

Healthcare Associated Infections in European Long Term Care Facilities (HALT)

Prevalence Study 2010 in Scotland



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Health Protection Scotland
3rd Floor, Meridian Court, 5 Cadogan Street,
Glasgow, G2 6QE

Tel: +44 (0) 141 300 1100

Email: NSS.HPSEnquiries@nhs.net

Designed and typeset by:
Graphics Team, Health Protection Scotland

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Executive Summary

Throughout the European Union (EU) there is increasing interest in the burden of healthcare associated infection (HAI) within care home settings. Adult care homes offer people a safe, comfortable and supportive environment to live in a home like atmosphere while protecting their individuality, privacy, dignity and rights along with the opportunity for making choices. The highest proportion of care homes in Scotland care for older people.

Older people are a vulnerable group who are more susceptible to infection due to increased age and underlying health problems which reduce their ability to fight infection. These risk factors apply to any setting where older people live but there is an additional risk in the care home setting associated with the number of people living together. Residents are at risk from the same infections as older people living in the community and may also be at risk from HAI depending on the level of care that they are receiving. It is known that the frequency of infections in care homes is comparable to the acute care setting therefore there is a need to be informed about infections and antibiotic use within this setting to enable future action to be planned.

During July 2010 as part of Healthcare Associated Infection Long Term Care Facilities (HALT) project a European HAI prevalence study was carried out across 28 countries in volunteer care homes and Health Protection Scotland (HPS) coordinated the contribution across Scotland. A total of 4870 residents from 83 care homes across Scotland were surveyed. The results indicate that within the surveyed care homes 2.6% (95% CI 2.2-3.1) of residents had an HAI at the time of survey. The prevalence of HAI by care home ranged from 0% to 13.5%. The most common infection types were urinary tract (52.7%), respiratory tract infections (19.4%) and skin infection (15.5%). A total of 357 residents were receiving antimicrobial therapy at the time of survey with ten residents receiving two antimicrobials. The prevalence of antimicrobial use was 7.3% (95% CI 6.6-8.1) and ranged from 0% to 27.8%. The most commonly prescribed antimicrobials were Trimethoprim (26.7%), Nitrofurantoin (18.3%) and Amoxicillin (16.1%).

The results from this survey of volunteer care homes have provided valuable insight into prevalence of HAI and antimicrobial use in Scottish care homes for older people. The results should be considered with all of the caveats including the survey only included volunteer care homes and were not representative of all care homes in Scotland. The methodology may be used in the future at a local or national level.

List of Abbreviations

AMR	Antimicrobial Resistance
CAUTI	Catheter Associated Urinary Tract Infection
C. difficile	Clostridium difficile
CI	Confidence intervals
CP	Coordinating Physician
ESAC	European Surveillance of Antimicrobial Consumption
ECDC	European Centers for Disease Control
EU	European Union
GPs	General Practitioners
HAI	Healthcare associated infection
HALT	Healthcare Associated infection within Long Term Care Facilities
HPS	Health Protection Scotland
ICP	Infection Control Practitioner
ICT	Infection Control Teams
IPSE	Improving Patient Safety in Europe
MRSA	Meticillin-resistant Staphylococcus aureus
NHS	National Health Service
UTI	Urinary Tract Infection

1. Introduction

1.1. Background

Over the last few decades the importance of infection control within care home settings has increased due to a number of contributing factors. Throughout Europe, there has been an increase in the number of places in nursing, residential homes and hospices. This has resulted in an increase in the number of people cared for with residents spending longer periods of time in care homes¹. These facilities have developed over the years to provide many functions designed for taking care of individuals with physical or mental disabilities and who have become dependent on assistance with basic daily living activities. Many of these residents are in the highest age groups in the population due to an increase in population age¹. Older people are a vulnerable group who are more susceptible to infection due to increased age and underlying health problems which reduce their ability to fight infection²⁻⁴. These risk factors apply to any setting where older people live but there is an additional risk in the care home setting associated with the number of people living together in close proximity. The profile of residents is also changing in relation with changes in areas of healthcare. There is an increase in the level of care required for residents, because of earlier discharge from acute care hospitals and an increasing use of invasive devices².

Care home settings have several characteristics which may hinder the implementation of effective infection and surveillance control programmes when compared to the acute care setting. These include:

- Most elderly residents live in care homes permanently; however the care home population can be fluid resulting in a flow of residents in and out of the facility frequently to and from acute care settings. This results in a balance of preventing transmission of infection between residents who have the facility as their home environment and those that visit.
- Infection prevention and control is a continuing challenge in the care home setting which must at all times ensure a homely but safe environment^{5,6}.
- Difficulties may also arise due to the number general practitioners (GPs) who have responsibility for coordinating medical care and antimicrobial prescribing preferences within the same care home⁷.

For elderly residents living in care homes, the onset of an infection represents the most common cause of hospital admission and death⁸ with the most frequent cause being pneumonia⁹.

1.2. Care Homes and Antimicrobial Resistant Pathogens

Care homes play an important role in the epidemiology of antibiotic resistant bacteria. These settings may become a reservoir for antibiotic resistant bacteria due to many residents entering care home colonised with antibiotic resistant organisms that were acquired in the acute setting⁹.

Residents of care homes are reported to be frequently colonised with antimicrobial resistant organisms, including methicillin resistant *Staphylococcus aureus* (MRSA), vancomycin resistant enterococci, penicillin resistant pneumococci, extended spectrum β lactamase-producing gram negative organisms, and quinolone resistant gram negative organisms^{2;10}. Exposure to at least one course of antibiotics is reported to occur for 50-70% of care home residents annually¹¹. The most common infections for which antibiotics are prescribed in care homes are urinary tract infections (UTI), respiratory tract infections and skin and soft tissue infections. It is reported within the literature that within care home settings, antibiotics are frequently prescribed without the presence of infection⁹. Several studies have shown that HAI and antimicrobial resistance rates in care homes are influenced by the implementation of infection control and surveillance programmes, including improving hand hygiene compliance and the presence of trained staff^{12;13}. Therefore, surveillance of HAI and antibiotic use within care homes is required to increase knowledge and awareness in order to improve practice.

