SWECARE

Infection Prevention and Control

– the Swedish Way

Jakob Forssmed, Minister for Social Affairs and Public Health

No one should catch an infection while receiving health care, and yet, these infections spread through outbreaks and many regular care practices, affecting millions of people across the world every year. Antibiotic resistance is a leading cause of mortality internationally, and a growing threat to public health. Health care systems and productivity losses in the EU cost about EUR 1.5 billion annually. These health and economic impacts are expected to worsen.

To be able to provide patients with the care they need in the future, the crucial issue of antibiotic resistance must be solved. Through solutions for infection prevention and control, we can reduce the risk of spread, while also achieving better results, increasing patient safety and saving money.

The Swedish Government highly prioritises efforts to combat the silent pandemic of AMR in the long-term.

We have seen that setting prescription targets can be a useful tool to combat antibiotic resistance if they consider both current treatment recommendations and a systematic follow up antibiotic use.

The interdisciplinary organisation Strama has promoted responsible use of antibiotics since it was formed in 1995. The Strama model is based on peer-to-peer feedback to prescribers, in particular how their prescriptions compare to established treatment recommendations and set targets. The model is a cornerstone in Swedish efforts to tackle antibiotic resistance.

We know that infections and resistant bacteria respect no boundaries. To ensure that we have continued effective treatment against infections in the future, we depend on that all countries will prioritise and collaborate in joint efforts. By mutual sharing of our experiences and lessons learned, we can contribute to a more powerful and united response, within the EU and internationally.

The national strategy to combat antibiotic resistance includes objectives such as effective measures to prevent infections, minimize the spread of multi-resistant bacteria, and emissions of antibiotics and antimicrobial substances to the environment. The strategy promotes collaboration, research e.g. on new antibiotics, diagnostic methods and data on HAIs.

In 2015, Sweden and WHO Member States established the Alliance of Champions to combat AMR. In 2023, Sweden's Minister for Social Affairs and Public Health Jakob Forssmed became a member of the Global Leaders Group on Antimicrobial Resistance.

AMR and HAI – Major Threats to Global Health

The spread of healthcare-associated infections (HAI) constitutes a major global health issue for patient safety, with a global average of +10% but showing large variations between countries, hospitals and units. A growing public health problem is bacteria that have developed resistance to antibiotics, causing increased morbidity and mortality and reducing the treatment options of healthcare. WHO has declared antibiotic resistance one of the top 10 global public health threats facing humanity and involving large costs for healthcare. Recognizing the interconnection between people, animals, plants, and their shared environment, many experts call antimicrobial resistance (AMR) the silent pandemic.

Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections and limiting AMR. Implementing IPC programmes and interventions can lead to 35-70% HAI reduction.

Effective IPC requires constant action at all levels of the health system, including policymakers, facility managers, health workers and patients. To combat AMR, HAI and pandemics in the future, innovation and implementation of new solutions are of highest importance.

1 in 10 patients
get an infection while receiving hospital care

1.27 million people
die each year as a direct result of antibiotic resistant infections

70% of HAIs
could be prevented by good IPC programs

9,8 million HAI
are estimated to occur each year in European hospitals and long-term care factilities

Source: WHO, ECDC, the Lancet

Swedish Strengths in IPC

Sweden is at the global forefront of high-quality healthcare. We have been a frontrunner when it comes to combatting AMR and infections. This has generated one of the lowest levels of antibiotic use and resistance in humans and animals in Europe.

Thanks to long-term government supported strategic and muti-level partnerships, stakeholders sharing the same view of the problem, knowledge and most of all, the same goal of preventing infections and AMR. The Swedish approach to guide interventions, with reliable and transparent antibiotic use and resistance data, and our focus on disease prevention as means to reduce antibiotic use, has proven to be effective. This has generated one of the lowest levels of antibiotic use and resistance in humans and animals in Europe.

Other strengths of Swedish healthcare include:

Efficient healthcare provision

- A well-developed healthcare system based on equality and accessibility regardless of geography, socio-economic group, age or gender
- High-level competence and teamwork between all healthcare professions
- Holistic view and patient perspective
- Well-developed vaccination and screening programs.

World-class research

Sweden has world-class research and research infrastructure. We invest heavily in life science-related research and have a comparatively large and increasing proportion of highly cited publications.

Innovative life science industry

The life science industry is competitive, based on research, clinical activities and collaboration. The sector encompasses everything from large, well-established companies to a growing number of small research-based companies and innovative start-ups in drug development and manufacturing, biotechnology, medical technology and digital solutions for healthcare.

Well-established collaboration

Sweden has a longtime tradition of collaboration between healthcare, academia and companies. Swedish registers and social security numbers allow unique access to data. Many initiatives further improve collaboration such as innovations hubs and the development of high-tech data platforms.

"I strongly believe that, building back better from the COVID-19 pandemic, the efforts need to be based on the One Health approach, where multiple sectors communicate and work together to achieve better public health outcomes. Tackling antimicrobial resistance and preventing infections will be crucial in achieving the 2030 Agenda. The same speed with which new and safe vaccines against COVID-19 were developed must now be applied to develop new, safe and effective products and practices to prevent antimicrobial resistance."

Malin Grape, Ambassador on Antimicrobial Resistance

Sweden Taking the Lead Against AMR

Sweden has successfully contained the use of antibiotics and has today a low consumption compared to other EU countries, as well as low levels of antibiotic resistant bacteria. The use of antibiotics as growth promoters for animals was prohibited in Sweden already in 1986, resulting in the lowest level of antibiotic use in food-producing animals in the EU. The number of antibiotic prescriptions for humans has also shown a steady decline.

