ARHAI Scotland

Antimicrobial Resistance and Healthcare Associated Infection

NHS National Services Scotland

Healthcare Associated Infections

2020 Annual Report

Publication date: 21 September 2021

© 2021 NHS National Services Scotland. All rights reserved.

Alternative formats

If you require this document in an alternative format, please contact nss.communications@nhs.scot

Contact

Laura Imrie
Clinical Lead, Antimicrobial Resistance and Healthcare Associated Infections (ARHAI) Scotland
NHS National Services Scotland

Phone: 0141 300 1922

Email: nss.hpshaiic@nhs.scot

Reference this document as:

Antimicrobial Resistance and Healthcare Associated Infections Scotland. Healthcare Associated Infections. 2020 Annual Report. ARHAI Scotland, Glasgow 2021 [Report]

Contents

Foreword

Healthcare associated infections (HCAIs) continue to represent a threat to patient safety in NHSScotland and to safe care, wherever that is delivered. This annual report reflects the work undertaken on HCAI prevention and tackling Antimicrobial Resistance (AMR) in NHSScotland during 2020.

The global pandemic brought unprecedented challenges during 2020. The first positive case of Coronavirus disease (COVID-19) in Scotland was at the end of February with the first nosocomial case reported two weeks later. Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) Scotland within National Services Scotland (NSS) have been a key part of the national COVID-19 response to the pandemic developing data and intelligence; producing evidence and guidance; developing and delivering of educational resources and supporting health boards in their local pandemic responses. Two COVID-19 monitoring and surveillance systems were developed at pace and have provided invaluable intelligence to inform the Scottish nosocomial COVID-19 response. Rapid reviews of the ever emerging evidence base were undertaken to inform development of national and United Kingdom (UK) guidance that has been essential to reducing risk of COVID-19 nosocomial transmission in Scotland and across the wider United Kingdom. These reviews resulted in the publication of the COVID-19 Infection Prevention and Control (IPC) Addendum for Acute Settings in October 2020, Care Home IPC Addendum in December 2020 and an Addendum for Community Health and Care Settings in January 2021. Alongside the guidance published by ARHAI, ARHAI have provided IPC expertise to support the publication of a vast number of guidance documents published by other national organisations out with healthcare. The epidemiological and evidence intelligence was shared regularly by ARHAI Scotland with the COVID-19 Nosocomial Review Group (CNRG) and formed the basis of advice given to Scottish Government for development of nosocomial policy.

Surveillance activity during the pandemic has flexed to ensure continued monitoring of key HCAI with development of new systems to monitor COVID-19. In March 2020, the Chief Nursing Officer issued guidance to support local teams to deliver their pandemic response by pausing

all mandatory and voluntary surgical site infection surveillance; pausing enhanced surveillance of *Staphylococcus aureus* bacteraemia, *Escherichia coli* bacteraemia and *Clostridioides difficile* infection (with continued reporting of case numbers and origin of infection); and pausing of routine surveillance of HCAI in intensive care units.

The delivery of healthcare services changed significantly during 2020 where it was necessary at points to pause elective services to ensure capacity to care for high numbers of COVID-19 patients. The inpatient population demographics changed during this period and this must be considered when interpreting long term trends of HCAI. Although these patients continued to be at risk of HCAI, risk factors have changed during this period including comorbidities, age range and reason for admission. Comparing patient outcomes in 2020 with previous years is challenging. The impact of the pandemic on the epidemiology of HCAI is likely to have important implications for interpretation of epidemiological evidence for a number of years to come.

In January 2019, the UK Government published a five-year national action plan 'Tackling antimicrobial resistance 2019–2024' as well as a vision for AMR in 20 years 'Contained and controlled: The UK's 20-year vision for antimicrobial resistance'. The five-year national action plan focuses on three key aims to tackle AMR: reducing the burden of infection, optimising the use of antimicrobials, and developing new diagnostics, therapies, vaccines and interventions. The Scottish One Health Antimicrobial Use and Antimicrobial Resistance (SONAAR) programme has continued to focus on the aims of the action plan during the pandemic. The programme publishes further detailed data and intelligence to support the broad ambitions of the action plan and the SONAAR report, which includes data from 2020, will be published in November.

On 1 June 2021, NHS Scotland Assure was launched and exists to improve how risk in the healthcare built environment is managed across Scotland. The overall aim is to assure the public, patients and the service that the healthcare environment is safe and free from avoidable infection and other risks, with effective structures and processes in place, which are monitored, to ensure risk is minimised.

As the challenges arising from the pandemic have continued into 2021, ARHAI Scotland will continue to support the health boards and Scottish Government in local and national pandemic response. A continued focus on other HCAI, particularly in the context of the unintended consequences of the pandemic, is essential to reduce avoidable harm and ensure patient safety.

Executive Summary

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?

Coronavirus disease (COVID-19) has impacted healthcare delivery in both hospital and community settings. Priorities were adjusted to respond to the pandemic, leading to changes to delivery of services and to the patient population, including a new cohort of patients being treated for COVID-19. Changing patient behaviours, healthcare delivery practices and at-risk populations will have affected the risk and epidemiology of other types of healthcare associated infections (HCAI). This will make comparisons with previous years difficult and, for this reason, results presented in this report must be interpreted in the context of the pandemic and with due caution.

Hospital onset COVID-19

A system for monitoring COVID-19 in hospitals is critical to tracking nosocomial transmission, and informs infection prevention and control measures. In 2020, 2.6% of COVID-19 cases were nosocomial infections (first positive COVID-19 sample taken on day 8 or more of a hospital in-patient stay). Overall, 10,535 patients had their first positive COVID-19 sample taken as an in-patient. Please see the **Hospital onset COVID-19 cases** in Scotland report for more information.

Those with nosocomial COVID-19 had a higher median age (79 years) than those classed as indeterminate hospital onset (first positive sample taken on days 3-7) or non-hospital onset (first positive sample taken on admission or days 1-2) (72 years). Rates of nosocomial infections throughout 2020 followed the waves of infection observed in the community.

From 3,389 nosocomial infections, 1,015 (29.9%) died (all-cause mortality) within 28 days of their first COVID-19 sample date. There is no evidence from these analyses that patients developing nosocomial COVID-19 are at an increased risk of death compared with other patients diagnosed with

COVID-19 in hospital. Any patients who had their first positive COVID-19 sample taken as an in-patient, due to being admitted for hospital care, are more likely than the wider population to be older or have more underlying health conditions or co-morbidities. As length of stay increases, patients are also more likely to be older and more unwell. Increased all-cause mortality in those with nosocomial COVID-19 compared with others first diagnosed in hospitals can be explained by differences in demographics in these groups. Please see the **Hospital onset COVID-19 mortality in Scotland report** for more information.

Gram-negative bacteraemia

Gram-negative bacteria continue to be a recognised threat to health worldwide. During 2020, there were 4,206 cases of *Escherichia coli* bacteraemia (ECB) in Scotland with a rate of 77.0 per 100,000 population. Rates have decreased since 2016. In 2020, the incidence rate of healthcare associated ECB was 39.7 per 100,000 bed days and remains stable compared with the 2019 healthcare associated ECB rate of 39.4 per 100,000 bed days. The incidence rate of community associated ECB in 2020 was 39.1 per 100,000 population, this is a decrease from the 2019 community associated ECB rate of 43.5 per 100,000 population. The rate of healthcare associated ECB has increased 4.3% over the last 4 years; the reasons for which are being investigated as part of the Gram-negative bacteraemia programme. Between 2019 and 2020, antimicrobial resistance (AMR) of ECB isolates has remained stable. *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Acinetobacter* species and *Pseudomonas aeruginosa* bacteraemia rates have also remained stable since 2016. As part of the United Kingdom (UK) Government published five-year national action plan, a target of a 25% reduction of healthcare associated Gram-negative bacteraemias by 2021/2022 with a 50% reduction by 2023/2024 was set.

Urinary tract infections

Urinary tract infections (UTI) are amongst the most commonly encountered infections in healthcare. The majority of UTIs in Scotland are caused by *Escherichia coli* (*E. coli*). In 2020, there were 115,844 *E. coli* urinary isolates reported. In addition, findings from the ECB enhanced surveillance dataset indicate that 25.9% of these bloodstream infections had a lower urinary tract infection as their primary infection.

COVID-19 has restricted the activities of the **Scottish UTI Network (SUTIN)** however all resources developed to target UTI reduction strategies in collaboration with health and social care continue to be available. The **National Hydration Adult and Children's Think2DrinkH2O** campaigns, and the **National Catheter Passport** are examples of this collaborative approach to reducing UTI and catheter associated UTI (CAUTI). These resources support reduction of ECB and prudent antimicrobial prescribing.

Carbapenemase-producing organisms

The number of carbapenemase-producing organisms (CPOs) overall remains low, however in Scotland a total of 59 CPO were reported in 2020. Incidence of CPO isolates decreased from 2.3 per 100,000 population in 2019 to 1.1 per 100,000 population in 2020. In April 2018, the meticillin-resistant *Staphylococcus aureus* (MRSA) screening uptake monitoring tool was extended to include carbapenemase-producing Enterobacterales (CPE). In 2020, 82% of audited patients underwent a clinical risk assessment for CPE colonisation or infection, as per national CPE screening policy. These data continue to be monitored by ARHAI Scotland and feedback is provided to boards on a quarterly basis.

Clostridioides difficile infection

Clostridioides difficile Infection (CDI) is an important healthcare associated infection (HCAI) which causes diarrhoea and contributes to a significant burden of morbidity and mortality. Prevention of CDI is therefore essential and an important patient safety issue. During 2020, 1,088 cases of CDI in patients aged 15 years and older were reported in Scotland. There

was a decreasing year on year trend in the incidence rates between 2016 and 2020. Much of the decline in CDI can be attributed to a decrease in community associated CDI. In 2020, the incidence rate of healthcare associated CDI was 15.6 per 100,000 bed days, this is an increase from the 2019 healthcare associated CDI rate of 13.3 per 100,000 bed days. The incidence rate of community associated CDI in 2020 was 5.0 per 100,000 population and remains stable compared with the 2019 community associated CDI rate of 4.6 per 100,000 population. There was a decreasing trend in the proportion of people dying of any cause within 30-days of healthcare associated CDI diagnosis between 2015 and 2019 (2020 data not available). ARHAI Scotland will continue to investigate factors associated with improved survival among CDI patients.

Staphylococcus aureus bacteraemia

Staphylococcus aureus bacteraemia (SAB), is a serious systemic infection which leads to increased morbidity and mortality. During 2020, 1,501 cases of SAB were reported in Scotland, with 2.6% reported as meticillin resistant *S. aureus* (MRSA) bacteraemias and 97.4% as meticillin sensitive *S. aureus* (MSSA) bacteraemias. There was a decreasing year on year trend in both overall SAB and in MRSA between 2016-2020, however the incidence rate of MSSA has not changed over this time period.

In 2020, the incidence rate of healthcare associated SAB was 18.0 per 100,000 bed days, this is an increase from the 2019 healthcare associated SAB rate of 16.3 per 100,000 bed days. The incidence rate of community associated SAB in 2020 was 10.3 per 100,000 population and remains stable compared with the 2019 community associated SAB rate of 9.4 per 100,000 population. The main entry point for healthcare associated cases was relating to a device whereas skin and soft tissue infection were the main entry point for community associated cases. In 2020, 85% of patients audited underwent a clinical risk assessment in line with national MRSA screening policy. This remains below the 90% key performance indicator.

Prevention of healthcare associated bloodborne viruses

Bloodborne virus (BBV) transmission can occur, in the health and care setting, after exposure of staff or patients to infected blood or body fluids. Healthcare workers (HCWs) are at greatest risk of acquiring BBV infection following sharps related injuries. An annual surveillance programme has been established to monitor these exposure events which facilitates work to reduce their occurrence and promotes uptake of safer sharps devices. The programme has established that, in 2019, the rate of sharps injuries per 100 whole time equivalent (WTE) HCWs employed in Scotland was 2.02. Of the occupational exposures reported between January 2019 and December 2019 (2020 data not available) and that were sustained from a BBV infected source, less than 45% were known to involve a safer sharps device. In 2019 safety device uptake was 86% compared to 84% in 2018. ARHAI Scotland also works with local health protection teams to support the public health response following identification of BBV infected HCWs, no risk assessments were undertaken in 2019 and none were referred to the UK Advisory Panel for Healthcare Workers Infected with Bloodborne Viruses (UKAP).