1.3. *Epidemiology of HAIs within Care Home Settings*

Robust epidemiological data are essential to provide an evidence base for direction of infection prevention and control activities in the care home settings. Current literature suggests that HAI is common among residents within care home settings with a frequency comparable to rates observed in acute settings^{2;4;14;15}. The incidence of endemic infections in various care home studies ranged from 1.8 to 13.5 infections per 1,000 resident-days⁵ and the prevalence of infection is reported to range from 2.7 to 32.7 infections per 100 residents⁵. The most common infections identified in care homes were urinary tract, respiratory tract, skin, gastrointestinal tract and eye infections³. However, it is important to note that care home settings in these countries may differ from those in Scotland

The Scottish National HAI Prevalence Survey carried out in 2005/2006 reported that the prevalence of HAI in acute and non acute hospitals was 9.5% and 7.3% respectively¹⁶. In 2009, a pilot study by HPS was carried out in volunteer care homes across Scotland¹⁷. A total of 922 residents from 18 care homes were included. On the day of survey, 87 infections were identified in 86 residents. The overall prevalence of infection was 9.3%. The prevalence figure is higher than reported in care homes in other European countries. A survey carried out in Italy reported the prevalence of infection to be 8.4%¹⁴ and in Norway the prevalence ranged from 6.6% to 7.6% in 2002 and 2003¹⁸.

However, comparing surveillance data between these settings is difficult due to the wide variability of case mix within care homes. These facilities can care for residents with a wide range of chronic and acute diseases, with variation in the number and type of invasive procedures and other infection risk factors. Currently, throughout Europe no agreement exists on individual variables and/or scoring system for appropriate adjustment for case mix in care home settings¹⁹.

1.4. European Initiatives

A survey regarding the status of infection control and surveillance programmes in care homes in Europe was undertaken by the Improving Patient Safety in Europe (IPSE) project and published in May 2008⁷. The results highlighted that available resources for infection control were limited with very few HAI surveillance programmes in place. The report suggested that a prevalence approach to monitoring HAI may be more successful in the care home setting. In parallel to the IPSE study, the European Surveillance of Antimicrobial Consumption (ESAC) nursing home project designed a methodology to measure the prevalence and characteristics of antimicrobial prescribing throughout European care homes to address the lack of data on antimicrobial prescribing in these facilities. In response to these projects, the European Centre for Disease Prevention and Control (ECDC) commissioned a Healthcare Associated Infection in Long Term Care Facilities (HALT) pilot study with an overall aim to support and extend the control of HAI and antimicrobial resistance (AMR) in care homes. Data on HAI and antibiotic use in care home settings are limited therefore HALT pilot study aimed to develop and implement a sustainable methodology to estimate the prevalence of HAI and antimicrobial prescribing. A European wide HALT prevalence survey was undertaken across Europe during May to September 2010 in a total of 28 countries and the results are expected to be published in 2011.

1.5. Aims and Objectives

The aim of the HALT project were to develop and implement a sustainable methodology to estimate the prevalence of HAI and antimicrobial use in care home settings in Europe.

The objectives of the project were to:

- Assess the prevalence and types of HAI in care homes
- Assess the prevalence and types of antimicrobials used in care homes
- Produce a report on the findings of the survey and include the results within a European report.

2. Methodology

2.1. Data Collection

Volunteer pilot care homes across Scotland which employed registered nurses were recruited to the survey by HPS and the Social Care and Social Work Improvement Scotland. Data collection was undertaken between 10th July 2010 and 5th August 2010. Data were collected using paper forms by care home staff trained by HPS. Data were collected on the day of survey. In addition, data pertaining to medical care and coordination were recorded for each care home.

Leaflets describing the study were distributed amongst the care homes to residents and residents' next of kin informing residents that they could opt out of the study. All residents that had not opted out and were present (at 8am) in the care home on the day and had been present in the care home for at least 24 hours were included.

Data on resident demographics, the presence of extrinsic and intrinsic risk factors, antimicrobial prescription and the presence of an infection were collected for each resident who were identified with an infection or receiving antimicrobials. The data were obtained from resident's personal care plans, temperature charts and drug charts.

Data were also collected to describe additional care home factors:

- On a care home level:

- General data (ownership, type of rooms, qualified nurse-presence)
- Denominator data: total number of available and occupied beds, hospitalised residents, residents with signs/symptoms of infection, antibiotic-users and residents with urinary catheter, vascular catheter, incontinent, pressure sores, wounds, disoriented, impaired mobility
- Specific questions on medical care coordination, infection control structure, antibiotic policy.

- On resident level (for each resident with signs and symptoms of infection and/or receiving antibiotic treatment):

- General data (birth year, sex, admission date, previous admission to hospital)
- Possible risk factors (urinary catheter, vascular catheter, pressure sores, wounds, incontinent, disoriented, non ambulant mobility status, recent surgery)
- Antimicrobial data (name, date of treatment start, daily dosage, administration route, indications, sample taken, microorganism isolated, prescribed by whom)
- Signs and symptoms of infection

Data regarding medical care including infection control provision were collected, which detailed if the care home had official links with hospital infection control teams (ICT) and if infection control practitioners (ICP) were employed. An ICP was defined as per the HALT protocol as a registered nurse or physician who helped to prevent infection by isolating sources of infection and limiting their spread.

A checklist of signs and symptoms of adapted McGeer infection criteria 20 were used to identify HAIs as per the HALT protocol and throughout this report, these are referred to as HALT HAI criteria (see Appendix I). Healthcare Associated Infections were categorised by the following;

- Urinary tract infection
- Respiratory tract infection (common cold, pharyngitis, influenza-like illness, pneumonia and other lower respiratory tract infections)
- Skin infection (cellulitis, soft tissue infection, wound infection, fungal skin infection, herpes simplex, herpes zoster and scabies)
- Gastrointestinal infection
- Eye, ear, nose and mouth infection (conjunctivitis, ear infection, mouth and perioral infection and sinusitis)
- Primary bloodstream infection
- Unexplained febrile episode
- Other.