National effort to preserve treatment of bacterial infections

The overarching goal of preserving effective treatments of bacterial infections is accepted by all relevant stakeholders in Sweden: the government and its agencies, healthcare and organizations in human and animal healthcare and food industry. The government's long-term strategy and plan against AMR is implemented by an intersectoral coordinating group of 25 governmental agencies and organizations.

There are several success factors behind the Swedish achievement in terms of AMR in human medicine. The collaborative network Strama** collects data and shares knowledge and experience nationally and regionally. Regional Strama groups are key actors in facilitating the implementation of initiatives and identifying barriers.

Our long tradition of IPC is supported by regulations such as standard safety measures and mandatory access to expert advice in IPC for all healthcare professionals. There are also established mechanisms for feedback and benchmarking of data, e.g. all pharmacies supply statistics on sales.

Antimicrobial stewardship, decreased antibiotic consumption and improved quality of prescription of antibiotics have been achieved through national recommendations for treatments of common infections and set targets for antibiotic prescriptions. Joint national resistance monitoring, ensured by standardized methods and reporting nationally, enables continuous monitoring and early alerts in case of serious AMR outbreaks.

Key components in the Swedish effort against antibiotic resistance

- Long-term perspective with political and legislative support
- Consensus and cooperation between sectors
- Disease prevention limiting the need to use antibiotics
- Antibiotic Stewardship incl decreasing consumption
- Transparent and reliable data for action and follow-up
- Active involvement in international efforts

** the Swedish Strategic program against antibiotic resistance

National Governance

The Ministry of Health and Social Affairs

At the national level, the Ministry acts as policy maker, to support, coordinate and evaluate healthcare. A Strategy to combat AMR was launched in 2020. The world's first Ambassador on Antimicrobial Resistance, Malin Grape, was appointed in early 2022, to share Swedish knowledge and experience and to further strengthen Sweden's work internationally.

The Public Health Agency of Sweden

The Public Health Agency of Sweden works through an interdisciplinary model, involving all relevant stakeholders including national and local authorities, and professional and non-profit organisations. Important tasks are mapping and analyzing incidences of HAI and antibiotic-resistant bacteria and ensuring a structured approach to prevent and control infections. The Agency participates in the development of national recommendations and guidelines, in close collaboration with other stakeholders.

» Read more about the PHA's work on AMR: Antibiotics and Antimicrobial resistance

» Read more about the PHA's work on IPC and HAIs Infection control and healthcare-associated infections

The National Board of Health and Welfare

The Board issues mandatory regulations on basic hygiene that apply to healthcare and elderly care, e.g. workwear must be short-sleeved; lower arms and hands must be free from watches, jewelry and similar; and hands must be disinfected immediately before and after each direct contact with a patient. The Board also provides training for staff in regions and municipalities, to raise awareness of basic hygiene routines and increasing the compliance with these.

» Read more about the National Action Plan for Increased Patient Safety

The Swedish Medical Products Agency

The Swedish Medical Products Agency provides support in the development process of new drugs, including antibiotics and vaccines that counteract the spread of infections, but also in strengthening access to older antibiotics. The MPA supervises medical devices, such as tests for the diagnosis of bacterial infections; products containing antimicrobial components; and protective equipment for healthcare professionals. The agency is responsible for a Knowledge Centre on the environmental impact of antibiotics and other pharmaceuticals.

The Swedish Association of Regions and Local Governments

SALAR coordinates national measurements of patient safety, such as a database for pressure ulcers, prevalence measurements of HAIs as well as adherence to basic hygiene routines and regulations on clothing. This database is also used to promote improvements at regional and local levels. SALAR's work to reduce the incidence of HAIs include educational material in collaboration with the national level.

Healthcare Provision

Another key success factor is the long tradition of IPC and active patient safety work in the clinical setting. All healthcare providers have Infection Control units, which give locally adapted guidelines based on national regulations. Healthcare providers must ensure that all care staff have basic knowledge of hygiene and the safe use of medical devices. Care staff also get training and can consult care-hygiene expertise for both preventive work and acute situations. Access to well-developed support services such as microbiological laboratories is also important.

Tools to support IPC measures include formats for medical rounds, standardized checklists but we also see many digital solutions being developed to support staff in this.

Every caregiver must have the planning and organization to ensure IPC, including premises and equipment that follow the relevant hygiene requirements. Aspects relating to infection control and care hygiene must be included in procurement. An IT-support tool to further facilitate the measurement and reporting of HAIs, risk factors and antibiotic use has been introduced widely in inpatient care.

Health Data and Knowledge for IPC

Antibiotic surveillance and detailed knowledge about the use of antibiotics are factors contributing to Sweden's success in combating infections and AMR. Health data is also important for prevention, diagnosis and treatment. Data, evidence and knowledge come from many different sources. Sweden has systematised them in various registers, guidelines and processes at national and regional levels. Data from IT tools used in healthcare can be looped back to regulators and to research.

Quality Registries

The approximately 100 Swedish national quality registries are a unique phenomenon. They collect national information about a specific disease or treatment, and are used to evaluate and improve care, produce statistics and assist in research. The national quality registry RiksSår gives staff a structured clinical tool for increased knowledge through checklists, training and reports on the results and areas for improvement, and policy makers a comprehensive picture of the wound problem at the national level. Other registries also include aspects of infection prevention.

Automated Health Data

Health data can, with the help of artificial intelligence (AI), give us more detailed information about certain patient groups and patients and help us predict what care and resources are needed.