Healthcare outbreaks and incidents

ARHAI Scotland support local Infection Prevention and Control and Health Protection Teams to prevent, prepare for, and manage outbreaks and incidents, as well as share lessons learned throughout Scotland. The establishment of regular meetings has allowed this sharing to be achieved in a real-time, proactive environment covering COVID-19 and non-COVID-19 incidents and outbreaks.

In response to COVID-19, ARHAI Scotland developed a new Outbreak Reporting Tool (ORT) to collect and analyse COVID-19 cluster data and other Healthcare Infection Incident Assessment Tool (HIIAT) assessed incidents in hospital settings. This system was developed to enable comprehensive and timely reporting of outbreaks and incidents across NHSScotland and improve support to NHS boards by sharing of best practice in managing and preventing incidents.

This report reflects the HIIAT assessed incidents. In the last year, 136 outbreaks and incidents (non COVID-19) were reported compared to 208 in the previous year.

The COVID-19 cluster data is shared with NHS boards in real time and the COVID-19 Nosocomial Review Group to support the pandemic response.

Norovirus outbreaks

From 1 October 2019 to 30 June 2020 there were 47 wards closed and 66 bays closed due to norovirus, giving a total of 113 closures. Bay closures can assist NHS boards in reducing service impact without compromising patient safety during norovirus season.

In 2020, the information for the public for the management of norovirus was accessible through the NHS Inform website, through the norovirus topic on the Health Protection Scotland website and included an instructional video produced by ARHAI Scotland. A full review of the materials is pending.

National Infection Prevention and Control

ARHAI Scotland continues to collaborate with local Infection Prevention and Control (IPC) and Health Protection Teams in the development and review of guidance documents for the prevention and control of infection across all care settings. The National Infection Prevention and Control Manual was further developed during 2020 and 2021 with the addition of an Infection Prevention and Control Manual for Older People and Adult Care Homes and COVID-19 Addenda for Acute Settings; Care Home Settings and Community Health and Care Settings. In 2021, a new chapter with comprehensive built environment evidence-based IPC guidance, including decontamination, will be developed.

ARHAI Scotland continued to provide IPC expert advice and support to a range of key stakeholders including Scottish Government, Care Inspectorate, NHS boards, Public Health Scotland and service providers.

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?

Through changes in healthcare delivery, activity and changing patient population (including patients being treated for COVID-19), the COVID-19 pandemic has affected the epidemiology of other types of healthcare associated infections (HCAI) and has affected how we can compare and interpret HCAI rates in 2020.

Hospitals

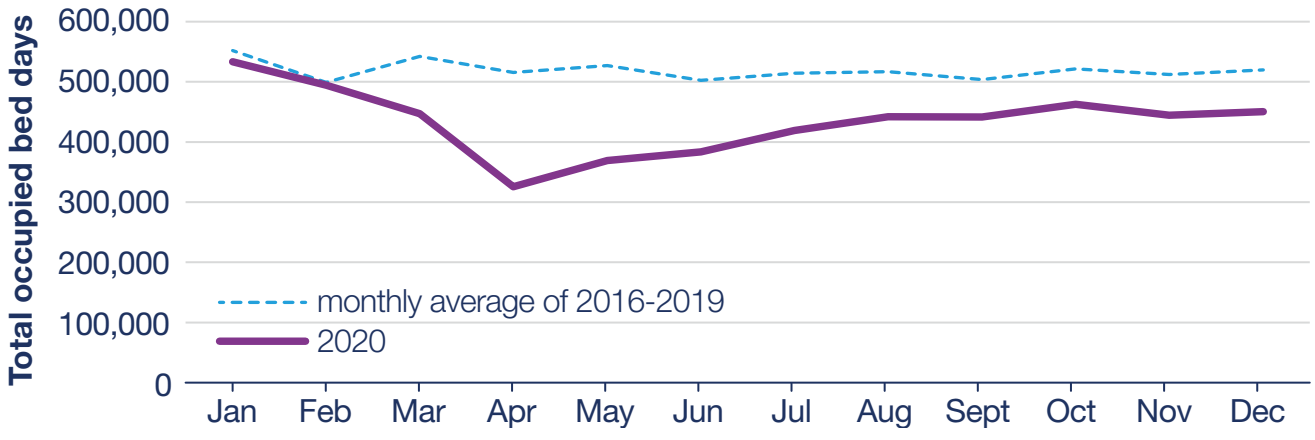
There was a decrease in hospital activity

A **decrease** of **25.1%** in the **number of patients admitted** to **acute hospitals** in **2020 compared** to **2019**

556,820 in **2020 compared** to **743,455** in **2019**

A **decrease** of **14.2%** in **total occupied bed days** in **2020 compared** to **2019**

5,212,564 in **2020 compared** to **6,075,708** in **2019**



A **decrease** of **37.5%** in **elective procedures** within **acute hospitals** in **2020 compared** to **2019**

80,094 in **2020 compared** to **128,119** in **2019**

There were changes in at-risk groups

A **higher proportion** of **emergency admissions** to **acute hospitals** in **2020 compared** to **2019**

54.6% in **2020 compared** to **47.5%** in **2019**

A **higher proportion** of **patients aged 65 and older admitted** to **acute hospitals** in **2020 compared** to **2019**

42.6% in **2020 compared** to **39.9%** in **2019**

There were changes in acute care

Changes in **infection prevention and control guidance**

Standard Infection Control Precautions (SICPs) and **Transmission Based Precautions (TBPs) extended** to **include specific COVID-19 measures**

A **5.5% decrease** in the **use of antibiotics** (including surgical prophylactic antibiotics) in **acute hospitals** in **2020 compared** to **2019**

Community

There were changes in primary care services

There was a **decrease** in the number of **face to face appointments** in **primary care** introduced by **government guidance**

There was a **decrease** in **non-COVID-19** related **healthcare services**

There was a **14.2% decrease** in **antibiotic prescription items** in **primary care** (excluding dental) in **2020 compared** to **2019**

There were changes in population behaviours

There was a **decrease** in the **number of in-person interactions** and **community mobility** due to **lockdown restrictions**

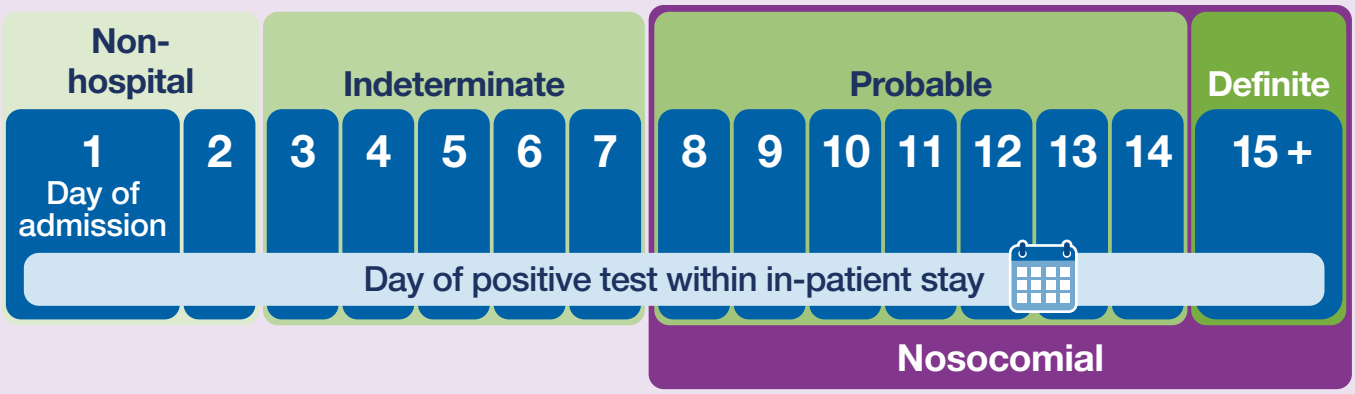
There was an **increase** in **personal infection prevention measures** such as **hand washing** and **wearing face-masks**

Hospital onset COVID-19

ARHAI Scotland developed a new surveillance system to monitor hospital transmission of COVID-19 at pace during 2020. This system monitors nosocomial COVID-19 infections (based on those presenting 8 days or more after admission to hospital). The intelligence has been used to provide critical evidence to inform infection prevention and control measures, guidance and policy within hospitals.

Hospital onset status timeline

Hospital onset status is divided into **4 categories**:
non-hospital, **indeterminate**, **probable** and **definite**



COVID-19 episodes in 2020 by hospital onset status

In **2020**, there were **3,389** (2.6%) **cases** of **nosocomial COVID-19**

Of **all COVID-19 cases** in **2020**

1.8% (n=2,389) **definite hospital onset** (days 15+)

0.8% (n=1,000) **probable hospital onset** (days 8-14)

0.6% (n=793) **indeterminate hospital onset** (days 3-7)

4.8% (n=6,353) **non-hospital onset** (days 1 and 2)

The **remaining 92.1%** (n=122,299) were **community onset**

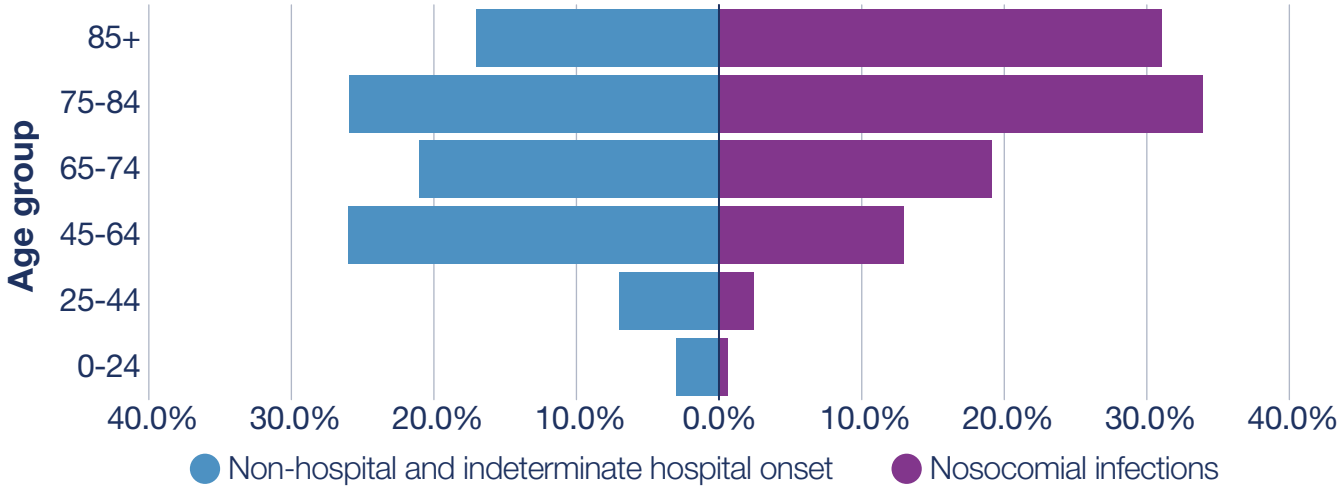
- Definite hospital onset
- Probable hospital onset
- Indeterminate hospital onset
- Non-hospital onset
- Community onset

Hospital onset COVID-19 by age

Patients with **nosocomial COVID-19** were **older** than **other* cases** of **COVID-19**

64.9% of **all nosocomial COVID-19 cases** were in **patients aged 75 and older**

The **median age** of those with **nosocomial COVID-19** was **significantly higher** than **other patients first diagnosed in hospital** ($p<0.001$)