2.2. Analysis of Prevalence Data

The HAI prevalence figures were calculated as the proportion of all residents that had an infection at the time of survey with 95% confidence intervals. The number and distribution of the HALT HAI rates were also calculated. The prevalence of invasive devices and antimicrobial therapy were calculated as the proportion of all residents that had a device in situ or had been prescribed an antimicrobial at the time of survey. The Wilson method was used to calculate 95% confidence intervals (CI)²¹.

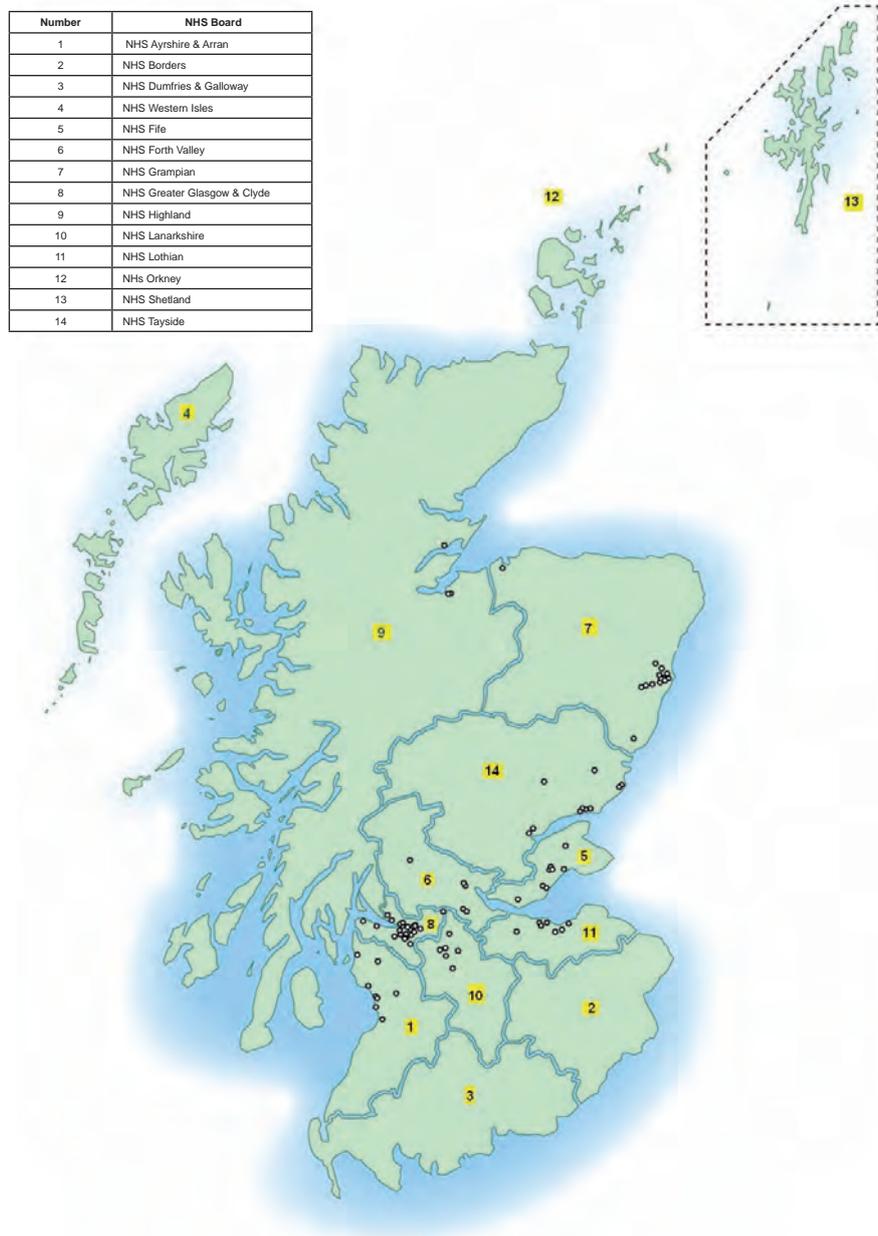
Statistical analyses were carried out using STATA® software. Univariate analyses based on logistic regression were carried out to examine the relationship between the intrinsic risk factors, the prevalence of HAI and p-values reported.

3. Results

3.1. Care Home Demographics

A total of 83 care homes in Scotland were included in the study. The care homes were situated within a number of different NHS health boards in Scotland these included, NHS Highlands, NHS Grampian, NHS Tayside, NHS Fife, NHS Forth Valley, NHS Lothian, NHS Greater Glasgow and Clyde, NHS Lanarkshire and NHS Ayrshire and Arran (Figure 1). However, almost a third of care homes were located within the Greater Glasgow and Clyde area (n=26, 31.3%) and these accounted for over a third of residents (n=1731, 35.5%).

Figure 1: Map showing the geographical spread of the participating care homes within Scotland



3.2. Survey Population

A total of 4870 residents from 83 care homes were surveyed. Of the residents surveyed where data were supplied, 27.3% were male, 43.9% were over 85 years, 39.6% were non ambulant, 62.5% were disoriented and 66.6% were incontinent. The size of participating care homes ranged from 16 to 180 available beds with a median of 60 (not recorded in 11 care homes). The median proportion of single rooms was 100% and the bed occupancy was 94.7%.

3.3. Medical Care and Coordination

Registered nurses were present on a 24 hour basis in all participating care homes. Medical resident care was provided by general practitioners (GPs) in 80 care homes (96.4%), solely by medical staff employed by the care home in one facility (1.2%) and by both in two of the care homes (2.4%). The total number of GPs coordinating medical care in each care home ranged from 1 to 83. None of the care homes surveyed had medical activities coordinated by a coordinating medical doctor or physician (CP).

