Scottish National Point Prevalence Survey of Healthcare Associated Infection and Antimicrobial Prescribing 2016

Frequently Asked Questions

May 2017 Version 1.0

1 Overview

1.1 What is a Healthcare Associated Infection (HAI)?

Healthcare associated infections (HAI) can develop either as a direct result of healthcare interventions such as medical or surgical treatment, or from being in contact with a healthcare setting. In this survey, a HAI was defined as any infection that occurs two days or more after admission to hospital or present on admission originating in another hospital or is associated with a device or surgical procedure.   A prevalent HAI is one where the patient has symptoms of a HAI or is being treated for a HAI on the day of the survey.

1.2 What is antimicrobial resistance and why is it important?

Bacteria can gain antimicrobial resistance (AMR) meaning that they are no longer killed by antimicrobials. Bacteria may be sensitive to all antimicrobials (i.e. not AMR), resistant to just one antimicrobial or antimicrobial class, they may be multi-drug resistant meaning that they are resistant to multiple antimicrobials, or pan-drug resistant if resistant to all drug classes. AMR is important when trying to treat patients effectively. If trying to treat a patient with an antimicrobial that the infecting bacteria is resistant to, then the treatment will fail. Antimicrobial stewardship and prudent use of antimicrobials will reduce/prevent the spread of

Scottish National Point Prevalence Survey of Healthcare Associated Infection and Antimicrobial Prescribing 2016
Frequently Asked Questions
May 2017

1

AMR and conserve the utility of antimicrobials.

1.3 What is a prevalence survey?

A prevalence survey is a count of the number of patients with HAI or receiving antimicrobials at a particular time as a proportion of the total number of patients who were being treated in hospital. This survey gives a snapshot picture of the number of patients with HAI or receiving antimicrobials in Scottish hospitals. The report contains information on the prevalence of HAI and antimicrobial prescribing for individual hospitals at the time of survey only, and not for all times.

1.4 Why was this survey undertaken?

It is important to know the prevalence of HAI and antimicrobial prescribing in Scottish hospitals to allow the government and local hospitals to plan effective ways to reduce HAI and prescribing. With this information both national and local infection control plans can be targeted most effectively.

1.5 Who undertook the survey?

Health Protection Scotland (HPS) undertook the survey on behalf of the Scottish Government. HPS trained local staff to collect data. Local data collection teams included infection prevention and control (IPC) staff, antimicrobial pharmacists, clinicians and other health professionals. Within each health board, a named contact person acted as coordinator for the local data collection team and sent data collection forms to HPS for data entry, quality assurance and analysis. HPS is indebted to the local data collection teams as well as staff in participating hospitals. Their contribution is gratefully acknowledged.

1.6 When was the survey undertaken?

Hospitals were surveyed in September, October and November 2016.

1.7 Where was the survey undertaken?

The survey was undertaken in every NHS board in Scotland including all Scottish acute hospitals (37 hospitals), all paediatric hospitals (3), a 25% sample of Scottish non- acute hospitals (24 hospitals) and independent hospitals (6).

Acute hospitals were defined using Information Services Division (ISD) classification of Scottish hospitals. All wards with the exception of day units and residential care units within acute hospitals were included.

1.8 Which patients were surveyed?

The data collectors visited all inpatient beds in the surveyed hospitals. Day patients who did not stay overnight were not included in the survey. All patients who were admitted to the ward at 8am on the morning of the survey with the exception of day patients were eligible for inclusion in the survey. Patients admitted to or transferred into the ward after 8am were excluded. Patients who left the ward before they were surveyed were not followed up and were, therefore, excluded from the survey.

1.9 What were the objectives of the survey?

The aim of the survey was to measure HAI and antimicrobial prescribing prevalence in Scottish NHS acute, non-acute, paediatric and independent hospitals.