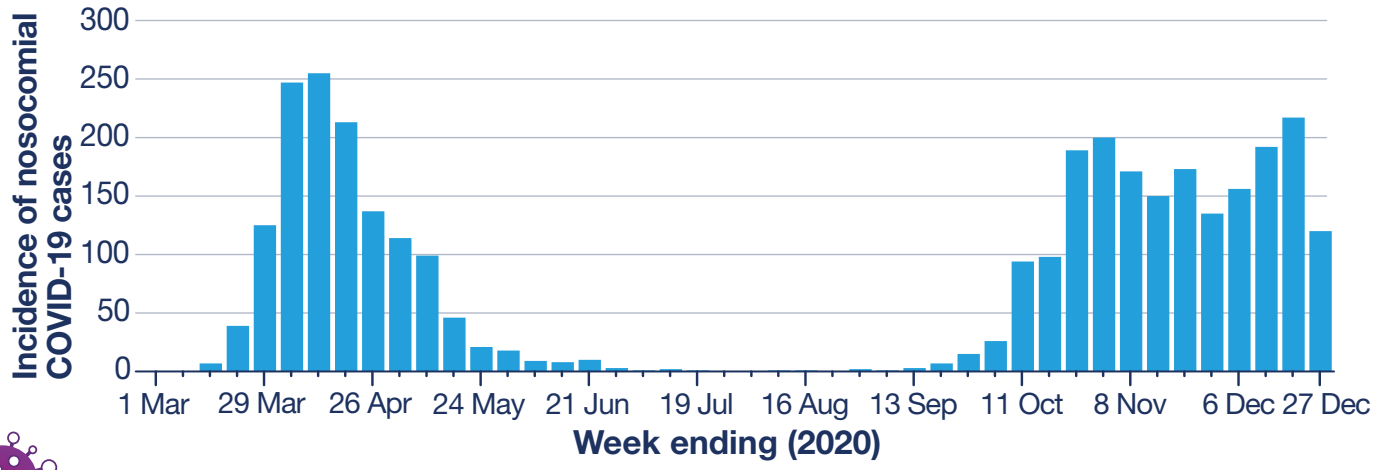


* Those diagnosed during the first week of their in-patient stay or in the community.

Incidence of nosocomial COVID-19 over time

Nosocomial cases of **COVID-19 followed** the **trends observed** in the **population**

There was a **lag time** of **approximately 2 weeks** from **increases in community cases** to an **increase in nosocomial cases**



All-cause mortality

29.9% (n=1,015) of **patients** with **probable or definite hospital onset COVID-19 died** within **28 days** of **their first positive sample**

More than a quarter of **patients diagnosed** in **hospital died within 28 days**

Hospital onset status	All-cause mortality within 28 days	All-cause mortality %	Total COVID-19 cases
Nosocomial infections	1,015	29.9%	3,389
Non-hospital and indeterminate hospital onset	1,767	24.7%	7,152
Total	**2,782**	**26.4%**	**10,541**

Differences in all-cause mortality rates between cases of nosocomial COVID-19 and other cases of COVID-19 diagnosed during an inpatient stay can be attributed to differences in the age distributions and underlying health conditions of the two groups. After adjusting for these factors there was no increased risk in all-cause mortality for nosocomial COVID-19, compared to other cases first diagnosed in hospital.

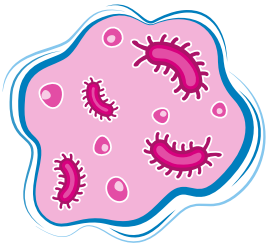
For more information please see the Hospital onset COVID-19 mortality in Scotland report.

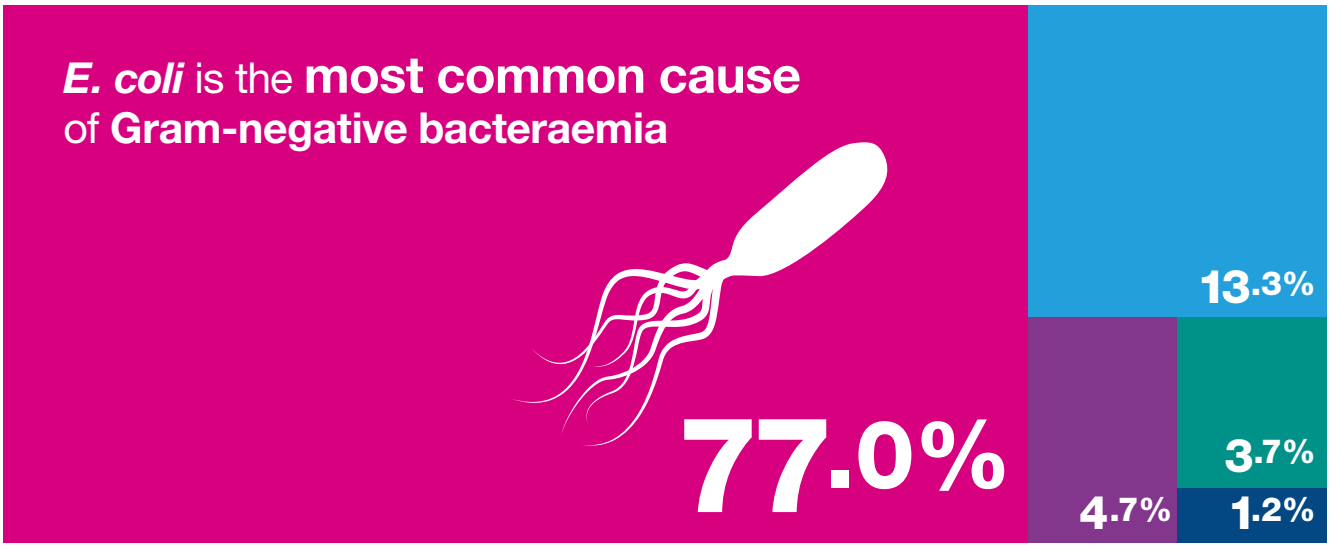
Gram-negative bacteraemia

Gram-negative bacteria are an important cause of serious infections in healthcare and community settings.

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of Gram-negative bacteraemia and comparison of results should be interpreted with caution.

In **2020**, there were **5,462** **Gram-negative bacteraemia** in **Scotland** caused by **5 key Gram-negative pathogens**





E. coli bacteraemia (ECB) enhanced data

In **2020**, there were **4,206** ***E. coli*** **bacteraemia** in **healthcare and community settings**

↓ **Compared** to **4,767** in **2019**

The **incidence of ECB** was **77.0** per 100,000 population

↓ The **rate** has **decreased 11.8%** between **2019** and **2020**

↓ The **rate** has **decreased 2.8%** over the **last 5 years**

In **2020**, the **cases** and **rates** of **ECB** were

Healthcare associated ECB

2,069 cases

Annual incidence rate

39.7 per 100,000 bed days

↔ The **rate** has been **stable** between **2019** and **2020**

↑ The **rate** has **increased** **4.3%** over the **last 4 years**

Community associated ECB

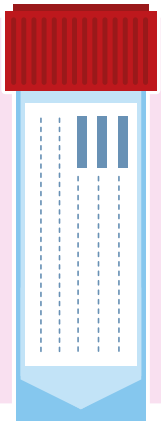
2,137 cases

Annual incidence rate

39.1 per 100,000 population

↓ The **rate** has **decreased** **10.1%** between **2019** and **2020**

↓ The **rate** has **decreased** **5.8%** over the **last 4 years**



25.9% of **ECB infections** were due to **lower urinary tract infections (UTIs)** as their **primary infection**

↓ There was a **3.7%** **year-on-year decrease** in **all cause mortality due** to **ECB** between **2015** and **2019** (2020 data not available)

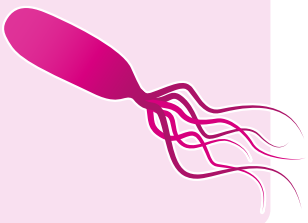
2020 Funnel plot analysis

NHS Ayrshire and Arran, **NHS Forth Valley** and **NHS Lanarkshire** were **above** the **95% confidence interval upper limit** for **healthcare associated ECB**

NHS Ayrshire and Arran, **NHS Dumfries and Galloway**, **NHS Forth Valley**, **NHS Lanarkshire** and **NHS Western Isles** were **above** the **95% confidence interval upper limit** for **community ECB**

ECB antimicrobial resistance

↔ **Since last year, antimicrobial resistance** has **remained stable**

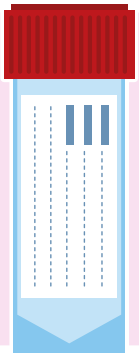


Urinary tract infections

Urinary tract infections (UTIs) and catheter-associated UTIs (CAUTIs) are a concern in acute and non-acute hospitals, care homes and care at home. UTI are the most common healthcare associated infection (HCAI) in acute and non-acute hospitals.

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of urinary tract infections and comparison of results should be interpreted with caution.

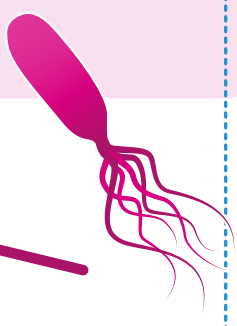
An important aspect of reducing the incidence of Gram-negative bacteraemia is the prevention and management of primary infections, including UTIs.

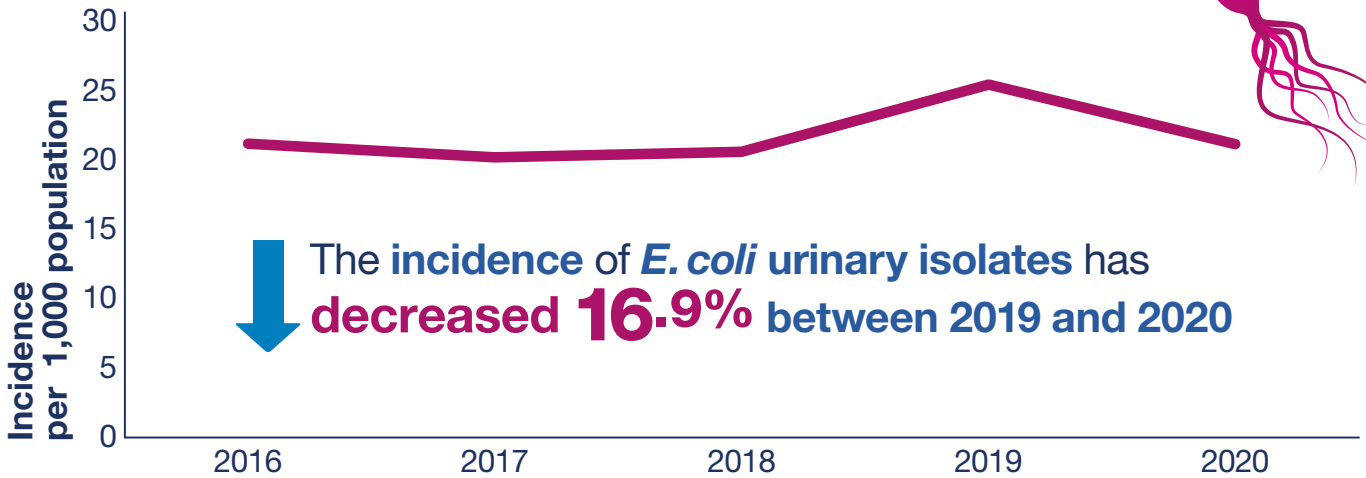


In **2020**, ***Escherichia coli* (*E. coli*)** was the **most commonly reported pathogen** found in **urine samples**

There were **115,844 cases** of ***E. coli*** in **urinary isolates**

An **incidence** of **21.2** per 1,000 population





The **incidence** of ***E. coli* urinary isolates** has **decreased 16.9% between 2019 and 2020**

* Laboratory reported urinary isolates used as a proxy for cases of UTI for monitoring purposes. See **Appendix 1 – Publication Metadata** for further details.