3.4. Infection Control Practice

Infection control practitioners were defined in the HALT protocol as either registered nurses or physicians who helped to prevent infection by isolating sources of infection and limiting their spread, these personnel did not require to have been trained formally in infection control. In 14 (16.9%) care homes surveyed, 1 staff member had been designated with responsibility for infection control activities, of these 12 (85.7%) were nurses, one (7.1%) was a doctor and one (7.1%) was unknown. In 73 (88.0%) of the care homes, there was a link with either the local hospital ICT or local health protection or public health teams where infection control advice could be obtained if required. Infection control committee meetings were held in 11 (13.2%) of the care homes and the number of meeting in the previous year ranged from 3 to 12 with a median of 4. Details of infection control activities within the care homes are shown in Table 1.

Table 1: Description of infection control activities in participating care homes (n=83)

Infection Control Activities	Number (%)
Infection prevention training of the nursing staff	53 (63.9)
Infection prevention training of the GPs and medical staff	2 (2.4)
Developing care protocols	19 (22.9)
Registration of residents colonised/infected with multi-resistant microorganisms	17 (20.5)
Designation of a person responsible for reporting and management of outbreaks	60 (72.3)
Feedback on surveillance results to the nursing/medical staff of the facility	11 (13.3)
Supervision of disinfection and sterilisation of medical and care material	14 (16.9)
Decision on isolation & additional precautions for residents colonised with resistant microorganisms	45 (54.2)

Table 1: Contd

Infection Control Activities	Number (%)
Offering immunisation for flu to all residents	66 (79.5)
Organisation, control, feedback on hand hygiene in the facility	47 (56.6)
Organisation, control, feedback of an audit of infection policies and procedures	20 (24.1)
Written evidence	
Management of MRSA carriers	77 (92.8)
Hand hygiene	80 (96.4)
Management of urinary catheters	80 (96.4)
Management of venous catheters/lines	35 (42.2)
Management of enteral feeding	75 (90.4)
Programme of surveillance of HCAI established	
Yes	8 (9.6)
No	69 (83.1)
Not recorded	6 (7.2)
Hand hygiene local training organised in the previous year	
Yes	29 (34.9)
No	4 (4.8)
Not recorded	50 (60.2)

3.5. Local Antibiotic Policies

Local NHS board antibiotic policies were available in 23 (27.7%) of the care homes. The median of the percentage of antimicrobial prescriptions by GPs was 100 and ranged from 1 to 100 with not recorded reported 6 times. The median of the percentage of antibiotic prescriptions made by external consultants (specialists) was two and ranged from 1 to 30. Details of antimicrobial policies within the care homes are shown in Table 2.

Table 2: Description of antimicrobial policy in participating care homes (n=83)

Antimicrobial policy activities	Number (%)
An 'antibiotic' committee	0 (0)
Annual regular training on appropriate antibiotic prescribing	0 (0)
Written guidelines for appropriate antibiotic use (good practice)	3 (3.6)
Data available on annual antibiotic consumption by antibiotic type	0 (0)
Microbiological samples taken for guidance of best antibiotic type	29 (34.9)
Local (i.e. for that region/locality or national if small country) antimicrobial resistance profile summaries	2 (2.4)
Permission from a designated person(s) for prescribing of restricted antibiotics, not included in local formulary	0 (0)
Pharmacist providing advice on antibiotics not included in the formulary	12 (14.5)
Therapeutic formulary, comprising a list of antibiotics	17 (20.5)
Feedback to the GPs on antibiotic consumption in the facility	5 (6)

