

Antimicrobial use in UK long-term care facilities: results of a point prevalence survey

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Background: The majority of people in long-term care facilities (LTCFs) are aged 65 years and older, and most of their care needs are provided by the LTCF staff. Provision of healthcare services for residents in LTCFs is variable and can result in disjointed care between carers and NHS healthcare professionals.

Objectives: Our aim was to understand the use of antibiotics in LTCFs across the UK and to identify potential gaps in knowledge and support for carers and residents when using antibiotics, in order to determine how community pharmacy teams can provide additional support.

Methods: A point prevalence survey (PPS) was conducted by community pharmacists ($n=57$) when they carried out visits to LTCFs across the UK between 13 November and 12 December 2017. Anonymized data were recorded electronically by the individual pharmacists.

Results: Data were analysed for 17909 residents in 644 LTCFs across the UK. The mean proportion of residents on antibiotics on the day of the visit was as follows: 6.3% England (536 LTCFs), 7.6% Northern Ireland (35 LTCFs), 8.6% Wales (10 LTCFs) and 9.6% Scotland (63 LTCFs). The percentage of antibiotics prescribed for prophylactic use was 25.3%. Antibiotic-related training was reported as being available for staff in 6.8% of LTCFs and 7.1% of LTCFs reported use of a catheter passport scheme. Pharmacists conducting the PPS intervened during the survey for 9.5% of antibiotic prescription events; 53.4% of interventions were for clinical reasons and 32.2% were for administration reasons.

Conclusions: This survey identified high prophylactic use of antibiotics. There are opportunities for community pharmacy teams to improve antimicrobial stewardship in LTCF settings, including workforce education.

Introduction

Long-term care facilities (LTCFs) provide personal and nursing residential care for people when they (or a relative) are no longer able to take care of themselves within their own homes. The majority of residents are over the age of 65 years.¹ LTCFs for elderly people are often described as nursing or residential homes, the difference being that a nursing home always has a qualified nurse on site. Staff ratios also tend to be higher than in a residential home, reflecting the greater reliance that residents have on carers to support them with daily tasks and complex healthcare needs. All LTCFs across the UK are required by law to deliver safe and quality services to a minimum standard, which are independently regulated.^{2–5} They have an essential role in supporting residents to

maintain their health, preventing infections, supporting self-management and identifying early signs of deterioration.⁶ There are an estimated 459000 places in 16000 LTCFs across England,⁷ 16000 places in 500 LTCFs across Northern Ireland,⁸ 41000 places in 1100 LTCFs across Scotland⁹ and 26000 places in 1600 LTCFs across Wales.¹⁰ Most of the healthcare needs of residents are provided by LTCF staff. The Care Standards Act 2000¹¹ requires a minimum of 3 days of annual training for LTCF staff, although the content varies enormously depending on the size and needs of each home, and mandatory aspects tend to be focused on health and safety. The majority of residential LTCF providers are for-profit organizations (83%), with the remaining delivered by non-profit organizations and local authorities,¹² of which most are small in

size and oversee one or two homes. At the other extreme, six providers operate >100 LTCFs each and have a combined share of 11% of all LTCFs and 17% of resident spaces available.¹² Places in LTCFs are funded through a combination of self-pay and local authorities depending on means testing of the resident.

Antimicrobial resistance (AMR) is a major public health problem, causing patient safety issues for individuals and health systems worldwide.¹³ Residents in LTCFs are associated with higher rates of antibiotic use (compared with community-dwelling older people), particularly for urinary tract infections (UTIs),¹⁴ which are frequently associated with antibiotic-resistant organisms that can lead to treatment failure and bloodstream infections. Infections within this environment are associated with higher hospital admissions and readmissions.¹⁵ NHS improvement schemes in England currently focus on reducing inappropriate antibiotic prescribing by 50% by 2021 and improving the primary care management of UTIs to reduce the risk of *Escherichia coli* bloodstream infections.¹⁶ It is estimated that 1 in 14 people within the community are catheterized¹⁷ and up to 60% of UTIs are related to catheter insertion.¹⁸ Problems can exist with diagnosis of infections as up to half of adults over the age of 65 years old and most people with a urinary catheter will have bacteria present within the bladder without signs of an infection.¹⁹ Diagnosis of an infection using a urine dipstick is not suitable in this age group due to the likely presence of bacteria producing a positive urine dipstick and, therefore, symptom-based tools are recommended to be used to give a more accurate diagnosis and lead to more appropriate use of antibiotics.²⁰ The catheter passport scheme was created to help support patients with their understanding and use of catheters, and healthcare professionals involved in their care, so that they have access to all the information needed regardless of location.²¹ The passport is designed to be carried by the patient at all times, so that healthcare professionals can see when it needs changing or, if the condition has improved, removing altogether. The scheme encourages more autonomy in decision making, helping to reduce the length of time the catheter is needed and therefore the risk of infection.