Since **last year**, **antimicrobial resistance** in ***E. coli* urinary isolates** has **remained stable**

Other than resistance to

co-amoxiclav which has **decreased**

and **fosfomycin** which has **increased**

Carbapenemase-producing organisms

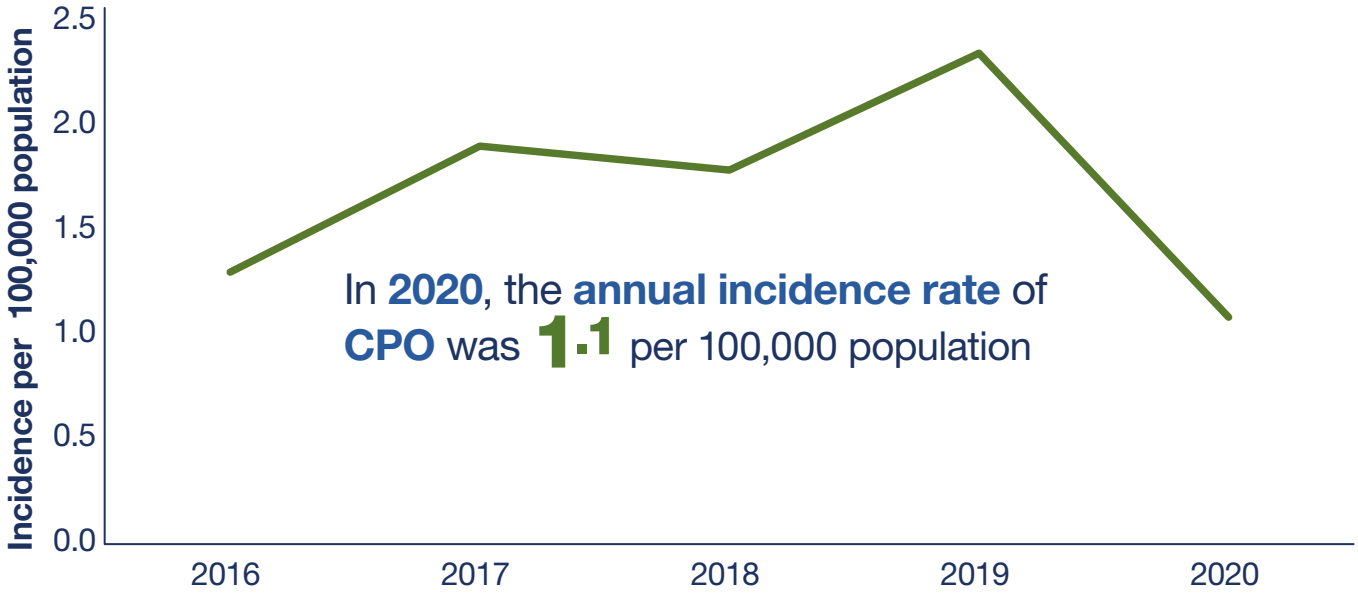
Carbapenems are very broad-spectrum antibiotics which are used almost exclusively in the hospital setting for the treatment of suspected or confirmed multi-drug resistant Gram-negative infections. Enzymes produced by carbapenemase-producing organisms (CPOs) can inactivate carbapenem antibiotics, leaving few therapeutic options for treatment of CPO infections.

Please refer to the **COVID-19 chapter** as changes in the hospital population and activity during 2020 may have affected the epidemiology of carbapenemase-producing organisms and comparison of results should be interpreted with caution.

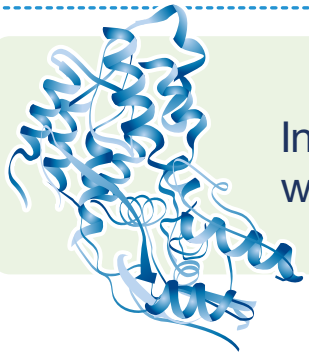
In **2020**, there were **59 CPOs**

Compared to **128 CPOs** in **2019**

Of **those identified** in **2020**, **94.9%** were **carbapenemase-producing Enterobacterales (CPE)**



In **2020**, the **annual incidence rate** of **CPO** was **1.1** per 100,000 population



In **2020**, the **most frequently isolated enzymes** were **OXA-48 like enzymes**, **NDM** and **VIM**

Prescribing

Carbapenem antibiotics are used for the treatment of infections caused by multi-drug resistant organisms and/or in people with co-morbidities.

Antimicrobial stewardship is the implementation of a programme of coordinated activities to optimise antibiotic prescribing to improve patient outcomes, reduce antibiotic resistance, and decrease the spread of infections caused by multi-drug resistant organisms.

A key component of the antimicrobial stewardship programme, coordinated by the Scottish Antimicrobial Prescribing Group (SAPG), is the optimisation of use of carbapenems and other very broad spectrum antibiotics.

Screening

Screening for multi-drug resistant organisms on admission to hospital is a key intervention to reduce the opportunities for infections to develop and spread in healthcare.

A two-step clinical risk assessment (CRA) based screening policy to identify and manage patients considered to be at high risk of carbapenemase-producing Enterobacterales (CPE) colonisation or infection, has been in place in acute hospitals in Scotland since 2013.

In 2020, 82% of audited patients underwent a clinical risk assessment for CPE colonisation or infection, as per national CPE screening policy. These data continue to be monitored by ARHAI Scotland and feedback is provided to boards on a quarterly basis.

Clostridioides difficile infection

Clostridioides difficile infection (CDI) is an important healthcare associated infection, which usually causes diarrhoea and contributes to a significant burden of morbidity and mortality. There is also a substantial burden which is community associated.

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of *Clostridioides difficile* Infection and comparison of results should be interpreted with caution.

In **2020**, there were **1,088 cases** of **CDI** in **patients aged 15 years and older**

Compared to **1,059 cases** in **2019**

The **annual incidence rate** was **19.9** per 100,000 population

Compared to **19.4** per 100,000 population in **2019**

There was a **7.5% year-on-year decrease** in **overall CDI rates** in **patients aged 15 years and older** over the **last 5 years**

In **2020**, the **cases** and **rates** of **CDI** were

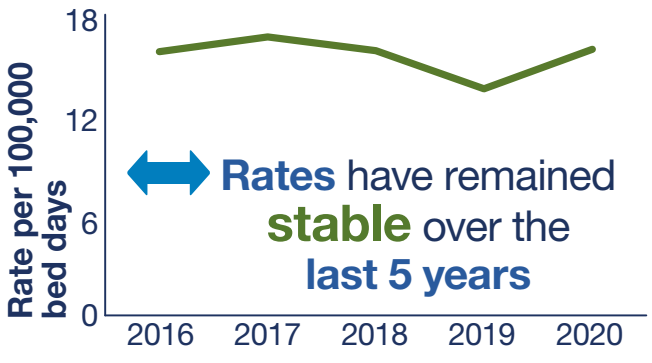
Healthcare associated CDI

813 cases

Annual incidence rate

15.6 per 100,000 bed days

The **rate increased 17.3%** between **2019** and **2020**



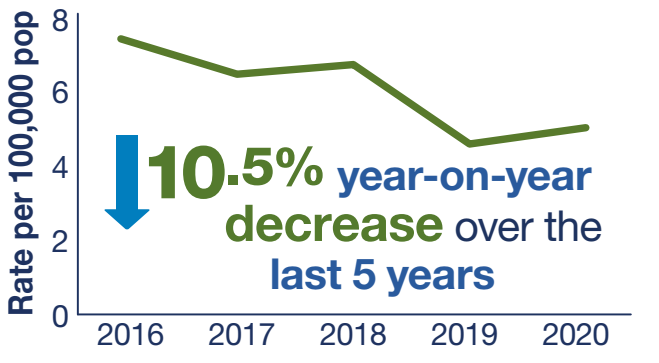
Community associated CDI

275 cases

Annual incidence rate

5.0 per 100,000 population

The **rate** has been **stable** between **2019** and **2020**



2020 Funnel plot analysis

NHS Ayrshire and Arran and **NHS Highland** were **above** the **95% confidence interval upper limit** for **healthcare associated CDI**

NHS Ayrshire and Arran was **above** the **95% confidence interval upper limit** for **community associated CDI**

Mortality rates

In **2019**, the **30 day all cause mortality rates** were

Healthcare associated CDI
15.5% mortality

8.3% year-on-year decrease between 2015 and 2019

Community associated CDI
7.8% mortality

There was **no change** observed **between 2015 and 2019**

Ribotyping

In **2020**, the **most common isolates** (found in a representative sample) were

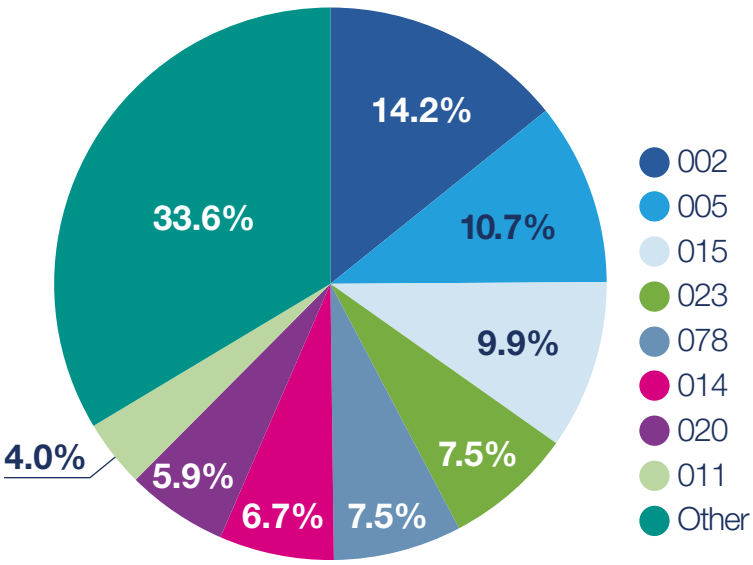
14.2% ribotype 002

10.7% ribotype 005

9.9% ribotype 015

7.5% ribotype 023

7.5% ribotype 078

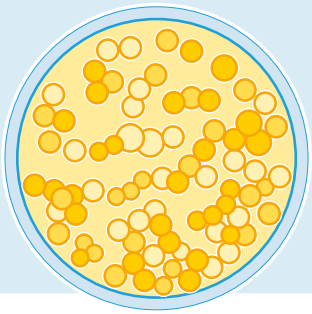


Staphylococcus aureus bacteraemia

Staphylococcus aureus (*S. aureus*) bacteria colonise the nasal cavity of about a quarter of the healthy population. When *S. aureus* breaches the body's defence systems it can cause a range of illnesses from minor skin infections to serious systemic infections such as bacteraemia.

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of *S. aureus* bacteraemia and comparison of results should be interpreted with caution.

In **2020**, there were **1,501**
***S. aureus* bacteraemia (SAB) cases**



A **rate** of **27.5 cases** per 100,000 population

There was a **2.0% decrease**
in **overall SAB rates** in the **last 5 years**

97.4% (n=1462)
of **all SAB cases** were
Meticillin-sensitive *Staphylococcus aureus* (MSSA)

Rates have remained **stable** over the **last 5 years**

2.6% (n=39)
of **all SAB cases** were
Meticillin-resistant *Staphylococcus aureus* (MRSA)

Rates have **decreased 18.7%** over the **last 5 years**

In **2020**, **85%** of **patients audited** underwent a **clinical risk assessment** in line with **national MRSA screening policy**. This **remains below** the **90% key performance indicator**.