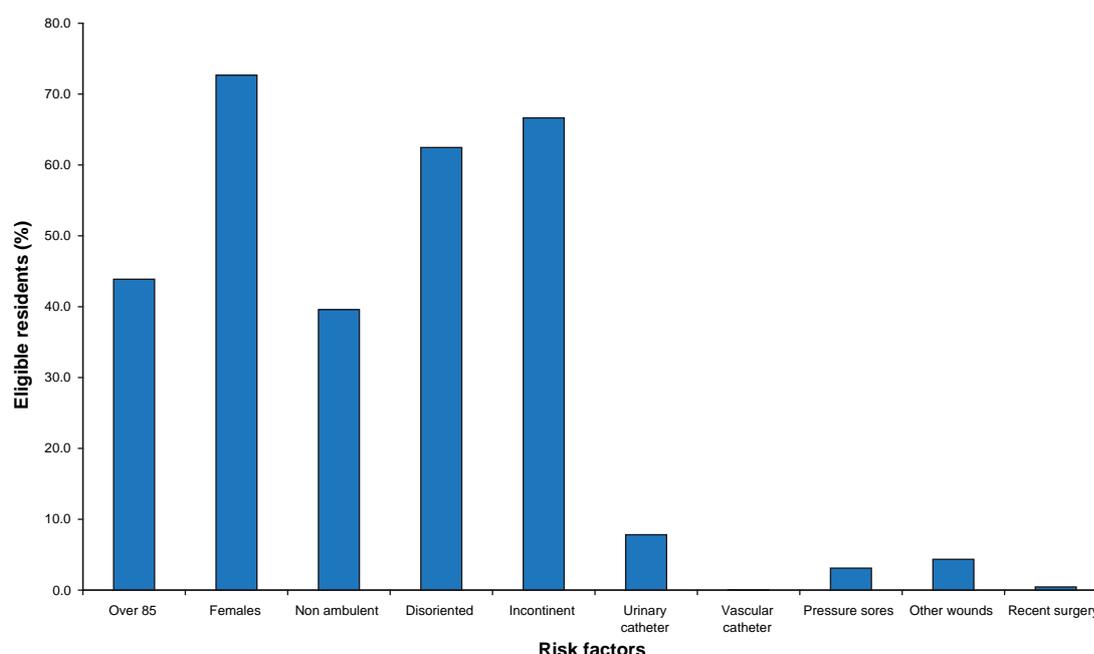
Table 2 Contd

Antimicrobial policy activities	Number (%)
Restrictive list identifiably used within care homes	
Carbapenems	0 (0)
Cephalosporins (3rd gen)	0 (0)
Flouroquinolones	0 (0)
Vancomycin	0 (0)
Mupirocin	0 (0)
Glycopeptides	0 (0)
Broad-spectrum antibiotics	2 (2.4)
Intravenously administered antibiotics	3 (3.6)
Therapeutic guidelines in place within care homes	
Respiratory tract infections	14 (16.9)
Urinary tract infections	16 (19.3)
Wound and soft tissue infections	16 (19.3)
Are urine dipstick routinely performed for UTI diagnosis	
Routinely	64 (77.1)
Sometimes	17 (20.5)
Never	1 (1.2)
Not recorded	1 (1.2)
Programme of surveillance of antimicrobial consumption	
Yes	3 (3.6)
No	79 (95.2)
Not recorded	1 (1.2)
Programme of surveillance of resistance microorganisms within care homes	
Yes	8 (9.6)
No	74 (89.2)
Not recorded	1 (1.2)

3.6. Prevalence of Risk Factors for HAI

The prevalence of potential risk factors for HAI in the residents where data was received are detailed in Figure 2.

Figure 2: Prevalence of risk factors for HAI in the survey population



The number of residents in each care home with a urinary catheter in situ ranged from 0 to 34 with a median of 3.

3.7. Prevalence of HAI

A total of 129 infections were identified in 4870 residents as defined by the HALT criteria definition. The prevalence of HAI was 2.6% (95% CI 2.2-3.1). None of the residents surveyed had more than one HAI identified. The prevalence of HAI by care home ranged from 0% to 13.5%. Table 3 summarises the number of residents with reported signs and symptoms of infection and the number of HAIs confirmed when using McGeer 20 infection definition compared with the HALT definitions (adapted McGeer definitions) which were applied in this study (Appendix 1) The HALT definitions recorded 12.4% more infections than if the McGeer definitions were applied.

Table 3: Number and percentage of HAI by McGeer and HALT definitions for HAI

Number of residents surveyed	4870
Number of residents with reported signs and symptoms (%)	291 (6.0)
McGeer infection definitions	
Number of residents with an infection	113
Number of infections	113
Prevalence of infection (range)	2.3 (0 - 10.9)
HALT (adapted McGeer) infection definitions	
Number of residents with an infection	129
Number of infections	129
Prevalence of infection (range)	2.6 (0 - 13.5)

The number and distribution of HAI are shown in Table 4. More than half (52.7%) of HAIs detected were UTIs.

Table 4: Number and percentage of HAI by HALT definitions for HAI

Infection	Type	n	%
Eye, ear, nose and mouth infection	Conjunctivitis	10	7.8
	Ear infection	1	0.8
	Mouth and perioral infection	4	3.1
	Sinusitis	0	0.0
Gastrointestinal tract infection		1	0.8
Respiratory tract infection	Common cold	8	6.2
	Influenza-like illness	0	0.0
	Pneumonia	0	0.0
	Other lower respiratory infection	17	13.2
Skin infection	Cellulitis/soft tissue/wound infection	20	15.5
	Fungal skin infection	0	0.0
	Herpes simplex and herpes zoster infection	0	0.0
Urinary tract infection	Symptomatic	68	52.7
Systemic		0	0.0
Total		129	100

The distribution of HAI for female and male residents are shown in Figure 3 and Figure 4 respectively, highlighting percentages of UTIs and skin infections for both populations. A total of 358 residents had a urinary catheter in situ of which 23 had a confirmed UTI. The prevalence of catheter associated urinary tract infection (CAUTI) per catheterised resident was 6.4%.

Figure 3: Prevalence of HAI for female residents (n = 89)

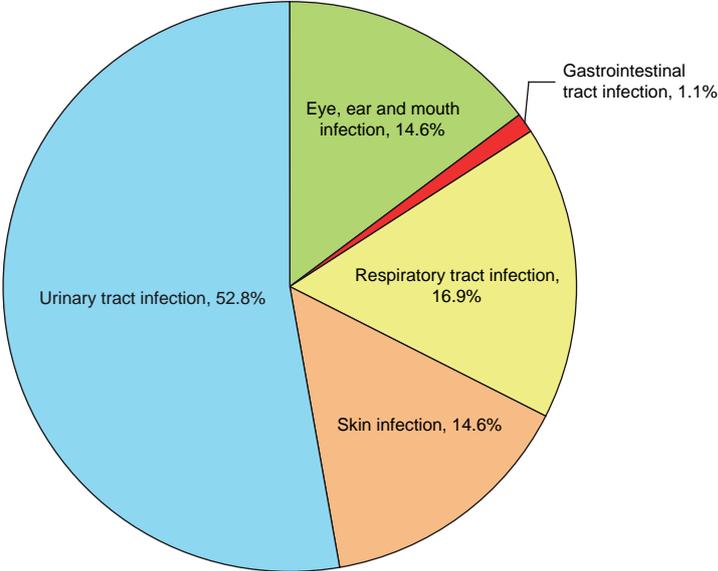
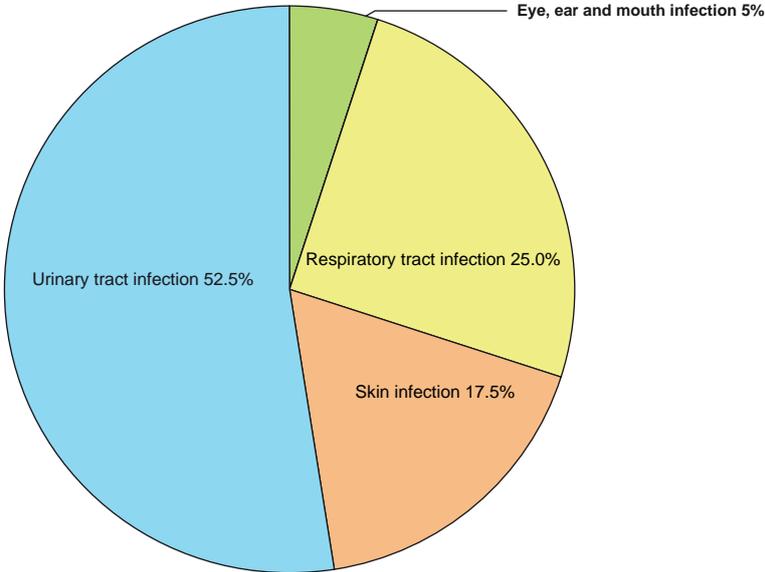