Education and Training

Academic courses on hygiene are part of the curriculum for doctors, nurses, dentists and other healthcare staff. Care staff has basic knowledge of care hygiene and the safe use of medical devices and must provide regular training and skills development. The government agencies and SALAR provide training for staff, including self-paced online courses. Some examples are:

- Wound Wise by SALAR and STRAMA on wound diagnosis and treatment
- Strama's practical e-learning course on antibiotic stewardship (launch April 2023)

HAI Proactive Project

The project has looked at several needs. At the level of clinical care of individual patients, a clinical tool was developed to identify both patients with high risk of developing HAI and with suspected HAI. The tool can show this in real time, both integrated into the patient's electronic health record or as a list with alarming results to follow up.

At an organizational level, the tool can be used for reporting on HAI, for input to measures to take - from an individual doctor to the national level - as well as to follow-up on the effect of such measures.

The data collected can also be used for quality registers and as a research database.

Infection Prevention and Control in Practice

As more healthcare provision moves to settings outside the hospital, to e.g. primary care and home-based care, attention to IPC has to be given in all settings where patients receive care. The following pages look at IPC in some of these settings.

The home

Knowledge about prevention and self-care of common infections such as colds reduces the need for seeking healthcare. In Sweden such information can be accessed through the portal 1177.se. A lot of care can nowadays be provided at home, either through digital consultations or a visit by healthcare staff, including provision of quite advanced healthcare. This reduces the spread of infections in the healthcare facility.

Eldery care

Elderly persons are often more vulnerable to infections. In care homes, the residents are quite fragile, and maintaining a healthy, clean environment is vital, as is team members doing all they can to prevent infection. When it does occur, staff must respond quickly and effectively.

The primary care clinic

Primary care is often the first point of entry for patients, including those with infections. The risk of HAIs is lower in primary care than in hospital care, but person-to-person and airborne transmission can still take place.

The hospital

The prevention of HAI is especially important in the hospital setting, where fragile patients can come into contact with bacteria and viruses. Take a look at the operating room, the sterilization central, and the patient ward.

The laboratory

Correct diagnosis of the type of bacteria is the first step to understand which antimicrobials, if any, are needed. Based on laboratory data, the Public Health Agency carries out extensive work of microbiological and epidemiological resistance monitoring.

The pharmacy

Prescribing appropriate antibiotics with adequate dosages, and only when needed is an important part of antibiotic stewardship, as well as keeping track of prescriptions and use of antibiotics.

Stay Healthy – Stay at Home

In order to limit the spread of infections, it's important that only persons that really need to visit a healthcare facility do so. In Sweden you can find written information on health matters and get personal advice when you are ill, through a call or chat service called 1177.se.

Some of this info is available in English. They can also advice you if you need to visit a healthcare facility.

If you need to see a doctor, an online consultation from your home can be one option. 99% of prescriptions in Sweden are electronic, and accessible by all pharmacies as well as by the prescription recipient. With advanced healthcare at home, a patient can receive the same technologically advanced care at home as in the hospital, short of needing continuous monitoring around the clock, you must be hospitalized.

Digital care, home tests and treatment mean easier access and less risk for infections

Digital Care Solutions

- Visiba care
- Platform24
- Doctrin

Home Tests and Treatment

- Aprovix
- Dynamic Code
- FindOut Diagnostics
- Pharmiva

Caring for our Elderly

Elderly care in Sweden is based on a common value system, allowing the elderly person to live a dignified life and in well-being, including the possibility to live independently in their own home for as long as possible. In Sweden, the use of welfare technologies such as digital alarms and night check-ups, digital locks and medication reminders, promote the elderly's feeling of being safe and secure in their home.

When the need arises, the elderly person can move to an elderly care home. Swedish care homes have one-room apartments, which are seen of the tenants' living space, with their own furniture but with adaptations to the needs of the tenant (alarms, lifts etc). The elderly person pays rent, a care fee and a fee for food and meals. The average age for moving into a care home in Sweden is +84 years, and by then, the level of care needed is often quite high.

This increased need for care, also means higher demands on the care home. It includes better coordination between different care providers and staffing, such as the need of different categories of staff, competence in infection control but also in e.g. dementia care. The COVID-19 pandemic made this even clearer.

Evidence suggests that the elderly are at higher risk of infection, with pneumonia and urinary tract infections being most common. Health conditions such as malnutrition, suppressed immune system, pressure ulcers, and chronic immobility are contributing factors.

Infection prevention and control in elderly care homes is thus very important. Staff competence level and adherence to hygiene routines and guidelines is of course of utmost importance, as well as factors such as staff turnover and rotation between units. The right design and the best use of space in the premises can also facilitate IPC. To reduce the contributing factors, residents should be empowered to move as much as possible. The evaluation tool Arjo Mobility Gallery supports care homes to be aware of the different mobility and risk levels of their residents, as well as assess the overall needs of the care home. The use of products designed to promote safe and dignified care also promote IPC, such as for personal hygiene, disinfection, and the prevention of e.g. pressure injuries.

"Staff at care homes need to be at the same level of knowledge with regards to basic hygiene routines as in hospitals."

Axana Haggar, PhD,
Programme Officer Patient Safety,
National Board of Health and Welfare

The Front Door of Healthcare

A reform is underway in Sweden to further promote good quality local healthcare, i.e. providing care as close to the patient as possible. Primary care is the first point of entry for most patients. Besides being more accessible and less costly, the lower risk of HAI in primary care than in hospital care is an additional benefit.