The objectives of the prevalence survey were to:

1. Measure the specific types and overall prevalence of HAI
2. Measure the overall prevalence of antimicrobial prescribing and types of antimicrobial prescribed as well as compliance with Scottish Antimicrobial Prescribing Group (SAPG) prescribing quality indicators
3. Describe the organisation of infection, prevention and control and antimicrobial stewardship programmes
4. Identify priority areas for future interventions to prevent and control HAI, and for antimicrobial stewardship quality improvement strategies
5. Contribute to the European Centre for Disease Prevention and Control (ECDC) prevalence survey and inform the European strategy to reduce HAI and antimicrobial resistance

1.10 Were these objectives met?

Yes, the report contains detailed discussion on each of these topics. The scientific objectives (1-4) are addressed in this report. The remaining objective has been met and the results from the Scottish survey will now inform the European strategy.

1.11 What does the report tell us?

The final report describes the patient population in terms of age, sex, co-morbidity status and invasive device (such as catheters) prevalence. It gives an estimate on how many patients in Scottish hospitals have a HAI on any one day in Scotland, what type of HAI those patients have and what specialty they are being treated in. It also reports the prevalence of antimicrobial prescribing; describes which antimicrobials are being prescribed and for which diagnoses and indications; and describes prescribing quality indicators. Hospital IPC and antimicrobial stewardship indicators are also described.

1.12 What does the report not tell us?

The report does not provide details of how a patient acquired their HAI and does not report on the cleanliness of the hospitals.

2 Methodology of Survey

2.1 How many patients were included in the survey?

The survey included 12,710 inpatients (93.8% of eligible patients) in 70 hospitals.

2.2 How is prevalence calculated?

HAI prevalence was calculated by dividing the total number of inpatients diagnosed with a HAI by the total number of inpatients. Antimicrobial prescribing prevalence was calculated by dividing the total number of inpatients receiving antimicrobials by the total number of inpatients.

2.3 What definitions of HAI were used?

The European Centre for Disease Control and Prevention (ECDC) has defined specific types of infection for use in surveillance. These definitions are internationally recognised as standard definitions for HAI types and these were used in this survey.

2.4 What types of HAI were included in the survey?

This survey included every type of HAI defined by ECDC. Therefore, the full range of HAI types found in hospital inpatients which met the survey definitions were examined. HAI were grouped into 15 broad categories by ECDC based on the main

physiological systems and surgical interventions.

These included:

- Bone/joint infection
- Cardiovascular system infection
- Central nervous system infection
- CVC/PVC related infection
- Eye, ear, nose, throat and mouth infection
- Gastrointestinal tract infection
- Laboratory-confirmed BSI
- Lower respiratory tract infection, other than pneumonia
- Pneumonia
- Reproductive tract infection
- Skin and soft tissue
- Surgical site infection
- Systemic infection
- Urinary tract infection
- Neonatal infection

2.5 How was the study designed?

The ECDC protocol for PPS studies in Europe was used and adapted for use in Scotland. HPS added further detail and data fields to this protocol to ensure maximum usability in Scotland. The protocol used in 2016 was the same as that was used in the 2011 survey, with the exception of minor changes to two case definitions, allowing comparisons between the surveys to be made.

2.6 How were the data collected?

A team of data collectors were trained to identify HAI in inpatients based on signs and symptoms recorded in the patient notes and discussion with clinical teams on the ward. The information was recorded on data collection forms designed for the survey. Specific case definitions for HAI were used. Other information on prescribed antimicrobials, devices and patient characteristics was also recorded. All data collectors were trained by HPS, using the ECDC accredited course, prior to collecting the data.

After a short introduction to ward staff, data collectors reviewed information relating to each eligible inpatient. Information was extracted from case notes, prescription charts, nursing notes, temperature charts and if anything was unclear from the notes, data collectors clarified with a member of staff. Data collection forms were sent to HPS where they were scanned and verified and the data were then validated and analysed.

Prior to the data collection period, HPS carried out a Privacy Impact Assessment (PIA) and the project was reviewed and approved by the Public Benefit and Privacy Panel for Health and Social Care (PBPP). Data were anonymised before being sent to HPS by the health board contacts. Patient information was protected according to the Data Protection Act.

2.7 What is the difference between number of infections and number of patients with HAI?

Some patients were found to have more than one HAI. Prevalence was calculated using the number of inpatients with infections compared to the total number of inpatients included in the survey. In some instances within the report the total number of infections is reported, this number is always greater than the total number of patients who have HAI. It is important to consider the total number of infections because this gives a clearer picture of what types of HAI patients have.