In **2020**, the **cases and rates** of **SAB** were

Healthcare associated SAB

940 cases

Annual incidence rate

18.0 per 100,000 bed days

↑ The **rate increased 10.9%** **between 2019** and **2020**

↔ The **rate** has been **stable** over the **last 5 years**

Community associated SAB

561 cases

Annual incidence rate

10.3 per 100,000 population

↔ The **rate** has been **stable** **between 2019** and **2020**

↔ The **rate** has been **stable** over the **last 5 years**

2020 Funnel plot analysis

No NHS boards were **above** the **95% confidence interval upper limit** for **healthcare associated SAB**

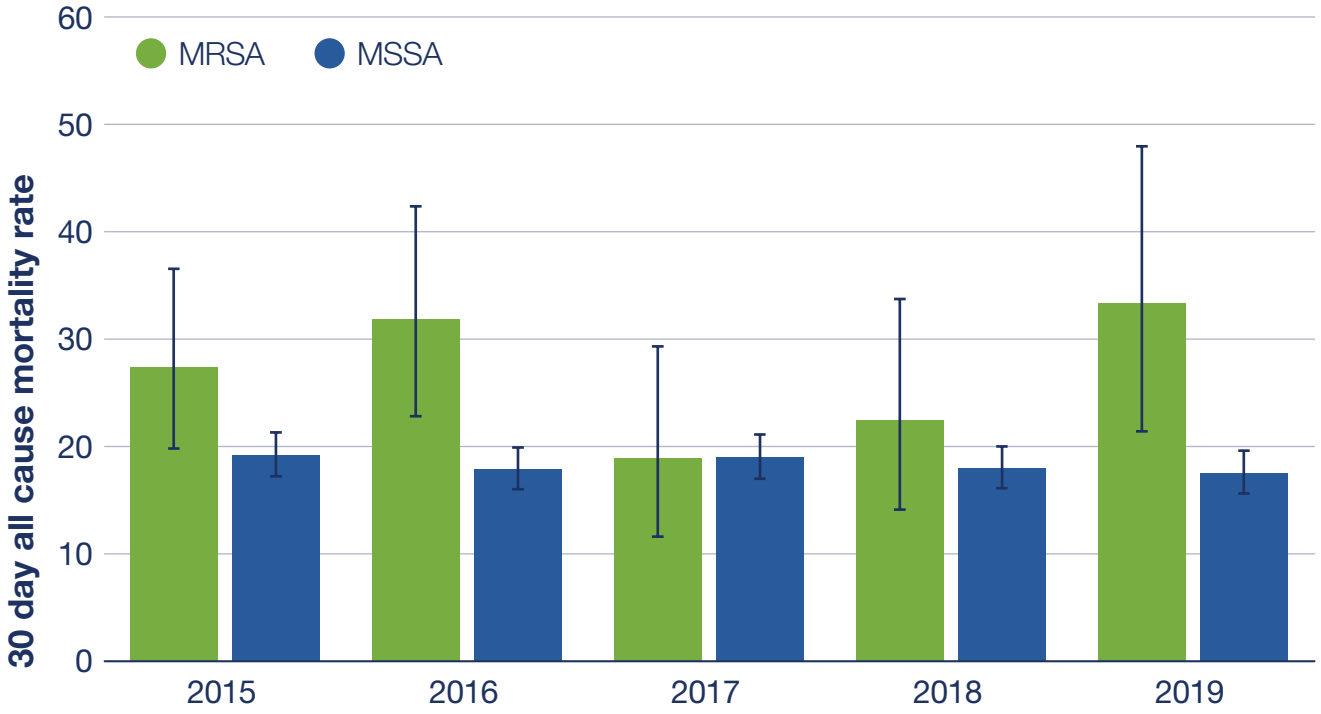
NHS Ayrshire and Arran was **above** the **95% confidence interval upper limit** for **community associated SAB**

Mortality rates

In **2019** (2020 data not available), the
30 day all cause SAB mortality rates were

33.3% MRSA **17.5% MSSA**

SAB mortality rates have **remained stable** over the **last 5 years**



Enhanced data

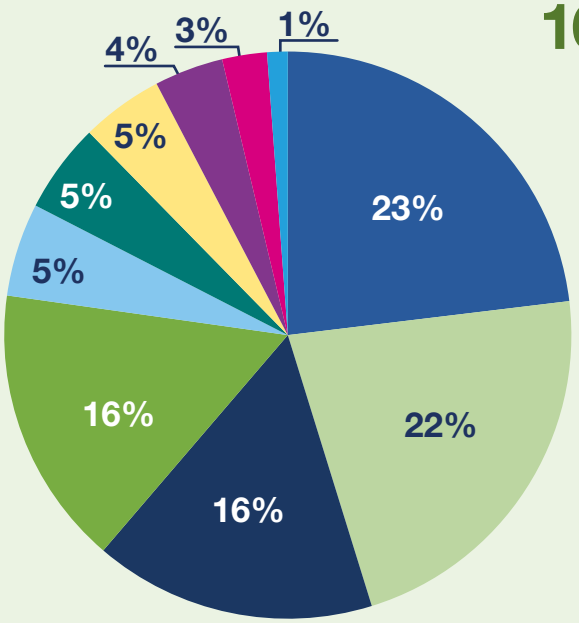
In 2020, the **4 most common entry points** for **Healthcare associated SAB** were

23.1% Vascular access device

22.1% Not known

16.1% Not answered*

16.0% Skin and soft tissues



- Vascular access device (VAD)
- Not known
- Not answered
- Skin and soft tissue
- Respiratory Infection
- Device other than VAD
- Surgical Site Infection
- Other
- Contaminant
- Illicit drug injection sites from people who inject drugs

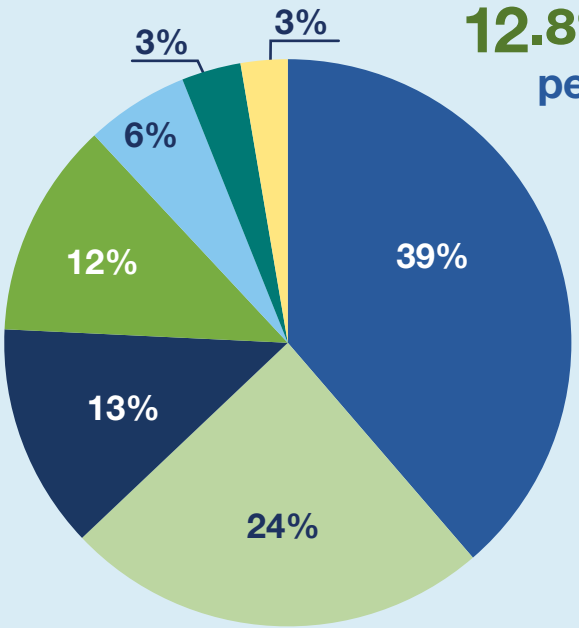
* Due to COVID-19 mandatory collection of enhanced surveillance items were made voluntary.

In 2020, the **3 most common entry points** for **Community associated SAB** were

38.5% Not known

24.3% Skin and soft tissues

12.8% Illicit drug injection sites from **people who inject drugs** (PWID)



- Not known
- Skin and soft tissue
- Illicit drug injection sites from people who inject drugs
- Not answered
- Respiratory infection
- Other
- Urinary tract infection

Prevention of healthcare associated bloodborne viruses

In the health and care setting transmission of bloodborne viruses (BBVs) can occur after exposure of staff to infected patient blood or body fluids (and vice versa) or between patients following infection control breaches.

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of healthcare associated bloodborne viruses and comparison of results should be interpreted with caution.

In **2019***, there were a **total** of **2,516** **healthcare worker occupational exposures**

84.5% (n=2126) of **all healthcare worker occupational exposures occurred via a sharps device**

Other routes of exposure were

7.4% (n=187)
Mucocutaneous

5.2% (n=132)
Other (e.g. bites, scratches)

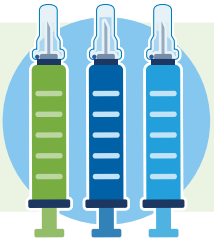
1.1% (n=28)
Non-intact skin exposure

1.8% (n=43)
Unknown

The **sharps exposure rate** per **100 whole time equivalent (WTE)** in **2015** was **2.09** **compared** to **2.02** in **2019**

* Based on full year data returned from 13/17 Scottish health boards (2 special boards and 11 health boards) and half year data returned from 4/17 Scottish health boards (1 special board and 3 health boards).

2.2% (n=47) of **sharps device related exposures** were **significant**



In **2019 safety device uptake** was **86%** **compared** to **84%** in **2018**

Healthcare outbreaks and incidents

Healthcare incidents and outbreaks are reported to ARHAI Scotland for expert advice and/or as part of the healthcare infection incident assessment tool (HIIAT).

Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of healthcare outbreaks and incidents and comparison of results should be interpreted with caution.

In **2020**, there were **136** **healthcare infection incidents** and **outbreaks** (non COVID-19)

Incidents and **outbreaks reported** as **HIIATs** are **categorised** as **red**, **amber** or **green**. Of the **total number** of **reports**, there were

15 Red	13 Amber	108 Green

Of the **total number** of **incidents** and **outbreaks** in **2020**

18.4% (n=25)
of **incidents** were **respiratory** (other than COVID-19)

17.6% (n=24)
of **incidents** were **bloodstream infections**

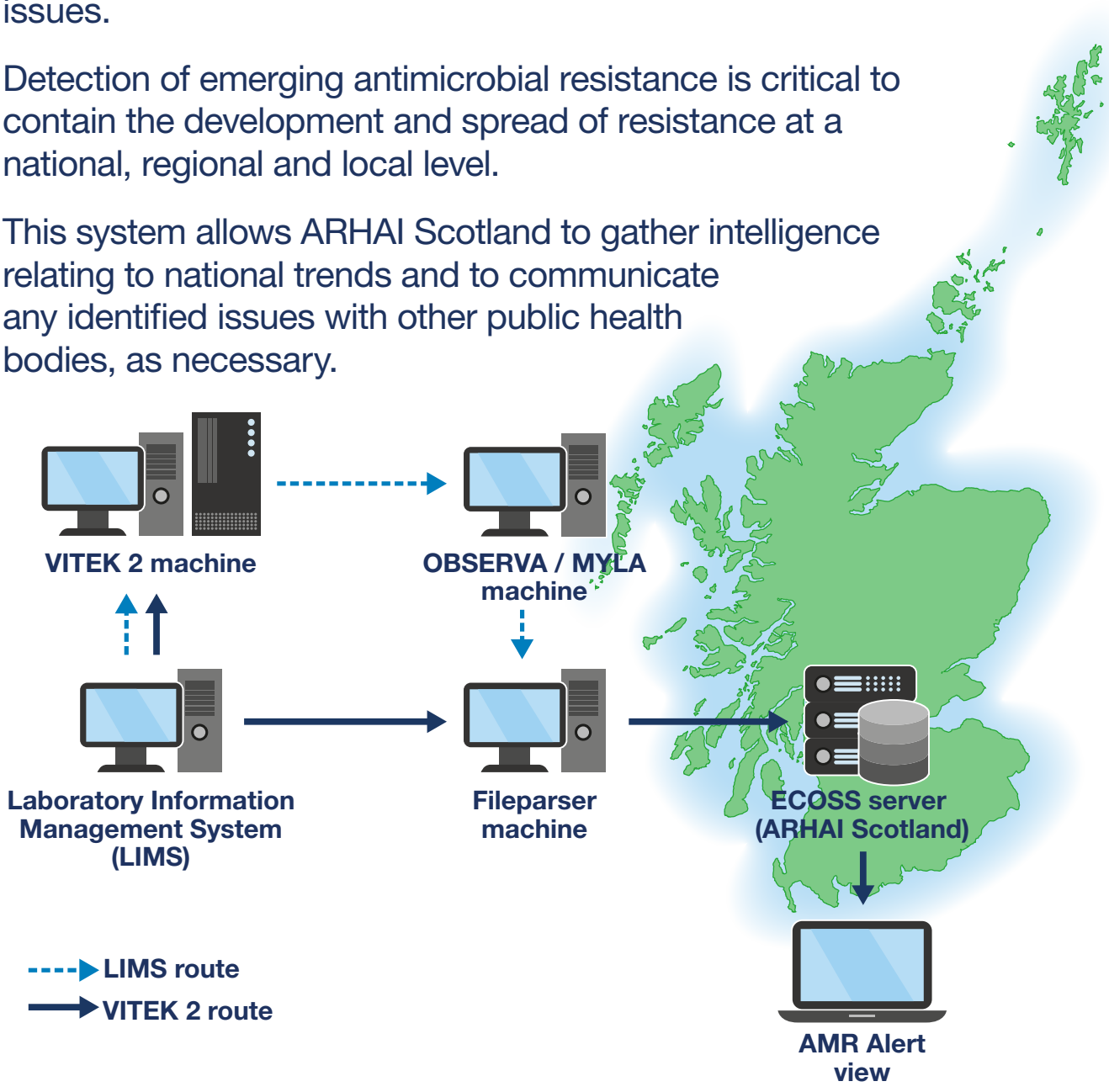
14.7% (n=20)
of **incidents** were **gastrointestinal**

The ARHAI Scotland antimicrobial resistance alerts early warning system

National monitoring of exceptional phenotypes enables a timely scientific and public health response to potential emerging AMR issues.