Swedish primary care centers can be publicly or privately operated, but with public funding from the healthcare region. They all have an agreement with the region, with stipulations of an integrated preventive work against HAI. The preventive work includes aspects such as:

Basic Hygiene

Good hand hygiene is the single most important factor in IPC to protect both patients and healthcare workers. Together with other cost-effective IPC practices, it can eliminate 35-70% of healthcare-setting infections, according to the WHO. Outpatient facilities in Sweden have established policies and procedures for routine cleaning and disinfection of environmental surfaces as part of their infection prevention plan. The basic hygiene requirements also prescribe sanitizing healthcare staff hands before and after contact with a patient, just as proper use of gloves, a dress code with short sleeves and no jewelry and routines for surface cleaning and disinfection.

Safe Injections

Practices for safe injections are important both for healthcare staff and patients. Staff must use aseptic techniques when preparing and administering medications, and syringes and needles should not be reused from patient to patient. Preventative routines can reduce the risk of needlestick and sharp injuries among healthcare staff.

Swedish companies have developed various tools and technologies to promote and effectively monitor IPC practices

- Xinix
- Bactiguard
- Essity

Antibiotic Prescriptions and Use

The majority of antibiotic prescribing occurs outside the hospital setting. Swedish primary care center doctors are well informed and only prescribe antibiotics when needed, and then the right type, at the right dose, time and duration.

The Public Health Agency, the Medical Products Agency and the National STRAMA group jointly publish treatment recommendations for common infections in outpatient settings (for otherwise healthy individuals). They function as decision support for healthcare and the attending physician.

» Read more: Treatment recommendations and patient information

Vaccinations

Vaccination is a key part of IPC and AMR strategies as they prevent bacterial infections, lessen antibiotic consumption, and reduce AMR levels. The national immunization program for children includes protection against 11 diseases. Most of these diseases are either eliminated or under control, the vaccination coverage has remained high for decades, and the vaccines that are used continue to exhibit a good safety profile. Vaccination against influenza and pneumococci are also recommended for persons +65 and for risk groups.

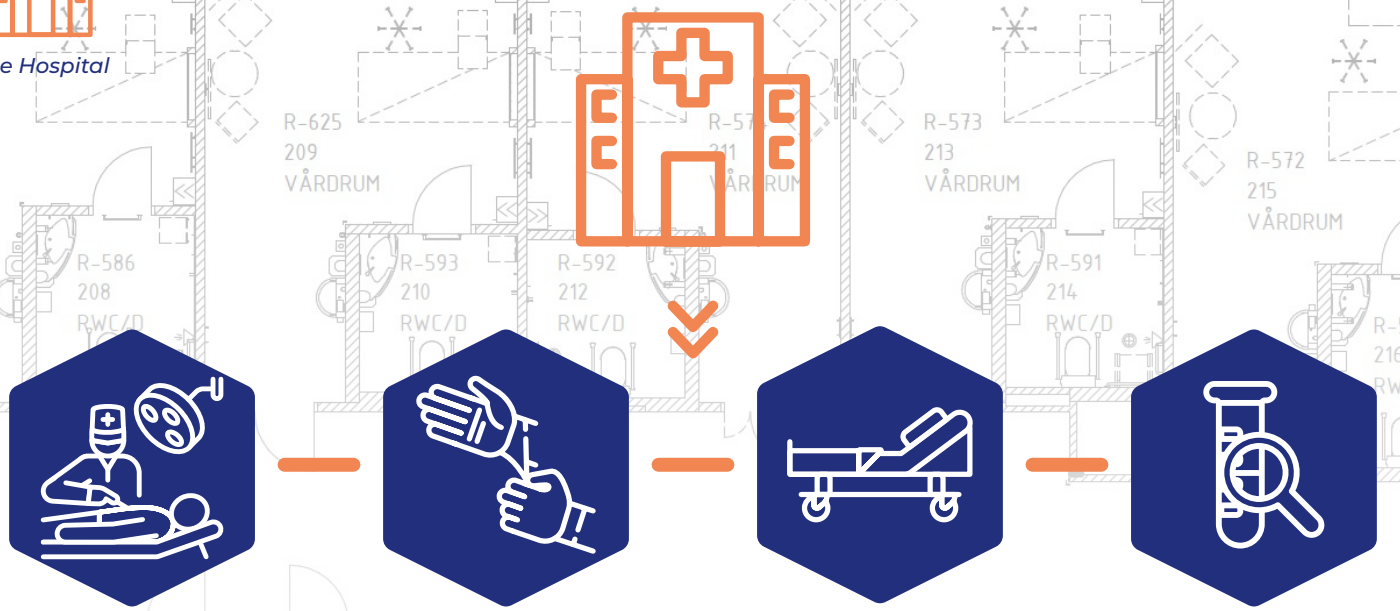
» Read more at Vaccinations

Some Swedish solutions include:

» NorthX Biologics in northern Sweden, is an innovation hub targeting the production of vaccines and advanced pharmaceuticals. Capabilities for RNA and cell-based vaccines and pharmaceuticals will be developed.

» SVF Svenska vaccinfabriken develops vaccines and immunotherapies based on technology developed at the Karolinska Institute in Stockholm. Vaccine candidates that target hepatitis B and D and COVID-19 are in the pipeline.

» Ziccum is developing new air-dried formulations of the world's most urgently-needed vaccines, that can be transported easily and cost-effectively, without the need for refrigeration.



Safe and Sustainable Hospitals

Swedish hospitals are in the forefront of IPC, implementing strategies to create safe environments for both patients and healthcare professionals. They are supported in this by leading Swedish companies within healthcare environment.