Point prevalence surveys (PPSs) help identify antibiotic use at the point of time of the survey, which can give an indication of infections and antibiotic use within the environments tested. They are commonly used in hospitals across the UK to help inform clinical practice.²² An Australian PPS found that 9.7% of residents in LTCFs were prescribed antibiotics, most frequently for pneumonia, UTIs and skin or soft tissue infections.²³ Within Scotland, a PPS conducted across 52 LTCFs during October 2017 identified 1 in 15 residents receiving at least one antimicrobial and, of these, 78.9% were for treatment of an infection and 21.1% for prophylactic use.²⁴ Whilst England did not participate in the 2016/17 PPS coordinated by the ECDC,²⁵ data for Scotland indicated that 6.2% of residents within LTCFs were taking at least one antimicrobial, 10.1% in Wales and 10.3% in Northern Ireland. England did participate in an earlier 2013 European survey, which found 9.0% of residents taking at least one antimicrobial, although the survey was found not to be representative of LTCFs across the country due to the small sample size.²⁶

Providing high quality care for LTCF residents requires close collaboration between NHS healthcare providers and LTCF providers. During 2016, the Royal Pharmaceutical Society ('RPS') facilitated a roundtable event that included families of LTCF residents,

providers and healthcare professionals to understand the health-care needs of residents.²⁷ The report produced as a result of this work gave examples of where pharmacists had supported improved care within these environments, reduced medicines waste and avoided serious harm.²⁸ Within England, the NHS have invested in the Medicines Optimisation in Care Homes programme to help support LTCF staff, residents and families in optimizing medicines.²⁹ This work is ongoing and already producing some valuable insights to inform practice around use of long-term medicines.³⁰

The 2014 National Care Forum (UK) survey, representing the views of 65 000 LTCF staff across 58 organizations, identified staff turnover of 18.4%, with 38.8% of carers leaving their job within 12 months and 66.5% within 2 years.³¹ High staff turnover can make it a challenging environment to maintain training levels and enforce good antimicrobial practice, particularly given the acute nature of infections and use of antibiotics. Provision of healthcare services for residents in LTCFs is variable and can result in disjointed care between carers and NHS healthcare professionals.³² Collecting data in this setting to provide evidence of value can also be complex and challenging as these are residents' homes and not healthcare facilities.³³

Within a UK national pharmacy chain, pharmacists are employed directly to provide support and advice to residents and carers within LTCFs for which they dispense medicines. These pharmacists conduct advice visits to the LTCF and provide support on medicine-related matters such as medicine management policies, controlled drug storage and waste. Online training is also provided to carers, which is supplemented by face-to-face support, and is dependent on local training needs. Pharmacists work directly with the LTCF organizations to support carers and residents on local priorities and needs, in addition to providing NHS services within the care environment such as medicines use reviews (when commissioned locally). Previous audits have been conducted focusing on antipsychotic medication use;³⁴ over a 2 year period, dosage was reduced in >20% of residents and treatment was discontinued in 17% of residents with dementia.

The purpose of this PPS was to understand use of antibiotics in the LTCF setting across the UK and to identify potential gaps in knowledge and support for carers and residents when using antibiotics, with the aim of identifying how community pharmacy teams can provide additional support.

