmission of multidrug-resistant (MDR) pathogens?	☐ No	0
	☐ Yes	2.5
Disinfection and sterilization?	☐ No	0
	☐ Yes	2.5
Health care worker protection and safety[8]	☐ No	0
	☐ Yes	2.5
Injection safety?	☐ No	0
	☐ Yes	2.5
Waste management?	☐ No	0
	☐ Yes	2.5
Antibiotic stewardship?[9]	☐ No	0
	☐ Yes	2.5

Annex 2. Swiss point prevalence surveys (CH-PPS)

The CH-PPS objectives are to obtain representative data on HAI and antimicrobial use (AU) and, since 2022, to assess the implementation level of evidence-based IPC strategies in Swiss acute care hospitals. To allow benchmarking of data on HAI and antimicrobial use with other European countries, Swissnoso followed the PPS protocol of the European Centre for Disease Prevention and Control (ECDC). The PPS protocol 2022 was based on the ECDC protocol version 5.3 [3].

Prior to the survey, instruction material was disseminated to the local PPS leads and virtual train-the-trainer courses offered in German and French. Data was collected from 1 April to 30 June of the respective year (2022 and 2023). Hospitals could choose to enter data into the database either manually or automatically using specifications provided by the coordinating centre. As in the previous year, automatic import was facilitated by a direct upload option in the database.

The national data was summarized and analysed using STATA version 13 (STATA Corporation), R and R studio.

Further information on PPS and methodology can be found on the Swissnoso website and in the original reports.[1]

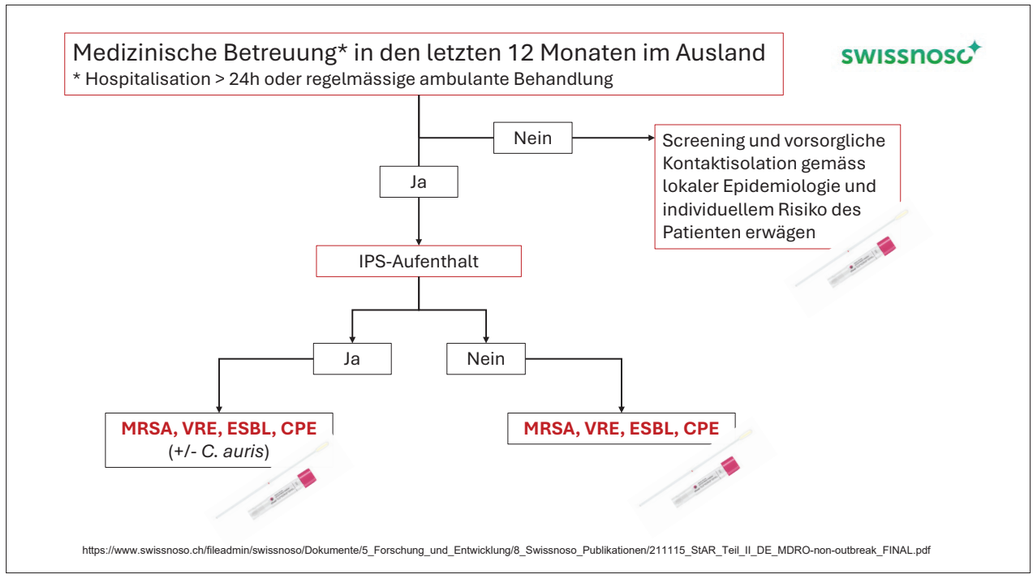
Annex 3. Nosocomial respiratory virus infections

Nosocomial respiratory virus infections were recorded by the hospital-based Sentinel Surveillance System for hospital admissions due to influenza (since 2018) and COVID-19 (since 2020). The surveillance is jointly coordinated by the Federal Office of Public Health (FOPH), the Institute of Global Health (IGH) of the University of Geneva and the Infection Control Program of the Geneva University Hospitals (HUG).

In 2023, 19 hospitals, from 1 December 2023 six hospitals, provided weekly data on influenza hospitalisations (during the winter season between week 40 to week 20) and COVID-19 hospitalisations (throughout the year). Nosocomial infection was defined as a patient who developed symptoms of influenza or tested positive for influenza more than three days or for COVID-19 more than five days after admission to the hospital. When the number of patients and events are low, all epidemiological and clinical data included in this report are to be interpreted with caution. Further information and essential definitions are provided in the reference document *Hospital Based Sentinel Surveillance of COVID-19 and Influenza Week 2023-52 Report*.[2]

Annex 4. Antimicrobial resistance

The survey was circulated to IPC officers of 142 acute care hospitals and open between 11 May and 7 July 2023. It inquired about the hospital's screening practices for MDRO on admission and during hospitalisation, and their internal guidelines for identification and screening of contact patients in case of a patient newly identified with an MDRO. The survey contained 28 questions subdivided into five parts: personal and institutional questions; evaluation of the practice for routinely performed screening for MDRO on admission (targeted screening on admission); routinely performed screenings for MDRO of hospitalized patients (universal active surveillance cultures (ASC) during hospitalization); evaluation of the practice for identification and screening of contact patients; evaluation of reporting practices and adherence to screening practices (see flow chart below illustrating the screening process).



1 Point prevalence survey (CH-PPS). Information with full reports and useful links (also to the ECDC PPS) available here.
2 FOPH, January 2024, available here.

Swissnoso
Sulgeneckstrasse 35
3007 Bern
031 331 17 33
contact@swissnoso.ch
swissnoso.ch

swissnoso

National Center
for Infection Control