Hospital Design

The architectural design can support IPC and safe, salutogenic environments. Easy-to-clean surface materials are chosen, when possible. This is especially true for intensive and post-operative care.

Single-patient Rooms

Today, single-patient rooms are the standard in Swedish hospitals; one objective being the reduction of HAIs. Swedish hospitals now have single-patient rooms, with one objective being reducing HAI. By limiting the number of patients in each room, general hygiene can also be improved while creating a calmer environment for the sick person.

Improved Workflows

Integrated and optimized workflows that respond to the collaborative needs of modern healthcare can also lessen the risk of contamination. As an example, Skåne's University Hospital utilizes a centrally located sterile technical center that cleans, disinfects and sterilizes instruments, and has improved transformation flows through culverts between buildings to guarantee patient safety.

State of the Art Ventilation

Modern ventilation systems deliver ultra-clean air and minimize risk of airborne transmission. Besides advanced filtration systems, air can be over- or under-pressured to control or limit air flow.

Safe Waste Management

A hospital produces a lot a waste. Measures and systems for safely managing and disposing of healthcare waste reduces the risk of adverse health and environmental impacts.

Clean and Safe Hospitals

Cleaning is an important aspect of IPC, especially of surfaces in proximity to patients, such as bed rails, bedside lockers, infusion pumps, nurse call button and door handles. Hand-hygiene facilities should be available at the point of care, to allow for sanitizing of staff hands before and after contact with each patient, putting on gloves.

Swedish companies contribute in various ways to safe and sustainable hospitals:

- Sweco
- White
- Medic Solutions Nordic
- Getinge
- QleanAir
- Envac
- Abigo
- Mölnlycke
- Bactiguard
- Essity
- Xinix

Some of Sweden's Leading Hospitals in IPC

The seven university hospitals in Sweden all perform very well in international comparisons, both in terms of quality of care, research and training of medical staff.

Sahlgrenska University Hospital in Gothenburg

One of the largest in northern Europe, Sahlgrenska has a strong focus on the patient and health promotion. Queen Silvia Children's Hospital is part of the hospital and opened in spring 2021, a 2-billion SEK investment. The building contains advanced technology and a large number of installations allowing for a better healthcare environment for patients, visitors and personnel.

REGION VÄSTRA GÖTALAND
SAHLGRENSKA UNIVERSITY HOSPITAL

Uppsala University Hospital

Uppsala University Hospital is Sweden's oldest University Hospital and continues to be among the first, making the best use of new technology, scientific findings and ways of working to continuously improve the care of our patients. The University Hospital has several different roles- as a county and specialist hospital as well as training and research.

AKADEMISKA SJUKHUSET

Karolinska University Hospital in Stockholm

The hospital is ranked among the top 10 best hospitals in the world. It is one of the largest in Europe and located at two sites. The newest hospital building is designed to promote collaboration between medical care, research and education, and to optimize the flow of patients, staff and logistics.

Karolinska Institutet | KAROLINSKA UNIVERSITETSSJUKHUSET
Karolinska Comprehensive Cancer Center

Skåne University Hospital

As the third largest hospital in Sweden with 12,000 employees, Skåne University Hospital offers a full range of highly specialized care, research and education. Infection control is in focus when Skåne University Hospital invests 12 billion SEK to extend the hospital.

REGION SKÅNE

Many Pieces of the Puzzle in the OR

There are many potential sources of microbial contamination in an operating room. All of them must be considered to reduce the risk of surgical site infections and infections associated with the devices used. Safety procedures and routines need to be put into place for successful infection prevention and protection against surgical site infections and other HAIs.

Staff

Operating room personnel can be a source of microbial contamination. The use of Personal Protective Equipment, such as clothing and surgical gloves, is key to help reduce the risk of contamination and infection for both staff and patients. The staff must have proper education and support in IPC, and OR processes should be optimized.

Peri-operative Care

By using perioperative care pathways, early recovery and reduced risk of complications can be achieved even for patients undergoing major surgery.

Patient

Microorganisms exists on the patient's skin. Whole body washing and surgical drapes prevent that these spread to the surgical site. Swedish products that support this include

Devices

A common cause of HAIs is bacterial growth on medical devices, such as catheters or ventilators. Smart and innovative Swedish solutions help prevent bacterial growth causing infections.

The OR space, furniture and equipment

All surfaces in the OR can be sources of contamination. The interior must therefore be easy to clean and meet high hygiene requirements.

Ultra-clean air

Airborne microbials in the OR should be limited to the extent possible. Advanced ventilation systems are required to reduce microbials in the air, and at the same time provide a comfortable working climate.

Both well-known and innovative Swedish solutions help prevent infections and reach better outcomes in the OR

- Mölnlycke
- Arjo
- Getinge
- Encare Eras perioperative care
- Bactiguard
- Xinix
- Essity
- Mediclair

Patient

Staff

Devices

Operating room

Peri-operative Care

Ultra-clean Air

The OR, furniture and equipment

At the Central Sterile Services Department

The hospital needs to have and follow procedures for safe handling of potentially contaminated medical equipment. Medical devices are labeled by the manufacturer as either reusable or single-use. Reusable medical devices (e.g. endoscopes) should be accompanied by instructions for cleaning and disinfection or sterilization as appropriate.

Instrument reprocessing is a key process at all health care facilities providing surgeries. Instruments that have been used in a surgery must be cleaned, disinfected, inspected, packed and sterilized to be used again. This process, including the workflow to transport sterile instrument to the OR, is key in infection prevention.