Methods

This was a PPS conducted when community pharmacists ($n=57$) carried out pharmacist advice visits to LTCFs across the UK between 13 November and 12 December 2017 as part of their routine visits. Survey questions were informed by those included within Healthcare-Associated infections in Long-Term care facilities (HALT) PPS projects so that results could be compared with those across Europe.^{25,26} Anonymized data were recorded electronically by the individual pharmacists capturing type of LTCF (residential/nursing/other), number of residents in LTCF on date of the visit, number of residents taking antibiotics on that date, whether any antibiotic training was in place for staff and if the LTCF operated a catheter passport scheme. For residents on an antibiotic, the following information was recorded: whether they were over 70 years old, if any missed doses (recorded on the medication administration record) and, if so, reason why, type of treatment (prophylaxis/therapeutic), reason for antibiotic, whether the patient was catheterized, where the antibiotic was prescribed, who prescribed it and

Table 1. Number of LTCFs and number of residents included in the survey

Country	Number of LTCFs			Number of residents		
	included within PPS	total registered	percentage included	included within PPS	total spaces available	percentage included
England	536	16037 ⁷	3.3	14714	458905 ⁷	3.2
Scotland	63	1142 ⁹	5.5	2165	40926 ⁹	5.3
Northern Ireland	35	457 ⁸	7.7	815	16005 ⁸	5.1
Wales	10	1579 ¹⁰	0.6	215	25993 ¹⁰	0.8
Total	644	19215	3.4	17909	541829	3.3

whether it was done remotely or in person. Whilst the pharmacists were not asked to make any special interventions as part of the survey, they did record whether they made any clinical interventions based on any information collected. Individual pharmacists sent information they collected to a central point to be amalgamated and analysed using Microsoft Excel v2013. The study was approved by the Research Governance Board within the pharmacy chain who confirmed that ethics approval was not required as the study was based on an audit to help inform service development to the LTCF resident population serviced by the national pharmacy chain.

Survey questions are available as [Supplementary data](#) at JAC Online.

Results

Data were analysed for 17909 residents across 644 LTCFs across the UK, representing 3.4% of all LTCFs and 3.3% of all residents (for full split see Table 1). Average number of residents per LTCF was 27.8 (median=25, IQR=8–39).

More than two-thirds (66.8%) of all LTCFs visited had at least one resident on antibiotics on the day of the visit, equating to 1204 residents using 1244 antibiotics (mean number of antibiotics per patient=1.04, range=1–4). Amoxicillin, nitrofurantoin and trimethoprim accounted for half ($n=622$) of these antibiotics. The mean percentage of residents in LTCFs on antibiotics on the day of the visit was as follows: 6.3% England, 7.6% Northern Ireland, 8.6% Wales and 9.6% Scotland. The proportion of residents on antibiotics was higher in nursing homes (7.7%) compared with residential homes (6.7%).

Use of antibiotics by indication and therapeutic/prophylactic use is shown in Figure 1. Over a third of antibiotics (38.7%) were for UTIs and, of these, half (47.1%) were for prophylactic use (52.5% therapeutic and 0.4% unknown). Residents aged 70 years and over represented 61.2% of those with a UTI and, of these, 54.6% were taking nitrofurantoin and 44.7% trimethoprim. Just under a third of antibiotics (31.6%) were for respiratory tract infections (RTIs), the majority of which were being used to treat infections (93.4%). The majority of antibiotics recorded for skin infections (89.6%) and eye infections (84.5%) were also based on therapeutic use.

Antibiotic-related training was reported as being available for staff in 9.9% of nursing homes and 6.5% of residential homes (overall 6.8% UK, 7.3% England, 4.8% Scotland, 5.7% Northern Ireland and 0.0% Wales). Figure 2 shows the distribution across the four nations, which is based on the postcode location of each LTCF. Nursing homes across England and Scotland reported higher levels of antibiotic training availability compared with residential facilities (England nursing 10.6%/residential 6.7% and Scotland nursing 7.9%/residential 0.0%). Northern Ireland LTCFs reported

nursing 8.3%/residential 10.0% and for Wales the training availability was 0.0% across both settings.

A catheter passport scheme was in place for 13.1% of nursing homes and 5.5% of residential homes (overall 7.1% UK, 6.3% England, 17.5% Scotland, 2.9% Northern Ireland and 0.0% Wales). Of those residents taking antibiotics, 10.1% were recorded as being catheterized. Less than a fifth (19.6%) of residents with catheters were in LTCFs with catheter passport schemes.