Figure 4: Prevalence of HAI for male residents (n =40)



3.8. Prevalence of Antimicrobial Use

A total of 357 residents were reported to be receiving antimicrobial therapy, with 10 residents receiving two antimicrobials. The prevalence of antimicrobial use was 7.3% (95% CI 6.6 -8.1). The prevalence of antimicrobial use by care home ranged from 0% to 27.8%. There were a total of 367 antimicrobials prescribed at the time of survey with approximately one third of residents receiving prophylactic antimicrobial therapy. The most commonly prescribed antimicrobials were trimethoprim (26.7%), nitrofurantoin (18.3%) and amoxicillin (16.1%) outlined in Table 5. A culture was obtained prior to commencement of antimicrobial therapy for 40.3% of antimicrobials prescribed.

Table 5: Antimicrobials prescribed at time of survey

Name of substance	Number of antimicrobials	% of total antimicrobials
Trimethoprim	98	26.7
Nitrofurantoin	67	18.3
Amoxicillin	59	16.1
Cefalexin	40	10.9
Flucloxacillin	30	8.2
Ciprofloxacin	15	4.1
Co-amoxiclav	10	2.7
Doxycycline	8	2.2
Erythromycin	6	1.6
Metronidazole	6	1.6
Clarithromycin	4	1.1
Phenoxymethylpenicillin	4	1.1
Other	20	5.4
Total	367	100

The most frequently prescribed antimicrobial for urinary tract, respiratory tract and skin HAIs are outlined in Table 6. These include prescriptions for both prophylactic and therapeutic treatments. A dipstick test was reported to be carried prior to commencement of antimicrobial treatments for 60.2% of antimicrobials prescribed and for 93.3% where a confirmed urinary tract infection was reported.

Table 6: Most frequently prescribed antimicrobials for urinary tract, respiratory tract and skin infection (prophylaxis and therapeutic)

Residents on antimicrobial therapy for urinary tract infection	(%)
Trimethoprim	40.8
Nitrofurantoin	28.5
Cefalexin	13.6
Amoxicillin	5.3
Ciprofloxacin	5.3
Other	6.6
Residents on antimicrobial for respiratory tract infection (%)	
Amoxicillin	57.1
Cefalexin	10.0

Table 6 Contd

Residents on antimicrobial therapy for urinary tract infection	(%)
Erythromycin	7.1
Clarithromycin	5.7
Co-amoxiclav	5.7
Other	14.3
Residents on antimicrobial for skin tract infection (%)	
Flucloxacillin	53.1
Amoxicillin	8.2
Doxycycline	8.2
Ciprofloxacin	6.1
Co-amoxiclav	4.1
Other	20.4

3.9. Risk Factors Associated with HAI Prevalence

The results from the univariate analyses based on logistic regression are presented in Table 7.

Table 7: Results from univariable logistic regression (n = 4870)

		Residents (n)	Infections (n)	Prevalence %	Odds ratio	95% CI	p-value (chi-square)
Gender	Male	1252	38	3.0	1	-	-
	Female	3329	84	2.5	0.83	0.56-1.22	0.34
	Not recorded	289	7	-	-	-	-
Age	<85	2541	68	2.7	1	-	-
	≥85	1986	52	2.6	0.98	0.68-1.41	0.90
	Not recorded	343	9	-	-	-	-
Mobility status	Ambulant	2584	43	1.7	1	-	-
	Non-ambulant	1693	58	3.4	2.10	1.41-3.13	0.00
	Not recorded	593	28	-	-	-	-
Disoriented	No	1685	40	2.4	1	-	-
	Yes	2804	80	2.9	1.21	0.82-1.77	0.34
	Not recorded	381	9	-	-	-	-
Incontinent	Fully continent	1493	27	1.8	1	-	-
	Urinary/Faecal incontinent	2983	88	3.0	1.65	1.07-2.55	0.02
	Not recorded	394	14	-	-	-	-
Urinary Catheter <i>in situ</i>	No	4223	93	2.2	1	-	-
	Yes	358	28	7.8	3.77	2.43-5.83	0.00
	Not recorded	289	8	-	-	-	-
Pressure Sores	No	4439	111	2.5	1	-	-
	Yes	142	11	7.7	3.27	1.72-6.23	0.00
	Not recorded	289	7	-	-	-	-

Table 7 Contd

		Residents (n)	Infections (n)	Prevalence %	Odds ratio	95% CI	p-value (chi-square)
Other Wounds	No	4382	104	2.4	1	-	-
	Yes	199	18	9.0	4.09	2.43-6.89	0.00
	Not recorded	289	7	-	-	-	-

The univariate analyses indicate that the risk factors of non-ambulant mobility, insertion of urinary catheter, presence of pressure sores and presence of other wounds were each found to significantly increase the odds of infection. Incontinence was found to have marginally significant higher odds for HAI.

4. Discussion

4.1. Prevalence and Distribution of HAI

This report presents the prevalence of HAI and antimicrobial prescribing in a total of 83 volunteer care homes for older people across Scotland.

There are important caveats that must be acknowledged and the results should be interpreted with caution. The survey included voluntary care homes that employed registered nurses including care homes with NHS contracts and is not representative of all care homes in Scotland. Additionally, whilst prevalence surveys offer a fast, consistent and robust method for measuring HAI in settings without resources for incidence surveillance, they measure a snapshot in time and are subject to variation.