Detection of emerging antimicrobial resistance is critical to contain the development and spread of resistance at a national, regional and local level.

This system allows ARHAI Scotland to gather intelligence relating to national trends and to communicate any identified issues with other public health bodies, as necessary.



The exceptional phenotype list is published in the **National Infection Prevention and Control Manual**

www.nipcm.hps.scot.nhs.uk/

Norovirus outbreaks

Norovirus spreads very easily and there is a risk of outbreaks in any place where there are shared living spaces such as in hospitals.

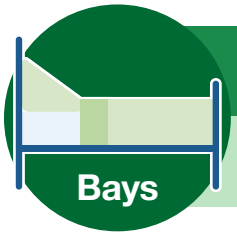
Please refer to the COVID-19 chapter as changes in the hospital population and activity during 2020 may have affected the epidemiology of norovirus outbreaks and comparison of results should be interpreted with caution.

NHS Scotland boards reported **113 closures** due to **norovirus** in **season 2019/20**

A **decrease** of **27.6%** from **156** in **season 2018/19**

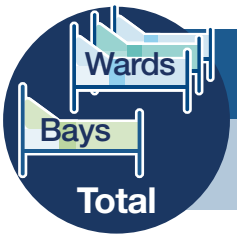
2019/20 **47** ward closures

2018/19 **60** ward closures



2019/20 **66** bay closures

2018/19 **96** bay closures



2019/20 **113** closures

2018/19 **156** closures

There were **559 suspected or confirmed cases** of **norovirus** in **season 2019/20**

A **decrease** of **27.1%** from **767** in **season 2018/19**

2019/20 **559** cases

2018/19 **767** cases

National Infection Prevention and Control

National Infection Prevention and Control Manual

The National Infection Prevention and Control Manual (NIPCM) continues to evolve from its inaugural chapter, Chapter 1: Standard Infection Control Precautions (SICPs) in 2012, followed by Chapter 2: Transmission Based Precautions (TBPs) in 2013/2014; Chapter 3: Healthcare Infection, Incidents, Outbreaks and Data Exceedance in 2017 and the Addendum for Infection Prevention and Control within Neonatal Settings (NNU) in 2018.

In May 2021, an IPC Manual that is context specific for Older People and Adult Care Homes was published. The content of the Care Home Infection Prevention and Control Manual (IPCM) is aligned to the evidence based NIPCM and is intended to be used by all those involved in care provision in the care home setting.

In 2021, a new chapter for the NIPCM will be developed (Chapter 4). This will include comprehensive built environment evidence-based IPC guidance, including decontamination, for frontline staff.

Recognising the volume of expansion within the NIPCM throughout 2020, work will be undertaken to refresh the NIPCM including design, content and functionality and this will be done in conjunction with our stakeholders.

COVID-19 Guidance and Addenda

The COVID-19 Acute Addendum to the NIPCM was published in October 2020. The Addendum is aligned with UK Infection Prevention and Control (IPC) guidance and was developed to provide context for the Scottish setting following extensive stakeholder feedback. This operates as the central information hub for COVID-19 specific IPC guidance containing useful tools, risk assessments and appropriate links to Scottish policy and Public Heath Scotland (PHS) guidance.

Subsequently, a COVID-19 Care Home Addendum and Community Health and Social Care Addendum have been developed providing sector specific guidance for care home staff and providers on a single platform to improve accessibility.

In addition to the Scottish guidance development, ARHAI Scotland has supported UK and national groups, as part of the IPC pandemic response, to review existing guidance, scientific literature and emerging evidence including ventilation systems in healthcare settings; personal protective equipment provision and practice; and screening and testing for SARS-CoV-2.

Healthcare Associated Infection Compendium

The HAI Compendium is a directory of guidance and supporting materials produced by Scottish, UK and international organisations/stakeholders on IPC practice, antimicrobial resistance and the built environment. Content for the HAI Compendium is updated on a monthly basis by searching scientific alerts, newsletters and websites.

A COVID-19 compendium was created in 2020 and contains links to current national and international policy, guidance and resources on COVID-19 from key organisations. It is regularly updated during the COVID-19 pandemic.

IPC Education

In support of the pandemic response, ARHAI Scotland participated in the development, delivery and evaluation of a number of IPC webinars. The webinars supported learning, knowledge, understanding and implementation of IPC measures and relevant guidance.

Working in partnership with NHS Education for Scotland (NES) and other national stakeholders, ARHAI Scotland worked to develop and deliver educational tools to support IPC in health and care settings.

Support and IPC advice

ARHAI Scotland continued in their role in providing expert IPC advice and support to NHS boards through the Healthcare Infection Incident Assessment Tool (HIIAT) framework.

In support of the pandemic response, ARHAI Scotland provided IPC expert advice to a range of key stakeholders including Scottish Government, Care Inspectorate, NHS boards, Public Health Scotland and service providers.

List of abbreviations and acronyms

AMR	Antimicrobial Resistance
ARHAI	Antimicrobial Resistance and Healthcare Associated Infections
BBV	Bloodborne Virus
CARHAI	Care Home Antimicrobial Resistance and Healthcare Associated Infection
CAUTI	Catheter Associated Urinary Tract Infection
CDI	*Clostridioides difficile* Infection
COVID-19	Coronavirus disease 2019 (COVID-19)
CPE	Carbapenemase-Producing Enterobacterales
CPO	Carbapenemase-Producing Organism
CRA	Clinical Risk Assessment
E. coli	*Escherichia coli*
ECB	*Escherichia coli* Bacteraemia
ECDC	European Centre for Disease Prevention and Control
ECOSS	Electronic Communication of Surveillance in Scotland
HBV	Hepatitis B Virus
HCAI	Healthcare Associated Infection
HCV	Hepatitis C Virus
HCW	Healthcare Worker
HFS	Health Facilities Scotland
HIIAT	Healthcare Infection Incident Assessment Tool
HIIORT	Healthcare Infection, Incident and Outbreak Reporting Template
HIV	Human Immunodeficiency Virus
HMUD	Hospital Medicines Utilisation Database
HSE	Health and Safety Executive

HTM	Health Technical Memoranda
ICBED	Infection Control in the Built Environment and Decontamination
IPC	Infection Prevention and Control
IPCM	Infection Prevention Control Manual
ISD	Information Services Division
KPI	Key Performance Indicator
MHRA	Medicines and Healthcare products Regulatory Agency
MRSA	Meticillin-resistant *Staphylococcus aureus*
MSSA	Meticillin-sensitive *Staphylococcus aureus*
NERVTAG	New and Emerging Respiratory Virus Threats Advisory Group
NDM	New Delhi Metallo-Beta-lactamase
NES	NHS Education for Scotland
NHS	National Health Service
NIPCM	National Infection Prevention and Control Manual
NNU	Neonatal Unit
NPGO	National Policy, Guidance and Outbreaks
NRS	National Records of Scotland
NSS	National Services Scotland
ORT	Outbreak Reporting Tool
PcP	Pneumocystis pneumonia
PHE	Public Health England
PHS	Public Health Scotland
PIS	Prescribing Information System
PPE	Personal Protective Equipment
PWID	People Who Inject Drugs
OXA	Oxacillinase
RAPID	Rapid Admission Preliminary Inpatient Data

RPE	Respiratory Protective Equipment
S. aureus	*Staphylococcus aureus*
SAB	*Staphylococcus aureus* Bacteraemia
SAPG	Scottish Antimicrobial Prescribing Group
SBAR	Situation, Background, Assessment and Recommendations
SSSC	Scottish Social Services Council
SICPs	Standard Infection Control Precautions
SMiRL	Scottish Microbiology Reference Laboratories
SONAAR	Scottish One Health Antimicrobial Use and Antimicrobial Resistance
SHTM	Scottish Health Technical Memoranda
SSI	Surgical Site Infection
SUTIN	Scottish Urinary Tract Infection Network
TBPs	Transmission Based Precautions
UK	United Kingdom
UKAP	UK Advisory Panel for Healthcare Workers Infected with Bloodborne Viruses
UTI	Urinary Tract Infection
UV	Ultraviolet
VAD	Vascular Access Device
VHF	Viral Hemorrhagic Fever
VIM	Verona integron–encoded metallo-Beta-lactamases
WHO	World Health Organization
WTE	Whole Time Equivalent
XDR-TB	Extremely Drug Resistant-Tuberculosis

Appendix 1 – Publication Metadata

Publication title

Healthcare Associated Infection. 2020 Annual Report.

Description

This release provides information on healthcare associated infection in Scotland for the period January to December 2020.

Theme

Healthcare Associated Infections in Scotland

Topic

Healthcare Associated Infection

Infection Prevention and Control

Format

Online resource (PDF)

Data source(s)

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: Acute hospital admissions data: Public Health Scotland SMR01

Total occupied bed days: Public Health Scotland ISD(S)1

Elective procedures data: Public Health Scotland, Acute hospital activity and NHS beds information (https://publichealthscotland.scot/publications/acute-hospital-activity-and-nhs-beds-information-quarterly/acute-hospital-activity-and-nhs-beds-information-quarterly-quarter-ending-31-december-2020/data-summary/)

Emergency admissions data: Public Health Scotland, Acute hospital activity and NHS beds information (https://publichealthscotland.scot/publications/acute-hospital-activity-and-nhs-beds-information-quarterly/acute-hospital-activity-and-nhs-beds-information-quarterly-quarter-ending-31-december-2020/data-summary/)

Patient age data: Public Health Scotland SMR01

Antibiotic use in acute hospitals data: Public Health Scotland, Hospital Medicines Utilisation Database (HMUD)

Antibiotic use in primary care data: Public Health Scotland, Prescribing Information System (PIS)

Hospital onset COVID-19: Case data: Electronic Communication of Surveillance in Scotland (ECOSS)

Admissions data: Rapid Admission Preliminary Inpatient Data (RAPID), validated/supplemented by local patient admissions systems.

Gram-negative bacteraemia: Case data: ECOSS and ECOSS Enhanced Surveillance Web Tool

Healthcare associated denominator: Total occupied bed days: Public Health Scotland ISD(S)1

Community associated denominator: National Records of Scotland (NRS) population estimates

Urinary tract infections: ECOSS

Population denominator: NRS population estimates

Carbapenemase-producing organisms: ECOSS, Antimicrobial Resistance and the Scottish AMR Satellite Laboratory (Scottish microbiology reference laboratories (SMiRL), Glasgow).

Population denominator: NRS population estimates

***Clostridioides difficile* infection:** Case data: ECOSS

Data linkage source: SMR01 General / Acute Inpatient and Day Case: Public Health Scotland

Healthcare associated denominator: Total occupied bed days: Public Health Scotland ISD(S)1

Community associated denominator: NRS population estimates

***Staphylococcus aureus* bacteraemia:** Case data: ECOSS Enhanced Surveillance Web Tool

Healthcare associated denominator: Total occupied bed days: Public Health Scotland ISD(S)1

Community associated denominator: NRS population estimates

Prevention of healthcare associated bloodborne viruses:

1. Voluntary anonymous returns from Occupational Health services and Health and Safety leads in health and applicable special boards in NHSScotland.
2. NHS National Procurement.

Healthcare outbreaks and incidents: Healthcare infection incidents reported to National Services Scotland (NSS) through the Healthcare Infection, Incident and Outbreak Reporting Template (HIIORT) reporting process and the ARHAI Outbreak Reporting Tool (ORT).

Norovirus outbreaks: Norovirus outbreaks reported to NSS.

National Infection Prevention and Control: N/A

Date that data are acquired

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: 01/07/2021

Hospital onset COVID-19: 01/07/2021

Gram-negative bacteraemia: 03/08/2021 (with the exception of *Escherichia coli* bacteraemia)

***Escherichia coli* bacteraemia:** 26/02/2021

Urinary tract infections: 03/08/2021

Carbapenemase-producing organisms: 03/08/2021

***Clostridioides difficile* infection:** 29/01/2021

***Staphylococcus aureus* bacteraemia:** 26/02/2021

Prevention of healthcare associated bloodborne viruses: 04/12/2020

Healthcare outbreaks and incidents: 12/08/2021

Norovirus outbreaks: 23/07/2021

National Infection Prevention and Control: N/A

Release date

21 September 2021

Frequency

Annual

Timeframe of data and timeliness

The latest iteration of data are to 31 December 2020, therefore nine months in arrears.