Washing and disinfection
Removes foreign material and eliminates or reduces harmful microorganisms

Sorting and packing
Instruments are visually inspected, sorted and packed into e.g. surgical trays

Sterilization
Destroys or eliminates all forms of microbial life

Use in surgery
Instruments are provided sterile in prepared trays, using procedures for safe handling, to the OR or other department where they are needed

Company example: Getinge develops and provides hospitals with products and solutions for intensive care, cardiovascular procedures, operating rooms, sterile reprocessing, life science research and laboratories.

Getinge, with +10,000 employees world-wide, has expertise in creating seamless workflows of instrument reprocessing and offers full solutions including sterilizers, automation systems and digital health solutions.

GETINGE

Patient Room - Post-operative and Critical Care

HAIs can occur after a surgery, at the surgical site or in critical care, e.g. when using devices such as ventilators or catheters. Patients must be monitored closely for such infections, which can be time consuming and resource intensive. Automated surveillance systems are now developed, based on electronic health records (EHR) data, serving as a decision support for staff, e.g. for sepsis or UTI prediction.

Wound care and Surgical Site Infections (SSI)

Surgical site infections (SSI) are a huge health problem that cause pain and trauma to patients, prolonged hospital stays of many days and mortality as well as costs. Most SSIs can be treated with the right antibiotics. However, many SSIs are preventable, through proper hygiene for staff and patients before, during and after surgery. The urinary tract, the bloodstream and the respiratory tract are three of the most common areas where HAI arise.

Ventilator-associated Pneumonia -VAP

Intubation increases the risk that bacteria access the lower respiratory tract, causing VAP, the second most common HAI in intensive care.

Sweden has a strong setup of companies within the surgical and wound care segment

- Abigo /Essity
- Mölnlycke
- Amferia
- Gnosco
- Arjo

Device-related infections

Devices are involved in up to a quarter of all health care-associated infections, where infections are caused by the colonization of microorganisms on the device such as catheters. Studies have shown that by using medical devices with a very thin coating of noble metals bacterial adhesion is prevented, which in turn reduces infection.

Sepsis

Sepsis is the result of the body's immune system overreacting to an infection, which quickly becomes life threatening. Infections that lead to sepsis most often start in the lung, urinary tract, skin, or gastrointestinal tract. Late diagnosis and antibiotic resistance are making it increasingly difficult to treat bacterial infections and to prevent them from developing into sepsis.

Every year nearly 50 million people develop sepsis, and one in five of them dies. Those who survive often suffer permanent damage.

Solutions for early diagnosis and treatment of sepsis can save lives.

Catheter-associated Urinary Tract Infections - CAUTI

Catheter-associated urinary tract infection is the most frequent HAI. It occurs when bacteria from the patient herself, staff or medical devices, adhere, colonize and form biofilm on the catheter and thus enters the urinary tract or bladder.

Catheter-related Bloodstream Infection - CLABSI

A central venous catheter is a risk factor for infection and the risk increases every time the closed blood system is broken. Insertion should take place under sterile conditions and, if possible, in an operating room. The surfaces of catheters can attract bacteria and other microbes, which colonize it and may develop biofilm.

Swedish company Bactiguard has developed the BIP technology based on a very thin coating of catheters making less bacteria adhere and reducing the risk of biofilm formation leading to infection.

Diagnosis and Treatment of Sepsis

Several Swedish industrial actors contribute to the combat of sepsis. It can be mitigated using several methods, such as through medical devices, diagnostic tools and monitoring solutions.

AlgoDx offers a solution for early prediction of sepsis using AI, offering clinical decision support in intensive care and integrated in the existing electronic health record system.

Alteco Medical has developed the LPS Adsorber for use when infections get out of control and standard medical treatment is insufficient to stabilize the patient. It's a safe add-on therapy, effective in removing endotoxin from the bloodstream.

Testing at Point-of-care and in the Lab

Correctly diagnosing which type of bacteria causes an infection is an important step to understand what solutions can be taken, and which antimicrobials, if any, are needed. Analyses are essential for IPC, both for the everyday diagnosis and management of infection in individual patients (the clinical role), and to inform HAI and IPC interventions or antimicrobial stewardship activities (the public health/the epidemiological role).

Improved rapid point-of-care tools have been shown to improve diagnostic timeliness and accuracy and curtail unnecessary antibiotic use.

Data on resistance in bacteria from humans are mainly obtained from clinical microbiology laboratories and via notifications from clinicians. Based on this data, the Public Health Agency carries out extensive work of microbiological and epidemiological resistance monitoring as an important part of antibiotic stewardship.

Prescribing against AMR

Improving the way we prescribe and use antibiotics is critical to combat antibiotic resistance, for effective treatment and to protect patients from unnecessary antibiotic use, leading to risk of adverse effects. It includes choosing the right antibiotic at the right time, dose and duration.

Understanding the prescribing patterns is necessary for optimal antibiotic use. Through the Swedish system for e-prescriptions, which covers 99% of all prescriptions outside the hospital, we get reliable and comprehensive data to monitor prescriptions.

» Read more about the Swedish eHealth Agency

All pharmacies in Sweden are required to provide statistics on sales of all products daily to the Swedish eHealth Agency, which maintains a national database. The database includes statistics on prescriptions to individuals as well as medicines sold to and used in hospitals, nursing homes and other health and social care facilities.

Thanks to dedicated effort, the sales of antibiotics have decreased with 59% since 1992, when the prescription of antibiotics peaked. Almost all regions have achieved the national long-term target of 250 or fewer prescriptions per 1 000 inhabitants and year. The sales of antibiotics in pharmacies and for hospital use decreased by 3 and 5% respectively.