The prevalence of HAI in acute and non acute care of the elderly specialties during the 2005/2006 Scottish National HAI Prevalence Survey were 11.9% and 7.3% respectively¹⁶. As the care home and hospital populations are dynamic with continual movement, the prevalence of HAI in the acute setting may have an impact on the prevalence within care home settings and vice versa. Older people living in care homes are also encouraged to remain a part of the community and are therefore exposed to infections circulating within the community. For these reasons, it is not possible to determine whether the infections identified in this survey were community, healthcare or care home associated infections.

This study was conducted during the summer months of 2010. On the day of survey, the prevalence of HAI was 2.6% (95% CI 2.2-3.1). The prevalence of HAI varied across individual care homes from 0% to 13.5%. This prevalence figure is lower than the prevalence reported for the care homes pilot survey for older people in Scotland¹⁷ of 9.3% (95% CI 7.5–11.4) where the prevalence of HAI by care home ranged from 0% to 21.8%. However, these differences may be as a result of seasonal variation as the surveys were conducted throughout different months of the year and should therefore be treated with caution.

The prevalence figure (2.6%) in this 2010 survey is also lower than the prevalence reported in similar settings across other European countries. A survey carried out in Italy reported the prevalence of infection to be 8.4%¹⁴ and in Norway, where care homes are obliged to carry out two point prevalence surveys a year, the prevalence ranged from 6.6% to 7.6% in 2002 and 2003¹⁸. Differences in HAI case definitions, data collection methods and the type of service provided in care homes should be considered when comparing prevalence between surveys and this may be especially important when making international comparisons. Data from this survey in Scotland has been exported to HALT where it will be compared with the data from the other European participants to give a true reflection of prevalence of HAI within care home settings.

The prevalence of urinary catheterisation in this population was 8.0% and was comparable with the prevalence of 8.9% in the care homes pilot survey for older people in Scotland¹⁷. Urinary tract infections (UTI) accounted for 52.7% of all of the HAIs identified. These findings were comparable with previous surveys conducted in Scotland^{16;17}. Gender was not found to have

a significant univariate relationship with the prevalence of UTI, this was not comparable with findings throughout Europe^{22,23}. Analyses identified that incontinence, non-ambulant mobility, presence of urinary catheter and the presence of pressure sores and other wounds were associated with an increased prevalence of HAI at univariate level. Non-ambulant residents were reported to have an increased risk of developing pressure ulcers²⁴ and immobility may also act as a proxy indicator for the underlying medical condition of residents.

A total of one gastrointestinal HAI was identified during this survey. This was comparable with the care homes pilot survey for older people in Scotland¹⁷.

4.2. Infection Control Provision in Care Homes

Staff with responsibility for infection control were in 16.7% of care homes and 88.0% reported access to either the local hospital ICT or local board health protection or public health teams. Written protocols for the management of MRSA carriers, hand hygiene, management of urinary catheters and management of enteral feeding were reported in 90.4% of the care homes.

4.3. Prevalence of Antimicrobial Use

This survey has shown that residents can be cared for by up to 83 general practitioners within a single care home environment. The prevalence of antimicrobial use was 7.3% (95% CI 6.6-8.1) and ranged from 0% to 27.8%. This report has contributed to the understanding of antimicrobial prescribing practice within care home settings across Scotland.

Prudent antimicrobial prescribing in the care home setting is essential to reduce the risk of *Clostridium difficile* infection and to slow the development of antimicrobial resistance. Prudent prescribing is a continuing challenge in the care home setting and it is important to highlight that in Scotland care homes do not have the responsibility for prescribing, this responsibility lies with individual GPs who coordinate medical care for residents within these settings.

5. Conclusion and Recommendations

This survey has provided an invaluable insight into the prevalence of HAI and antimicrobial prescribing in Scottish care homes for older people. The methodology may be used in future to identify key infection types and antimicrobial practices for targeted interventions at a local and national level. Service providers are encouraged to use these data to target local HAI prevention and control efforts appropriately.

A targeted UTI and CAUTI incidence surveillance protocol has been developed by HPS. This protocol provides data on the incidence of UTIs and CAUTIs in care of the elderly settings²⁵. HPS have also developed a range of model infection control policies including Standard Infection Control Precautions and Transmission Based Precautions²⁶ which care homes are encouraged to use to support the development of local infection prevention and control policies and procedures.

Social Care and Social Work Improvement Scotland continue to work in partnership to facilitate, promote and sustain evidence based practice in infection prevention and control and use this practice to support regulatory activities to improve quality of care and safety for people living in care homes. A full EU-wide report containing Scottish data is due to be published by ECDC in 2011.

6. Acknowledgements

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8. Appendix 1

Adapted McGeer* definitions of infection for surveillance in long-term care facilities. McGeer et al. 1991. Definitions of infection for surveillance in long-term care facilities. *Am J Infect Control*, 19, (1) 1-7. The additional criteria of diagnosis by physician is highlighted in bold.

Respiratory tract infection

Common cold syndromes/pharyngitis

The resident must have at least two of the following signs or symptoms:

- (a) Runny nose or sneezing
- (b) Stuffy nose (i.e., congestion)
- (c) Sore throat or hoarseness or difficulty in swallowing
- (d) Dry cough
- (e) Swollen or tender glands in the neck (cervical lymphadenopathy)
- (f) **Diagnosis by physician**

Comment: Fever may or may not be present. Symptoms must be new, and care must be taken to ensure that they are not caused by allergies.

Influenza-like illness

Both of the following criteria must be met:

1. Fever (38°C)*
2. The resident must have at least three of the following signs or symptoms:
 - (a) Chills
 - (b) New headache or eye pain
 - (c) Myalgia
 - (d) Malaise or loss of appetite
 - (e) Sore throat
 - (f) New or increased dry cough
 - (g) **Diagnosis by physician**

Comment: This diagnosis can be made only during influenza season. If criteria for influenza-like illness and another upper or lower respiratory tract infection are met at the same time, only the diagnosis of influenza-like illness should be recorded.