For the following chapters 2019 data has been reported as 2020 data was not available:

- ***Escherichia coli*** bacteraemia: 2020 mortality data was not available.
- ***Clostridioides difficile*** **infection**: 2020 mortality data was not available.
- ***Staphylococcus aureus*** **bacteraemia**: 2020 mortality data was not available.

Norovirus outbreaks: Norovirus season extends from October through to April and the data in this report is for 1 October 2019 to 30 June 2020. The data reported on a weekly basis by boards and the reporting method has capacity to be retrospective due to only being reported when the bay/ward has reopened. Therefore, the data should not be used for benchmarking or comparison but only for NHS boards assessment for risk and outbreak preparedness.

Prevention of healthcare associated bloodborne viruses: Based on historical practice, occupational exposure data was collected up until mid-2019, however, a decision was made to switch to presenting data in annual increments. The next annual report will contain complete data for 2020.

Bloodborne virus (BBV) seroconversion data only being available 6 months post the last day of exposure. National Procurement data is available up to the end of 2019, for comparison with sharps injury data which is also reported up to the end of 2019.

Continuity of data

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: None

Hospital onset COVID-19: None

Gram-negative bacteraemia: Changes in the hospital population and activity during 2020 may have affected the epidemiology of gram-negative bacteraemia and comparison of results should be interpreted with caution.

Urinary tract infections: Changes in the hospital population and activity during 2020 may have affected the epidemiology of urinary tract infections and comparison of results should be interpreted with caution.

Carbapenemase-producing organisms: Changes in the hospital population and activity during 2020 may have affected the epidemiology of carbapenamase-producing organisms and comparison of results should be interpreted with caution.

***Clostridioides difficile* infection:** Changes in the hospital population and activity during 2020 may have affected the epidemiology of Clostridioides difficile infection and comparison of results should be interpreted with caution.

***Staphylococcus aureus* bacteraemia:** Changes in the hospital population and activity during 2020 may have affected the epidemiology of Staphylococcus aureus infection and comparison of results should be interpreted with caution.

Prevention of healthcare associated bloodborne viruses: Changes in the hospital population and activity during 2020 may have affected the epidemiology of healthcare associated bloodborne viruses and comparison of results should be interpreted with caution.

Healthcare outbreaks and incidents: Changes in the hospital population and activity during 2020 may have affected the epidemiology of healthcare outbreaks and incidents and comparison of results should be interpreted with caution.

Norovirus outbreaks: Changes in the hospital population and activity during 2020 may have affected the epidemiology of norovirus outbreaks and comparison of results should be interpreted with caution

National Infection Prevention and Control: N/A

Revisions statement

These data are not subject to planned major revisions. However, our aim is to continually improve the interpretation of the data and therefore analysis methods are regularly reviewed and may be updated in the future.

Revisions relevant to this publication

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: N/A

Hospital onset COVID-19: N/A

Gram-negative bacteraemia:

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Since the previous publication, changes have been made to the data processing methods used to produce antimicrobial susceptibility figures. The new method identifies the most resistant (non-susceptible) isolates from a patient during each episode of positive blood rather than within each calendar year. The new methods have been applied to historic data to allow year-on-year trend analyses using the same definitions.

Urinary tract infections: Since the previous publication, the UTI case definition has changed from a rolling 14-day deduplication of positive urinary isolates to a rolling 30-day deduplication of positive urinary isolates. The new case definition has been applied to historic data to allow year-on-year trend analyses using the same definitions.

Carbapenemase-producing organisms: None

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: There are no revisions to historical data. Commodity specialists identify and classify all sharps instruments available for purchase via National Procurement. New sharps devices including new safety versions and non-sharp alternative products will be added by the National Procurement Product Specialist and incorporated into the data as applicable.

Healthcare outbreaks and incidents: In October 2020 the ARHAI Outbreak Reporting Tool (ORT) was launched, and thereafter previous HIIORT data were reviewed to ensure retrospective and current data were complete and comparable. For 2019, 208 incidents have been reported, down from 213 in last year's report due to five duplications and erroneous records removed.

Norovirus outbreaks: None

National Infection Prevention and Control: N/A

Concepts and definitions

Statistical significance: Please note an increase or decrease stated in this report refers to a statistically significant change, and where a trend is referred to as stable, or there has been no change, this means that there has been no significant increase or decrease.

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?:

Acute hospital admissions data: Total number of unique patients admitted to hospital in 2019 and 2020 as per Public Health Scotland SMR01

Total occupied bed days: Total number of occupied bed days for years 2016-2020, as per Public Health Scotland ISD(S)1.

Elective procedures data: Details provided in Public Health Scotland publication: https://publichealthscotland.scot/publications/acute-hospital-activity-and-nhs-beds-information-quarterly/acute-hospital-activity-and-nhs-beds-information-quarterly-quarter-ending-31-december-2020/data-summary/

Emergency admissions data: Details provided in Public Health Scotland publication: https://publichealthscotland.scot/publications/acute-hospital-activity-and-nhs-beds-information-quarterly/acute-hospital-activity-and-nhs-beds-information-quarterly-quarter-ending-31-december-2020/data-summary/

Patient age data: Ages of unique patients admitted to acute hospitals in 2019 and 2020, as per Public Health Scotland SMR01.

Antibiotic use in acute hospitals data: Details provided in ARHAI Scotland publication Scottish One Health Antimicrobial Use and Antimicrobial Resistance Report: https://www.hps.scot.nhs.uk/web-resources-container/scottish-one-health-antimicrobial-use-and-antimicrobial-resistance-in-2019/

Antibiotic use in primary care data: Details provided in ARHAI Scotland publication Scottish One Health Antimicrobial Use and Antimicrobial Resistance Report: https://www.hps.scot.nhs.uk/web-resources-container/scottish-one-health-antimicrobial-use-and-antimicrobial-resistance-in-2019/

Hospital onset COVID-19: Details provided in weekly publication https://www.publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/

Gram-negative bacteraemia: Gram-negative organisms including Enterobacterales, (comprising amongst others *Escherichia coli, Klebsiella oxytoca*, and *Klebsiella pneumoniae*), and non-fermenters, (comprising amongst others *Pseudomonas aeruginosa*, and *Acinetobacter species*), cause serious infections including bacteraemia, pneumonia, meningitis, and surgical site infections (SSIs).

Gram-negative bacteraemia is a public health and clinical concern because of:

- the severity of infection, commonly occurring among vulnerable patients often at the extremes of life and/or with comorbidities,
- the large number of cases of Gram-negative bacteraemias each year, and high prevalence of Gram-negative infections,
- the association with receiving healthcare in community and healthcare settings.,
- their ability to become resistant to multiple classes of antibiotics, limiting treatment options.

All antimicrobial susceptibility data published in this report were aligned with the following definition:

- A new case of bacteraemia is a patient from whom an organism has been isolated from the patient's blood, and who has not previously had the same organism isolated from blood within a 14-day period (i.e. 14 days from date last positive sample obtained).

% Non-susceptible= non-susceptible (resistant or intermediate) isolates divided by the total number of isolates tested *100.

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Urinary tract infections: An important aspect of reducing the incidence of Gram-negative bacteraemia is the prevention and management of primary infections, including urinary tract infections (UTIs). As prescribing for UTIs is usually empirical, it is essential that resistance to commonly used antibiotics is monitored and reported to inform prescribing policy. The majority of UTIs in Scotland are caused by *Escherichia coli (E. coli).* All antimicrobial susceptibility data published in this report were aligned with the following definition:

- A new case of UTI is a patient from whom an organism has been isolated from the patient's urine, and who has not previously had the same organism isolated from urine within a 30-day period (i.e. 30 days from date last positive sample obtained).

- Please note that the UTI case definition used for this report is based on bacteriuria (bacteria present in urine) and not all cases will be clinically significant UTIs.
- As part of the NHS Pharmacy First Scotland service, community pharmacist have the ability to prescribe trimethoprim or nitrofurantoin for uncomplicated UTIs in females aged 16-65. This service has been available in all community pharmacies since August 2020 and is likely to have had an impact on the number of urine samples being referred to laboratories as females with uncomplicated UTIs are treated by pharmacists as opposed to attending their GP's.

% Non-susceptible= non-susceptible (resistant or intermediate) isolates divided by the total number of isolates tested *100.

Carbapenemase-producing organisms: Carbapenems are broad spectrum antibiotics that are generally used in hospitals for the treatment of suspected or confirmed multidrug resistant Gram-negative infections. They are often one of the few antibiotics left for treatment of these resistant infections. Important healthcare associated infection -related Gram-negative organisms are; Enterobacterales, (comprising amongst others *Escherichia coli, Klebsiella oxytoca*, and *Klebsiella pneumoniae*), and non-fermenters, (comprising amongst others *Pseudomonas aeruginosa*, and *Acinetobacter species*).

The emergence and spread of Gram-negative organisms which have acquired the ability to produce carbapenemase enzymes that inactivate carbapenem antibiotics, known as carbapenemase-producing organisms (CPOs), is increasingly concerning. CPOs have been reported globally with increased intercontinental travel and exposure to healthcare abroad contributing to their spread.

The genes that code for carbapenemase enzymes spread between and within bacterial species via plasmids or transposons, and are commonly associated with other resistance determinants; this means that bacteria resistant to carbapenems are invariably resistant to most other broad spectrum antibiotics, leaving little in the way of treatment options.

Although the overall occurrence of carbapenem resistance in bacteraemia and UTIs is estimated to be low in Scotland but has been increasing over recent years. A national enhanced surveillance program for carbapenem

resistance, with a focus on Gram-negative bacteria expressing acquired carbapenemases, was setup to improve understanding of the current situation across Scotland.

Probable case - A case is any person in Scotland with Gram-negative bacteria isolated from a clinical or screening specimen, where resistance is suspected to be caused by the expression of an acquired carbapenemase.

Confirmed case- A case is any person in Scotland with Gram-negative bacteria isolated from a clinical or screening specimen, where resistance is suspected to be caused by the expression of an acquired carbapenemase and with a reference laboratory confirmation of a CPO.

Carbapenemase-producing Enterobacterales (CPE) clinical risk assessment (CRA) screening uptake - The national policy for CPE screening on admission to hospital states all acute admissions must undergo a clinical risk assessment followed by a swab screen to test for CPE. In April 2018, the MRSA screening uptake monitoring tool was extended to include CPE. CPE CRA-based screening compliance continues to be audited within each Board. Screening compliance data are monitored by ARHAI Scotland and feedback is provided to boards on a quarterly basis.

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: Safer sharp device - A medical sharp device which has been designed to incorporate a feature or mechanism that minimises and/or prevents the risk of accidental injury. Other terms include (but are not limited to) safety devices, safety-engineered devices and safer needle devices.

Sharps Injuries - An injury caused by a sharp instrument or object such as a needle or scalpel, cutting or puncturing the skin. Other terms include percutaneous injury.

Significant Occupational Exposure - A percutaneous, mucocutaneous exposure or non-intact skin (abrasions, cuts, eczema) exposure to blood/ other body fluids from a source that is known (or later found to be) positive for a bloodborne virus infection.

Healthcare outbreaks and incidents: Healthcare infection incidents reported to NSS.