Over three-quarters (77.7%) of antibiotics were prescribed within the LTCF itself and, of these, 86.9% were as a result of the prescriber visiting the LTCF and 9.6% were over the phone (3.5% unknown). The majority of antibiotics prescribed within the LTCF were prescribed by a GP (90.5%), 4.3% by a nurse and 2.5% by an out-of-hours doctor (2.7% other or unknown). Of all antibiotics prescribed by phone (10.4%), 93.8% were prescribed by a GP and 4.7% by doctors located in out-of-hours centres or hospitals (1.5% other or unknown). Approximately 1 in 13 residents (7.9%) was prescribed antibiotics whilst the resident was in hospital (the remaining 14.5% were prescribed elsewhere or unknown). The distribution of how the antibiotic was prescribed (in person or by phone) by therapeutic indication is shown in Figure 3.

Missed doses were recorded for 9.2% of residents prescribed antibiotics ($n=115$), with refusal by the patient being the most common reason (47.0%), followed by resident sleeping (12.2%), patient not within the LTCF due to being either hospitalized or out on social leave (although they may have had their medicine administered separately within these settings, 10.4%), administration error by staff (7.0%), prescriber queries (5.6%) or problems with actually being able to take the antibiotic itself (4.3%). Reasons were unknown in 13.5% cases. Of all the residents taking an antibiotic for UTIs, 9.8% (47/482) were recorded as having missed doses; for RTIs this was 8.1% (32/393), for skin infections this was 10.4% (21/202) and for eye infections this was 11.9% (10/84).

During the survey, pharmacists intervened for 9.5% of antibiotics ($n=118$), which represented 12.0% of antibiotics prescribed within nursing homes and 6.4% within residential homes. The majority of interventions were for clinical/allergy check (53.4%) and issues with timing and continuation (32.2%). Other reasons included referral to a GP (6.8%), error identified (2.5%), sample recommended for testing (2.5%) and formulation change recommended (2.5%).

Discussion

Whilst these results only provide a snapshot in time of antibiotic use within LTCFs, they are the largest data set published to date