2.8 What is the difference between colonisation and infection and what implications did this have for the survey?

A patient may have an organism living on or in their body without any clinical signs or symptoms of disease. These patients are colonised with the organism. An example of this is the presence of MRSA in a patient's nasal passage which is detected by screening. An infection occurs when the organism enters the body and causes disease through, for example, a wound in the skin.

The survey collected information on patients that showed clinical signs and symptoms of infection (i.e. those that were symptomatic) and not those that were colonised with an organism (i.e. those that were asymptomatic).

2.9 What is the difference between acute and non-acute hospitals?

Acute hospitals are hospitals that provide a wide range of specialist care and treatment for patients. They include consultation with specialist clinicians, emergency treatment following accidents, routine, complex and life saving surgery, specialist diagnostic procedures and close observation and short-term care of patients with health symptoms of concern.

Non-acute hospitals are hospitals which offer long term care for psychiatric, elderly or community patients. The majority of their inpatients are cared for within the specialties of care of the elderly and psychiatry.

2.10 What does the burden mean?

In this report, the burden of HAI is defined as the total number of patients with HAI on any one day. The hospital level prevalence figures included in the report estimate the burden of HAI in that hospital irrespective of what hospital the HAI originated in. This means that some HAI included at hospital level may have originated in a different hospital, or even a different board. This highlights the burden that HAI is placing on the healthcare system as a whole.

3 Results

3.1 What is the overall prevalence of HAI and antimicrobial prescribing in Scottish hospitals?

The overall prevalence of HAI in acute hospitals (including paediatric and independent hospitals) was 4.5%. Non-acute hospitals had an overall HAI prevalence of 2.3%. The prevalence in acute adult inpatients (including independent hospital inpatients) was 4.6%, and in paediatric patients was 2.7% (although when healthy newborn babies were excluded, the prevalence was 3.4%). The prevalence in included non-acute inpatients was 3.2% but when this figure was weighted to account for the underrepresentation of psychiatric hospitals in the 25% sample, the prevalence across all non-acute hospitals was 2.3%.

More than a third of patients in acute care hospitals were receiving at least one antimicrobial at the time of survey (35.3%). The highest prevalence was reported in acute adult inpatients (35.7%) although one in three paediatric patients were also receiving antimicrobials at the time of survey (29.3%). The lowest prevalence was

reported in the non-acute patient group (13.8%), and the weighted antimicrobial prevalence in 2016 in the non-acute sample was 12.9%. This weighted prevalence accounts for the sampling strategy where psychiatric patients were under-represented and estimates the true population antimicrobial prevalence in the whole Scottish non-acute hospital population.

3.2 Does a prevalence of 4.5% mean that if I go in to hospital I have a one in twenty-two chance of getting a HAI?

No. This means that at any time one in twenty-two inpatients in hospital will have a HAI. A prevalence survey counts the number of patients with HAI at any point in time. People with HAI tend to stay in hospital longer and those patients who stay in hospital for longer periods of treatment tend to be more seriously ill and therefore more at risk of developing HAI. The large majority of patients are successfully treated in hospital and go home without acquiring a HAI.

3.3 Can you tell me what my chance is of contracting HAI during my hospital stay?

No. This is not shown by the current prevalence survey. In order to calculate how likely a person is to get a HAI an incidence study would be required. This would look at all patients who were treated within the hospital on a regular basis over a defined time period.

3.4 What are the most common types of infections?

Acute hospitals (including independent inpatients):

The most common HAI reported in the 2016 survey were (urinary tract infections) UTI (24.5%) and approximately half of the UTI developed in patients who had been catheterised. Pneumonia remains a large proportion of all HAI, accounting for almost a quarter of all HAI (22.4%). The majority of these pneumonia were not ventilator associated (72.0%). Surgical site infections (SSI) also continue to represent a large burden accounting for one in six HAI (16.5%). The most common surgeries resulting in SSI were colorectal procedures. Bloodstream infections accounted for one in eleven HAI and a quarter of these were associated with a vascular catheter.

Paediatric hospitals:

Clinical sepsis and bloodstream infections and were the most prevalent types of HAI

accounting for two thirds of all HAI.

Non acute hospitals:

More than half of all HAI in non-acute patients were UTI (58.8%) and half of these occurred in patients who had been catheterised.