Healthcare associated infection incidents are defined within chapter 3 of the National Infection Prevention and Control Manual as:

- **An exceptional infection episode:** A single case of any serious illness which has major implications for others (patients, staff and/or visitors), the organisation or wider public health e.g. infectious diseases of high consequence such as Viral Hemorrhagic Fever (VHF) or Extremely Drug Resistant-Tuberculosis (XDR-TB).
- **A healthcare associated infection outbreak:** Two or more linked cases with the same infectious agent associated with the same healthcare setting over a specified time period; or
- A higher than expected number of cases of HCAI in a given healthcare area over a specified time period.
- **A healthcare infection exposure incident:** Exposure of patients, staff, public to a possible infectious agent as a result of a healthcare system failure or a near miss e.g. ventilation, water or decontamination incidents.
- A healthcare infection data exceedance: A greater than expected rate of infection compared with the usual background rate for that healthcare location

http://www.nipcm.scot.nhs.uk/chapter-3-healthcare-infection-incidents-outbreaks-and-data-exceedance/

Norovirus outbreaks: Outbreaks of norovirus are defined as two or more linked cases associated with the same healthcare setting over a specified time period.

National Infection Prevention and Control: N/A

Relevance and key uses of the statistics

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: Figures provided are used for management information for resource planning, surveillance and research in NHS Scotland.

Hospital onset COVID-19: Details provided in weekly publication https://www.publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/

Gram-negative bacteraemia: The outputs of the surveillance programme are intended to support the NHS boards in controlling and reducing the burden of Gram-negative bacteraemia.

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Urinary tract infections: The outputs of the surveillance programme are intended to support the NHS boards in controlling and reducing the burden of *E. coli* urinary tract infections.

Carbapenemase-producing organisms: Output from the surveillance system is intended to support units in reducing and preventing CPOs. The data are intended to be used locally for improvement and the data are also used nationally to measure trends at this level and to benchmark against other European countries.

CPE clinical risk assessment based screening continues to be monitored by ARHAI Scotland and feedback is provided to boards on a quarterly basis.

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: The data will facilitate compliance with health and safety legislation and reduce BBV infection risk events and infections occurring as a consequence of healthcare interventions through i) monitoring the incidence of occupational exposures, among healthcare workers (HCWs) and changes over time ii) monitoring exposure outcomes and an assessment of the impact of interventions such as post exposure prophylaxis (Human Immunodeficiency Virus (HIV) and Hepatitis B Virus (HBV)) or disease treatment (Hepatitis C Virus (HCV)) iii) monitoring the circumstances surrounding occupational exposures, including the use of safer sharps devices iv) evaluating the impact of safer sharps devices on sharps injuries and v) informing local and national prevention strategies to reduce the number of sharps injuries sustained, and thus reduce the risk of contracting a BBV occupationally.

Healthcare outbreaks and incidents: To identify risks or trends in the organisms, types of infection, procedures, patients, or medical specialities associated with healthcare infection incidents to inform the production of guidance, tools or policy to assist in preparing for, preventing, detecting and managing healthcare infection incidents.

Norovirus outbreaks: Norovirus outbreak data are used to provide more robust data on norovirus outbreaks thus assisting preparedness for future seasons.

National Infection Prevention and Control: N/A

Key to NHS boards

AA = Ayrshire & Arran

BR = Borders

DG = Dumfries & Galloway

FF = Fife

FV = Forth Valley

GGC = Greater Glasgow & Clyde

GJ = Golden Jubilee

GR = Grampian

HG = Highland

LN = Lanarkshire

LO = Lothian

OR = Orkney

SH = Shetland

TY = Tayside

WI = Western Isles

Accuracy

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: Details available as per each data source.

Hospital onset COVID-19: Details provided in weekly publication https://www.publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/

Gram-negative bacteraemia: Gram-negative bacteraemia data are the product of the Electronic Communication of Surveillance in Scotland (ECOSS). Participating laboratories routinely report all identifications of organisms, infection or microbiological intoxication and where possible the antimicrobial resistance data unless they are known to be of no clinical or public health importance. The collected data are used for the identification of single cases of severe disease, outbreaks, antimicrobial resistance patterns and longer term trends in the incidence of laboratory reported infections, enhanced surveillance, health protection, analytical and statistical use.

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Urinary tract infections: Gram-negative urinary isolate data are the product of the Electronic Communication of Surveillance in Scotland (ECOSS). Participating laboratories routinely report all identifications of organisms, infection or microbiological intoxication and where possible the antimicrobial resistance data unless they are known to be of no clinical or public health importance. The collected data are used for; the identification of single cases of severe disease, outbreaks, antimicrobial resistance patterns and longer term trends in the incidence of laboratory reported infections, enhanced surveillance, health protection, analytical and statistical use.

Carbapenemase-producing organisms: CPO isolates are derived from a range of screening and clinical specimens including urine, respiratory and blood isolates submitted to the Scottish AMR Satellite lab (SMiRL, Glasgow).

In April 2018, the MRSA screening uptake monitoring tool was extended to include CPE. CPE CRA based-screening compliance continues to be audited within each Board. Screening compliance data are monitored by ARHAI Scotland and feedback is provided to boards on a quarterly basis.

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: Validation of collated data includes assessing data completeness and quality. Sense check of expected codes, frequencies and patterns in the data, with resolution of any queries/data irregularities with the data originators.

Healthcare outbreaks and incidents: NSS are aware that the healthcare infection incident assessment tool (HIIAT) is subjective and that there is variation in how NHSScotland boards assess and therefore report healthcare infection incidents.

Norovirus outbreaks: Data are quality checked when it first comes in for accuracy and NHS boards are contacted if there are any data issues. The data are then added onto a spreadsheet holding all the 2019-2020 figures. The data on this spreadsheet is checked again before being added to the Tableau file and any issues resolved.

National Infection Prevention and Control: N/A

Completeness

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: Details available as per each data source.

Hospital onset COVID-19: Details provided in weekly publication https://www.publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/

Gram-negative bacteraemia: Susceptibility data in this report were derived from bacteraemia isolates from cases from the diagnostic laboratories in each NHS board. VITEK 2 systems were used to determine the susceptibilities for the majority of isolates. Other methods (such as agar dilution and Etest®) may have been used for testing of some isolates/agents. Selective reporting may also have occurred, where laboratories have chosen only to test and/or report susceptibility results against certain agents for clinical reasons.

All data for the reporting period have been included in the analysis.

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Urinary tract infection: Susceptibility data in this report were derived from urinary isolates samples from cases from the diagnostic laboratories in each NHS board. VITEK 2 systems were used to determine the susceptibilities for the majority of isolates. Other methods (such as agar dilution and Etest®) may have been used for testing of some isolates/agents. Selective reporting may also have occurred, where laboratories have chosen only to test and/or report susceptibility results against certain agents for clinical reasons.

Selective reporting potentially weakens comparisons of data between different laboratories and could also underestimate the occurrence of multidrug resistance.

Carbapenemase-producing organisms: CPO isolates are derived from a range of screening and clinical specimens including urine, respiratory and blood isolates. All potential CPOs isolated by Scottish diagnostic laboratories are referred the Scottish AMR Satellite Reference service for confirmation.

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: Note, sharps incidents and occupational exposures are self-reported, thus open to bias. Sharps device data consists of products distributed throughout Scotland via the National Distribution Centre and is thought to represent the vast majority of products purchased.

Healthcare outbreaks and incidents: NSS are aware that the healthcare infection incident assessment tool (HIIAT) is subjective and that there is variation in how NHSScotland boards assess and therefore report healthcare infection incidents. The extent of variation in assessment and unreported incidents has not been fully quantified.

Norovirus outbreaks: NHS Boards only send in data when their ward has reopened so data are included in a retrospective way.

National Infection Prevention and Control: N/A

Comparability

Changes in the hospital population and activity during 2020 may have affected the comparison of results and therefore should be interpreted with caution.

How has the pandemic impacted on the epidemiology and risk of HCAI in Scotland during 2020?: N/A

Hospital onset COVID-19: Details provided in weekly publication https://www.publichealthscotland.scot/publications/hospital-onset-covid-19-cases-in-scotland/

Gram-negative bacteraemia: Public Health England report on national data on antibiotic resistance https://www.gov.uk/government/publications/english-surveillance-programme-antimicrobial-utilisation-and-resistance-espaur-report

European Centre for Disease Prevention and Control (ECDC) report on Antimicrobial resistance surveillance in Europe https://www.ecdc.europa.eu/en/antimicrobial-resistance/surveillance-and-disease-data/report

Escherichia coli bacteraemia: Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Urinary tract infections: Public Health England report on national data on antibiotic resistance https://www.gov.uk/government/publications/english-surveillance-programme-antimicrobial-utilisation-and-resistance-espaur-report.

Carbapenemase-producing organisms: Public Health England report on Carbapenem resistance https://www.gov.uk/government/collections/carbapenem-resistance-guidance-data-and-analysis

ECDC report on Carbapenem resistance https://ecdc.europa.eu/en/surveillance-atlas-infectious-diseases

***Clostridioides difficile* infection:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

***Staphylococcus aureus* bacteraemia:** Details provided in quarterly publication https://www.hps.scot.nhs.uk/data/healthcare-associated-infection-quarterly-epidemiological-commentary/

Prevention of healthcare associated bloodborne viruses: The data collected on sharps incidents and occupational exposures is comparable with that elsewhere in the UK (https://www.gov.uk/government/publications/bloodborne-viruses-eye-of-the-needle)

Healthcare outbreaks and incidents: N/A, reporting of all HCAI outbreaks is not mandatory elsewhere in the UK and comparable data are not published.

Norovirus outbreaks: Public Health England produce a national norovirus surveillance report, however, reporting is voluntary and not comparable to Scottish data collected through mandatory reporting https://www.gov.uk/government/collections/norovirus-guidance-data-and-analysis

National Infection Prevention and Control: N/A

Accessibility

It is the policy of NSS to make its web sites and products accessible according to published guidelines.

Coherence and clarity

Tables and charts are accessible via the website https://www.hps.scot.nhs.uk/

Development of guidance: All National Infection Prevention and Control Manual (NIPCM) reviews and resources are produced using a defined process which ensures clarity and coherence. http://www.nipcm.scot.nhs.uk/resources/literature-reviews/development-process/

Value type and unit of measurement

Count and proportion of COVID-19 cases by hospital onset status. Count and proportion of hospital onset COVID-19 cases with all-cause mortality at 28 days.

Number of cases and incidence rates (per 100,000 population) for Gram-negative bacteraemia. Antimicrobial resistance (AMR) data includes percentage non-susceptible for antibiotics/organism combinations.

Number of cases and incidence rates (per 1,000 population) for E. coli urinary tract infections.

Number of isolates, number of Carbapenemase-producers by organism and enzymes and incidence per 100,000 population.

CPE CRA Uptake % = no.patients/records where CRA was applied/all patients/records in audit sample.

Healthcare associated cases and incidence rates (per 100,000 total occupied bed days) for *Clostridioides difficile* infection, *Escherichia coli* bacteraemia & *Staphylococcus aureus* bacteraemia.

Community associated cases and incidence rates (per 100,000 population) for *Clostridioides difficile* infection, *Escherichia coli* bacteraemia & *Staphylococcus aureus* bacteraemia.

Number and rate (per 100 Whole Time Equivalent (WTE)) of sharps related injuries per 100 WTE; number of significant occupation exposure. Volume (millions) sharps devices purchased.

Total number of reported incidents is counted, often reported as a proportion of the total by infection type or organism.

Number of patients affected and number of wards/bays closed.

Disclosure

The NSS protocol on Statistical Disclosure Protocol is followed.

Official Statistics designation

Not Assessed

UK Statistics Authority Assessment

Not Assessed

Last published

22 September 2020

Next published

September 2022

Date of first publication

25 May 2015

Help email

nss.hpshaiic@nhs.scot

Date form completed

21 September 2021

Appendix 2 – Early Access Details

Pre-Release Access

Under terms of the 'Pre-Release Access to Official Statistics (Scotland) Order 2008', NSS is obliged to publish information on those receiving Pre-Release Access ('Pre-Release Access' refers to statistics in their final form prior to publication). The standard maximum Pre-Release Access is five working days. Shown below are details of those receiving standard Pre-Release Access.

Standard Pre-Release Access

Scottish Government Health Department

NHS Board Chief Executives

NHS Board Communication leads

Appendix 3 – NSS and Official Statistics

Official Statistics

Our statistics comply with the Code of Practice for Statistics in terms of trustworthiness, high quality and public value. This also means that we keep data secure at all stages, through collection, processing, analysis and output production, and adhere to the 'five safes'.