» Read more about sales of antibiotics and antibiotic resistance in Sweden

Pharmaceuticals must be kept safe during transport and storage, e.g. within a certain temperature span. Swedish company TSS has developed a reliable temperature monitoring solution that can send alerts in case of issues, thereby reducing waste-related costs and increasing patient safety.

430+ IPC research projects

with +2 billion SEK of funding received funding of +2 bn SEK from the Swedish Research Council, Horizon 2020, Vinnova, Formas and Swedish Foundation for Strategic Research (SSF) since 2018.

World-class Research for IPC

Sweden is considered one of the world's most prominent research nations, leading the way in a wide range of fields such as oncology, neuroscience, genomics and diagnostics, as well as IPC and AMR.

One in five researchers in the country work in the life science sector and many research projects are born at renowned medical universities such as Karolinska Institute, University of Gothenburg - Sahlgrenska Academy and Uppsala University. Sweden ranks at the very top both when it comes to innovation and R&D investments per capita.

The Swedish model is built on strong collaboration between academia, government and the private sector, e.g. through testbeds and innovation departments. Funding agencies and policies help foster an environment of discovery and co-innovation. The innovation agency Vinnova, important research councils and private foundations all contribute to funding research and innovation nationwide. Supporting research in Life science has been a longstanding priority for the Swedish government, e.g. through investments in well-developed R&D infrastructure such as SciLife Lab, MAX IV and ESS.

Some examples of research infrastructure:

- ESS – Multidisciplinary research center in Lund under construction based on the world's most powerful neutron source.
- Max IV – National synchrotron radiation facility in Lund providing scientists with the highest quality of X-rays for research in the world.
- SciLifeLab – Institution for the advancement of molecular biosciences in Sweden. SciLifeLab contributes to the research for infection prevention and control within for example genomics, serology and data analysis.
- Genomic Medicine Sweden (GMS) – Comprised of regional centers located in cities with university hospitals, Each GMC serves as focal point for collaborations between the region, university and research. GMC has access to next-gen sequencing, enabling rapid identification, and sharing ofe knowledge, of microorganisms causing infectious diseases.

The Home of World-leading Companies in IPC

Sweden's life science sector is home to more than 3,000 competitive companies employing 45,000 people and based on research, clinical activity and collaboration. The sector encompasses everything from large, well-established companies to a growing number of small research-based companies and innovative start-ups. Swedish companies excel in drug development, biotech tools, diagnostics, medtech and digital healthcare solutions; with +240 of them developing and marketing solutions for various aspects of IPC. Several are spinouts from research and universities.

Sweden hosts leading companies within sterilization and healthcare environment, the surgical and wound care segment with particular focus on infection control. Our companies have also excelled in utilizing technological and digital innovations for IPC. Some of the world's leading companies within IPC are Swedish, with a significant contribution to IPC globally.

» Combined employees worldwide: 140,000
» Combined country presence: 150+
» Combined annual revenue: 400,000 MSEK

Getinge

A leading global provider of products and systems that contribute to quality enhancement and cost efficiency within healthcare and life sciences. Getinge develops and provides hospitals with products and solutions for intensive care, cardiovascular procedures, operating rooms, sterile reprocessing, life science research and laboratories.

» Employees worldwide: 10,000
» Countries: 38

Mölnlycke

Designs and supplies medical solutions to enhance performance in healthcare – from the hospital to the home. Mölnlycke develops and sells products and solutions within surgery and wound care so that healthcare professionals have what they need to achieve the best clinical, patient and financial outcomes.

» Employees worldwide: 7,800
» Countries: 100

Essity

A leading global hygiene and health company developing and selling products and solutions. Within Essity's three business areas, personal care, consumer tissue and professional hygiene, Essity is a leading global player and the world's largest supplier of some products.

» Employees worldwide: 46,000
» Countries: 150

AstraZeneca

A global, science-led biopharmaceutical business developing and selling innovative medicines used by millions of patients worldwide. AstraZeneca focuses on the discovery, development and commercialization of prescription medicines in Oncology and BioPharmaceuticals, including Cardiovascular, Renal & Metabolism, and Respiratory & Immunology.

» Employees worldwide: 76,000
» Countries: 100

Source: Annual reports and company websites

Collaboration, the Swedish Way

The Swedish government has stated that Sweden will be a life science leader. "Life science contributes to improving the health and quality of life of the population, ensuring economic prosperity, further developing the country as a leading nation of knowledge and realizing the Agenda 2030."

The Swedish Life Science Strategy brings together industry, academia, civil society and public actors to prioritize how to meet the healthcare challenges and to further strengthen the life science sector. The strategy sets 30 prioritized goals, e.g. investment in data-driven life science, increased focus on health and prevention, integration of research and innovation into care delivery.

The industry works in close collaboration with other actors, such as academia, the healthcare service and patient organizations. Several arenas for co-creation have been launched across the country, including the test bed Testa Center, Uppsala; GoCo Health Innovation City and BioVenture Hub, Gothenburg.

Sweden also has an extensive network of +60 innovation clusters, held together by universities, hospitals, incubators & science parks, and the life science industry. They create an exceptional environment for bringing innovations from academia and industry into areas where they are needed the most in healthcare.

United front against antibiotic resistance

The organizations Lif, Swedish Medtech, SwedenBio, Swedish Labtech and The Association for Generic Medicines and Biosimilars established the Swedish Industrial Alliance against AMR in June 2022, in order to reduce the number of infections in healthcare and slow down the development of antibiotic resistance.