Pneumonia

Both of the following criteria must be met:

1. Diagnosed by physician

2. The resident must have at least two of the signs and symptoms (from a – f) described under “other lower respiratory tract infections,” not including diagnoses by physician

Comment: Non-infectious causes of symptoms must be ruled out. In particular, congestive heart failure may produce symptoms and signs similar to those of respiratory infections.

Other lower respiratory tract infection (bronchitis, tracheobronchitis)

The resident must have at least three of the following signs or symptoms:

(a) New or increased cough

(b) New or increased sputum production

(c) Fever (~38°C)

(d) Pleuritic chest pain

(e) New or increased physical findings on chest examination (rales, rhonchi, wheezes, bronchial breathing)

(f) One of the following indications of change in status or breathing difficulty: new/increased shortness of breath or respiratory rate ~25 per minute or worsening mental or functional status[#]

(g) Diagnosed by physician

Comment: This diagnosis can be made only if no chest film was obtained or if a radiograph failed to confirm the presence of pneumonia.

*A single temperature of ~38 °C, taken at any site

Significant deterioration in the resident’s ability to carry out the activities of daily living or in the resident’s cognitive status, respectively.

Urinary tract infection

Symptomatic urinary tract infection

One of the following criteria must be met:

1. The resident does not have an indwelling urinary catheter and has at least three of the following;

- (a) Fever (~38°C) or chills
- (b) New or increased burning pain on urination, frequency or urgency
- (c) New flank or suprapubic pain or tenderness
- (d) Change in character of urine*
- (e) Worsening of mental or functional status (may be new or increased incontinence)
- (f) Diagnosis by physician

2. The resident has an indwelling catheter and has at least two of the following:

- (a) Fever (~38°C) or chills
- (b) New flank or suprapubic pain or tenderness
- (c) Change in character of urine*
- (d) Worsening of mental or functional status
- (f) Diagnosis by physician

* Change in character may be clinical (e.g., new bloody urine, foul smell, or amount of sediment) or as reported by the laboratory (new pyuria or microscopic haematuria). For laboratory changes, this means that a previous urinalysis must have been negative

Eye, ear, nose, and mouth infection

Conjunctivitis

One of the following criteria must be met:

- 1. Pus appearing from one or both eyes, present for at least 24 hours.
- 2. New or increased conjunctival redness, with or without itching or pain, present for at least 24 hours (also known as “pink eye”).
- 3. Diagnosis by physician

Comment: Symptoms must not be due to allergy or trauma to the conjunctiva.

Ear infection

One of the following criteria must be met:

1. Diagnosis by physician[#] of any ear infection
2. New drainage from one or both ears. (Non-purulent drainage must be accompanied by additional symptoms, such as ear pain or redness)

Mouth and perioral infection

Oral and perioral infections, including oral candidiasis, must be diagnosed by a physician or a dentist.

Sinusitis The diagnosis of sinusitis must be made by a physician.

[#] Requires a written note or a verbal report from a physician specifying the diagnosis. Usually implies direct assessment of the resident by a physician. An antibiotic order alone does not fulfill this criterion. In some homes, it may be appropriate also to accept a diagnosis made by other qualified clinicians (e.g., nurse practitioner, physician associate).

Skin infection

Cellulitis/soft tissue/wound infection

One of the following criteria must be met:

1. Pus present at a wound, skin, or soft tissue site.

OR

2. The resident must have four or more of the following:

Fever (~38°C) or worsening mental/functional status

At the affected site, the presence of new or increasing heat

At the affected site, the presence of new or increasing redness

At the affected site, the presence of new or increasing swelling

At the affected site, the presence of new or increasing tenderness or pain

At the affected site, the presence of new or increasing serous drainage

Diagnosis by physician

Fungal skin infection

The resident must have both:

- (a) A maculopapular rash and
- (b) Either physician diagnosis or laboratory confirmation*

Herpes simplex and herpes zoster infection

For a diagnosis of cold sores or shingles, the resident must have both:

- (a) A vesicular rash and
- (b) Either a physician diagnosis or laboratory confirmation.

Scabies

The resident must have both:

- (a) A maculopapular and/or itching rash and
- (b) Either a physician diagnosis or laboratory confirmation.

Comment: Care must be taken to ensure that a rash is not allergic or secondary to skin irritation.

* For Candida or other yeast, laboratory confirmation includes positive smear for yeast or culture for Candida sp.; for herpetic infections, positive electron microscopy or culture of scraping or swab; for scabies, positive microscopic examination of scrapings

Gastrointestinal tract infection

Gastroenteritis

One of the following criteria must be met:

1. Two or more loose or watery stools above what is normal for the resident within a 24-hour period.
2. Two or more episodes of vomiting in a 24-hour period.
3. Both of the following:
 - (a) A stool culture positive for a pathogen (Salmonella, Shigellosis', E.coli 0157:H7, Campylobacter) or a toxin assay positive for C. difficile toxin and

(b) At least one symptom or sign compatible with gastrointestinal tract infection (nausea, vomiting, abdominal pain or tenderness, diarrhea).

Comment: Care must be taken to rule out noninfectious causes of symptoms. For instance, new medications may cause both diarrhea and vomiting; vomiting may be associated with gallbladder disease.

Systemic infection

Primary bloodstream infection

One of the following criteria must be met:

1. Two or more blood cultures positive for the same organism
2. A single blood culture documented with an organism thought not to be a contaminant and at least one of the following:
 - (a) Fever ($\sim 38^{\circ}\text{C}$)
 - (b) New hypothermia ($\sim 34.5^{\circ}\text{C}$, or does not register on the thermometer being used),
 - (c) A drop in systolic blood pressure of ~ 30 mm Hg from baseline
 - (d) Worsening mental or functional status

Comment: Bloodstream infections related to infection at another site are reported as secondary bloodstream infections and are not included as separate infections.

Unexplained febrile episode

The resident must have documentation in the medical record of fever ($\geq 38^{\circ}\text{C}$) on two or more occasions at least 12 hours apart in any three-day period, with no known infectious or noninfectious cause.