3.5 What are the most serious types of infection?

HAI is a term for a group of conditions. Some can be treated easily and while they can be unpleasant they do not have a lasting impact on a patient's health. Some of these infections, if they remain untreated can progress to more serious conditions. Other types of HAI initially have a very serious effect on a patient's health, increasing their hospital stay, requiring further surgery, prolonged treatment with antibiotics and considerable distress to the patient e.g. surgical site infections.

3.6 Why do some hospitals have higher prevalence than others?

Some hospitals will have a higher prevalence of HAI due to a number of factors including patient age, case severity and specialty mix, reflecting differing patient vulnerability to infection. Unadjusted hospital prevalence should not be compared as the hospital in question may have an extraordinary number of high risk patients within its care. The funnel plots in the report present adjusted prevalence estimates which were adjusted to account for differences in patient case mix. Estimates of prevalence for a hospital are at the time the survey was carried out and not for all times. The precision of prevalence estimates is determined by sample size. The precision of the estimate for smaller hospitals will be less.

4 Discussion

4.1 Is there any evidence to show that HAI or antimicrobial prescribing is rising or falling?

This is the third PPS of HAI and antimicrobial prescribing in Scotland. The findings indicate a significantly lower prevalence of HAI in acute adult inpatients compared to the 2011 PPS, however a substantial burden remains, with one in 22 patients (4.6%) at any one time with a HAI. This is equivalent to one patient on every ward, every day, in every acute hospital in Scotland, with an infection associated with the care they have received. The prevalence of HAI in paediatric inpatients was not significantly

different between 2011 and 2016 and the prevalence in non-acute patients in 2016 was not compared with 2011 as the sampling strategies differed between the two surveys.

The report also points to a large burden of antimicrobials being used in acute care and the risk of antimicrobial resistance (AMR) therein. More than a third of patients at any one time were on one or more antimicrobials and this was significantly higher than 5 years ago. The prevalence of antimicrobial prescribing in paediatric inpatients was not significantly different between 2011 and 2016 and the prevalence in non-acute patients in 2016 was not compared with 2011 as the sampling strategies differed between the two surveys.

When reviewing prevalence over time it is important to consider a number of factors before making any comparisons.

- The complexity of high-risk procedures increases with time
- The underlying health of the population is not constant
- The specialty mix will alter over time
- New therapies will increase the life expectancy of very ill patients who are more susceptible to infection
- The age of patients is increasing with time since people are living for longer
- Many procedures that were undertaken in hospital are now day procedures and therefore the hospital population is undergoing more complex procedures.

4.2 Can the results be directly compared to the rest of Europe and the UK?

Comparisons of the results of prevalence surveys undertaken in different locations or in the same location at different times are difficult. In the published literature, case definitions vary. Additionally, the prevalence of HAI is dependent on a number of factors that reflect differing patient vulnerability to infection and differences in admission policies and inpatient management policies and practices at the time of the survey. The Length of Stay (LOS) of hospital inpatients will also affect the likelihood of diagnosing HAI and/or the risk of HAI in inpatients.

Comparison of the results of the large number of prevalence surveys that have been published is therefore difficult. These studies have been undertaken in different countries, at different times, using different case definitions and data collection methods. Often important details of the methods used are unavailable. Personnel collecting the data can vary between surveys and it is often not clear how well data collectors have been trained. In addition, age and sex distribution, length of stay, case mix and underlying health of the population vary greatly across Europe. This limits the comparability of results from different surveys.

4.3 How do the results compare to the last prevalence survey?

The patients included in the 2016 survey of acute hospitals were older and sicker compared with the 2011 survey.

In acute adult patients (including independent hospitals), the overall prevalence was significantly lower compared with the 2011 survey (4.6% versus 5.0%) and this comparison accounted for differences in the patient case mix between the two surveys.

The overall prevalence of HAI in paediatric patients was not significantly different between the 2016 and 2011 surveys (2.7% versus 3.1%). Due to the small number of HAI cases in this patient group, differences in the patient case mix could not be controlled for in this comparison therefore the results should be interpreted with caution.

The prevalence of HAI in non-acute inpatients was not compared with that reported in 2011 as changes to the sampling strategy resulted in patient populations that were not comparable.