Many organizations based in Sweden also contribute to the development and innovation in IPC research and implementation, such as ReAct, one of the first international independent networks to articulate the complex nature of antibiotic resistance and its drivers.

Examples of ongoing or recent research projects

Clean Care project

» Adresses the urgent need to minimize HAI by use of innovative technologies for IPC and systematic monitoring of HAI to measure the effects.

» Cross-sector collaboration with 14 participating organizations from industry, healthcare and academia, e,g Arjo, Getinge, several Swedish universities and regions. Coordinated by RISE and centered at Sahlgrenska University Hospital

Graphene-based antibacterial surface

» One of several infection control-related projects within the Graphene Flagship, with a total budget of 1 billion SEK

» Aims to develop a surface with upright graphene flakes, which can be used on medical devices to reduce the risk of infection

» Collaboration between Chalmers University of Technology and industrial actors including Wellspect and Dentsply Sirona Implants from West Sweden

PLATINEA

» A unique collaboration platform that enables healthcare, industry, academia and public authorities to work together to identify new solutions against shortages and to create and implement new evidence to improve the use of antibiotics.

» Coordinated by Uppsala University & Swedish Public Health Agency, with 16 actors from academia, healthcare and industry.

Climate-AI-infection-response

» Aims to develop robust climate-based algorithms and decision-making tools to support public health adaptation to infectious disease risks following from climate variability and change

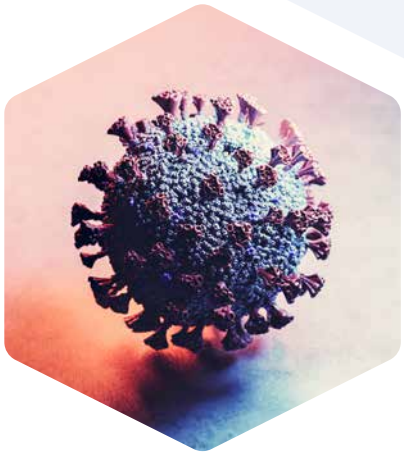
» Coordinated by Umeå University

» Joint initiative between Umeå University and Vinnova, Formas, the Swedish Energy Agency and the Swedish National Space Agency

Antibiotic Smart Sweden

» Through a mission-oriented approach, the Vinnova-funded initiative aims to address the complex challenges of AMR by involving all of society in keeping antibiotics effective and saving lives. It promotes innovation, inspires and engages citizens, municipalities and regions to be "antibiotic-smart" by sharing good practices and supporting hands-on implementation of national action plans against AMR.

» Core team: Public Health Agency of Sweden and Research Institutes of Sweden, with ReAct – and Strama in collaboration an expanding number of stakeholders from many sectors of society.



National Response to the COVID-19 Pandemic

Since the COVID-19 outbreak in the spring of 2020, Sweden has, like the rest of the world, redirected resources to focus on fighting the pandemic. One example of Sweden's contribution is the EU Digital COVID Certificate. The certificate use a QR code based on a Swedish technical solution and Sweden has also contributed to the trust framework that is an important principle behind the certificate.

Response from industry

In the wake of the pandemic 30+ IPC companies in Sweden have increased their focus to the development of new drugs, products and diagnostics tools.

Response from research

The central data portal set up in Europe is a major contribution to sharing research on the pandemic. The national node of the European COVID-19 Data Portal provides tools and guidelines for researchers and utilization of infrastructure.

Private foundations have enabled researchers to swiftly change focus by providing funding for research projects. Wallenberg Foundation was one of the first, offering 40 MSEK in the beginning of the pandemic, followed by addition 300 MSEK for research purposes.

- 400+ clinical studies targeting COVID-19 approved by Swedish Ethical Review Authority.
- 260+ research projects on COVID-19 with funding

Examples from research and healthcare

SciLifeLab has launched several initiatives, giving priority to projects with potential to generate important knowledge in the fight against the pandemic.

A pandemic laboratory preparedness was set up for future outbreaks with 130 MSEK funding from Swedish Government during 2021-2024.

Karolinska Institutet (KI) has established resource teams for support during the COVID-19 pandemic, one of them being the Interdisciplinary resource team post-pandemic (KIRP). The purpose is to ensure that KI can optimally contribute to the challenges posed by future pandemics.

A national pandemic centre was set up in collaboration with 16 regions in Sweden and the Public Health Agency to assist in surveillance of SARS-CoV-2 variants. The centre has since analysed a large amount of Sweden's PCR tests.

Swecare

Swecare was founded in 1978 by the Swedish government and stakeholders in life science and healthcare as a semi-governmental non-profit foundation and member organisation. Today, the Ministry of Health and Social Affairs, the Ministry for Foreign Affairs and Sweden's municipalities and regions are still active, and membership has grown to over 100 Swedish companies and organisations.

Swecare offers a platform where stakeholders in the Swedish life sciences sector can strengthen their international relations.

Vision

Swecare's vision is a world with good health on equitable terms as well as access to high-quality and sustainable healthcare.

Mission

Swecare seeks to contribute to increased export of Swedish products, services and knowledge within health and care.

Partners

Swecare works closely with the members and life science industry organisation. Together with the Ministry of Health and Social Affairs, Swecare develops plans and strategies for official export promotion work in the health area. Swecare has a large number of contacts with partners with specialist expertise and carries out its activities together with embassies, consulates, Business Sweden and chambers of commerce around the world.

SWECARE

Visit our website or our interactive Swedish life science space.