In acute adult patients (including independent hospitals), the prevalence of antimicrobial prescribing defined as the percentage of patients receiving at least one antimicrobial, was significantly higher in 2016 compared with 2011 (35.7% versus 33.2%) and this comparison accounted for differences in the patient case mix between the two surveys.

In paediatric patients, the prevalence of antimicrobial prescribing was not significantly different in 2016 compared with 2011 (29.3% versus 25.3%). This comparison did not

account for differences in the patient case mix between the two surveys due to small numbers.

The prevalence of antimicrobial prescribing in 2016 was not compared with that reported in 2011 as changes to the sampling strategy resulted in patient populations that were not comparable.

After controlling for difference in the case mix between the 2016 and 2011 surveys, the prevalence of broad spectrum antimicrobials associated with an increased risk of *Clostridium difficile* (*C. difficile*) infection was significantly higher in acute adult patients compared with the prevalence in 2011 (10.3% versus 9.4%). There was no difference in the prevalence of prescribing in paediatric patients between 2016 and 2011 (8.8% versus 9.1%), though differences in case mix were not controlled for due to small numbers.

The prevalence between 2016 and 2011 of very broad spectrum antimicrobials was not significantly different in acute adult (0.9% versus 1.1%) or paediatric patients (1.4% versus 1.2%).

In acute adult patients, the reason for prescribing was recorded in the notes at the time of prescribing for 94.8% of the antimicrobials prescribed for treatment of infection in 2016 and this was significantly higher than was reported in 2011 (89.0%). Compliance with local prescribing policy in acute adult inpatients was significantly higher in 2016 compared with 2011 (87.2% versus 82.5%).

4.4 How do the results compare to recent studies in the UK and Europe?

A PPS was undertaken in England at the same time as the Scottish survey and the findings will be published later this year. Northern Ireland and Wales are undertaking PPS between May, June and July 2017. The results from the Europe-wide survey will be published by ECDC in November 2018 following completion of the final wave of data collection in 2017.

4.5 What does the survey tell us about organisms which cause infection (e.g. MRSA, *C. difficile* and *Enterobacteriaceae*)?

Not every HAI identified in the survey had microbiology results available. Often the results from samples sent to microbiology were not available at the time of survey.

The percentages of organisms reported are therefore based on a subset of infections where the microbiology test results were available. This survey did not collect any information on the prevalence of microorganisms colonising patients who did not have a HAI.

Microbiology data indicated that, in acute care, the most commonly reported organisms in this survey were *Escherichia coli* (*E. coli*) (22.7%, n=64); accounting for nearly a quarter of all microbiology reports. Two-fifths of all reports were Gram negative bacilli (40.4%, n=114) and more than a third were from the Enterobacteriaceae family (36.9%, n=104). One in five microbiology reports were of *Staphylococcus aureus* (*S. aureus*) (20.2%, n=57). A total of 288 HAI met the case definition without there being positive microbiology at the time of survey (42.8%).

Further notes on emerging organisms causing HAI:
Enterobacteriaceae are a family of bacteria which includes *E. coli*, *Klebsiella* spp., *Enterobacter* spp. and other Gram negative organisms. They are widely dispersed in the environment and are often found in the gut of humans and animals. They can cause a range of infections in humans such as urinary tract infections and blood stream infections.
E. coli is an organism that colonises the gut of both humans and animals. It is a common cause of urinary tract infections but can also cause more serious conditions such as bloodstream infections.

4.6 Where does the work go from here?
The findings of this survey identify priority areas for IPC and antimicrobial stewardship quality improvement. These will be considered by the Scottish AMR and HAI (SARHAI) Strategy Group in order to inform future policy priorities using intelligence on the current epidemiology of HAI, antimicrobial prescribing and IPC indicators.

5 HAI Prevention

5.1 What is currently being done in Scotland to reduce HAI and antimicrobial resistance?

In 2016, the Scottish Government published its 5 Year Strategic Framework (2016-2021) to monitor and prevent HAI and tackle antimicrobial resistance. The Strategic Framework was commissioned by the Scottish Antimicrobial and Healthcare Associated Infection (SARHAI) Strategy Group and focuses on the safety of patients, the public and healthcare staff, both in community and healthcare settings. By 2021, vision for the Strategic Framework, is:

- To prevent avoidable HAI

- To stop spread

- To contain antimicrobial resistance

The Strategic Framework is detailed here:

http://www.gov.scot/Topics/Health/Services/Preventing-Healthcare-Infections/SARHAI5YrStrategicFramework

In 2017, HPS published an updated edition of the National Infection Prevention and Control Manual. The manual aims to:

- Make it easy for care staff to apply effective IPC practices

- Reduce variation and optimise IPC practices throughout Scotland

- Help reduce the risk of HAI

- Help align practice, monitoring, quality improvement and scrutiny.

The National manual is detailed here: http://www.nipcm.hps.scot.nhs.uk/

Guidance and care bundles to reduce the risk of HAI continue to be developed, updated and implemented. The HAI Compendium provides NHSScotland staff with links to all current HAI guidance, as well as the key messages from the guidance and all the associated supporting materials e.g. checklists, care bundles, patient information leaflets and training scenarios. The Compendium can be found here:

http://www.hps.scot.nhs.uk/haiic/ic/resourcedetail.aspx?id=653

In 2013, the 'UK Five Year Antimicrobial Resistance Strategy, 2013 to 2018' was published which is being implemented in Scotland through a number of actions. The

Scottish National Point Prevalence Survey of Healthcare Associated Infection and Antimicrobial Prescribing 2016
Frequently Asked Questions
May 2017

14

Antimicrobial Resistance Strategy is detailed here:
https://www.gov.uk/government/publications/uk-5-year-antimicrobial-resistance-strategy-2013-to-2018

The Scottish Antimicrobial Prescribing Group (SAPG) works closely with health boards to promote safe and effective prescribing practices and antimicrobial stewardship. SAPG is also implementing the Scottish Antimicrobial Resistance Action Plan (ScotMARAP) programme. More on SAPG activities and access to 'good practice' documents is detailed here: https://www.scottishmedicines.org.uk/SAPG

5.2 What other surveillance programmes are undertaken in Scotland?

The following mandatory incidence surveillance programmes are currently in place in Scotland:
- Surgical site infection (caesarean section, hip arthroplasty, vascular and large bowel surgeries)
- *Clostridium difficile* infection
- *Staphylococcus aureus* bacteraemia
- *Escherichia coli* bacteraemia
- HAI in Intensive Care Units

5.3 How will the results of this survey be used to reduce HAI?

The results of the PPS should be considered by the Scottish AMR and HAI Strategy Group (SARHAI) in order to inform future policy priorities using intelligence on the current epidemiology of HAI, antimicrobial prescribing and IPC indicators. Hospital prevalence results will allow local IPC teams to develop local policies on HAI reduction. It also allows local Antimicrobial pharmacy teams (AMTs) to target antimicrobial quality improvement and focus on stewardship.

5.4 What can I do as a visitor to prevent HAI?

If you are visiting a member of the family or a friend either in hospital or another place of care such as a care home, there are a number of things you can do to help prevent the spread of any infection, including winter vomiting disease (norovirus) and MRSA. Some infections such as norovirus may be brought in from the community

Scottish National Point Prevalence Survey of Healthcare Associated Infection and Antimicrobial Prescribing 2016
Frequently Asked Questions
May 2017

15

and can spread rapidly between patients and staff. Remember - hospitals, healthcare facilities and care homes have many vulnerable patients and residents - your actions can affect their health.

The top tips for visitors from the Chief Medical Officer and Chief Nursing Officer are available at: http://www.gov.scot/Topics/Health/Services/Preventing-Healthcare-Infections/Infection-Monitoring/Preventing-Infection

5.5 Where can I get more information on HAI?

Further information on HAI and HAI prevention can be obtained from:

Health Protection Scotland (HPS)
Telephone: 0141 300 1100
Website: http://www.hps.scot.nhs.uk/

NHS Education for Scotland
Telephone: 0141 223 1436
Website: http://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/healthcare-associated-infections.aspx

NHS electronic library
For current literature on HAI the NHS electronic library can be searched from
http://www.elib.scot.nhs.uk/portal/hai/Pages/index.aspx