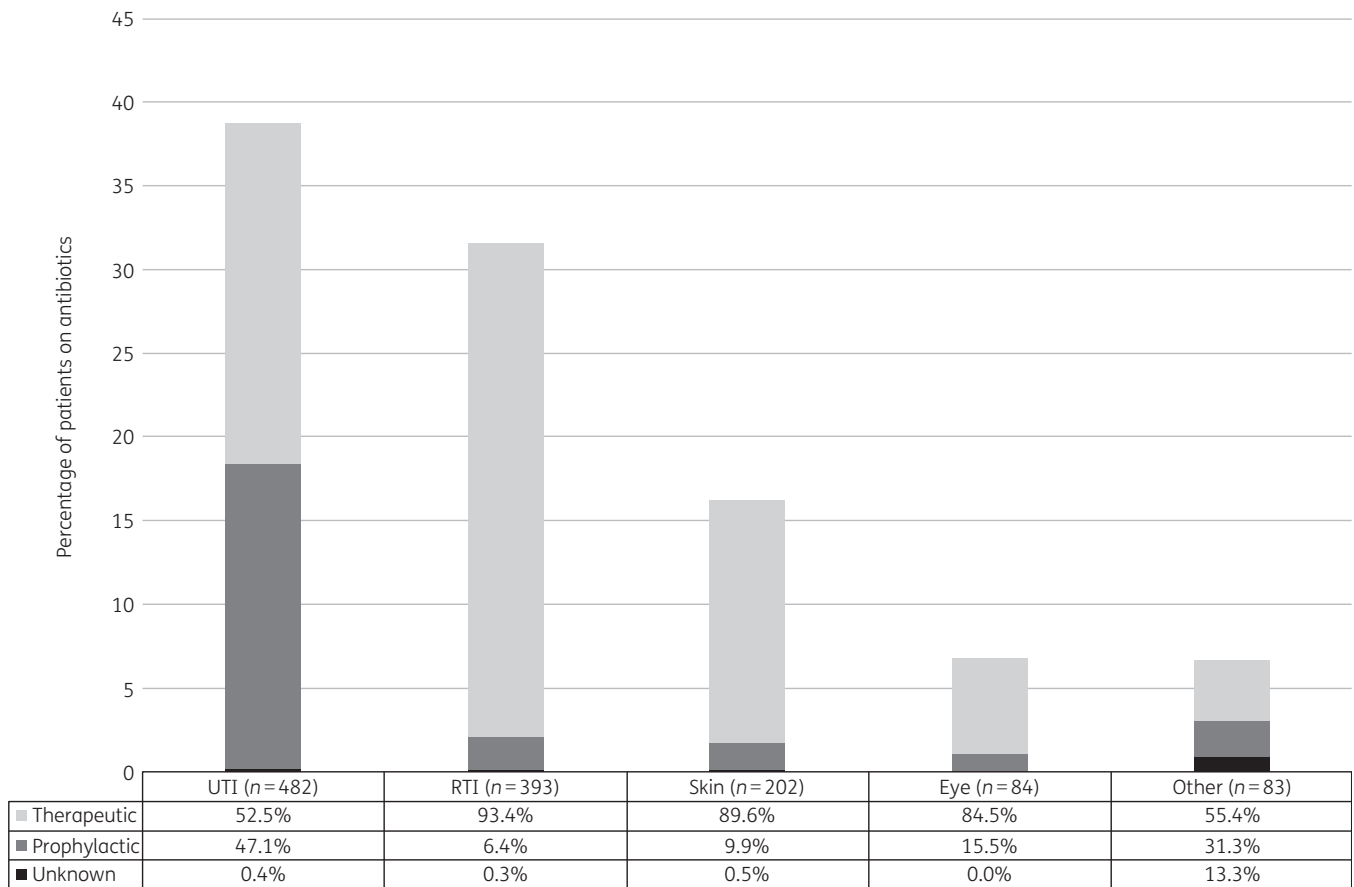


Figure 1. Reason for antibiotic.

across the UK, in particular for England, which has been under-represented in previous surveys.²⁴ England represented the largest number of LTCFs in this survey (536/16037 LTCFs),⁷ from which 6.3% of residents were taking an antibiotic, which is lower than the figure previously reported (9.0% although this is from a far smaller data set of 16 LTCFs).²⁶ For Northern Ireland, the number of LTCFs previously reported is higher than seen here (70 versus 35 in this sample), although the previous survey was based on nursing homes only and therefore may explain the difference in results from those reported here (10.4%²⁵ versus 7.6% in this PPS, which included both nursing and residential homes). The sample size of LTCFs reported for Wales within this survey is much smaller than that reported previously (10 versus 28), which may explain the slight difference in figures (10.1%²⁵ versus 8.6%). For Scotland, 52 LTCFs reported data previously, with antibiotic usage rates found to be 6.7%²⁴ compared with 9.6% across 63 LTCFs included within this survey. The differences may be explained by the types of LTCFs included as part of the analysis.

Overall, three-quarters of antibiotics prescribed were for therapeutic treatment of infections, which is similar to that reported within a previous PPS conducted in Scotland.²⁴ There was variation in use depending on therapeutic indication, in particular UTIs, which appeared to be treated with antibiotics more often for prevention of infections. UTIs represented over a third of antibiotic use (38.7%) and RTIs just under a third (31.6%). Whilst the actual

results are comparable, they are the opposite of what was found within the PPS conducted in Scotland during the same time period, where RTIs were found to occur more frequently than UTIs (38% and 31%, respectively), although the difference may be due to the type of residents included within the PPS).²⁴ The percentage of residents over the age of 70 years with a UTI and being treated with trimethoprim was much higher than expected given the fact that nitrofurantoin is the treatment of choice for these patients. Community pharmacists have a key role to play during the dispensing process in identifying inappropriate antibiotic prescribing to ensure that residents receive the most appropriate antibiotic in line with local and national guidelines.

Across the UK, there is a focus on improving management of UTIs within LTCF environments to reduce the risk of *E. coli* bloodstream infections,¹⁶ including schemes aimed at preventing infections through the use of catheter passports,²¹ but also increasing awareness of the inappropriateness of using urine dipstick tests.³⁵ Regular training and healthcare professional support for LTCF staff to help recognize signs of early infection for UTIs and RTIs can help reduce the risk to residents, but also support more efficient use of healthcare resources. Services aimed at providing regular support to residents and carers with COPD within the community pharmacy environment, including identifying early signs of exacerbations and treatment with rescue packs (which included steroids and antibiotics), have been shown to be cost-effective in improving

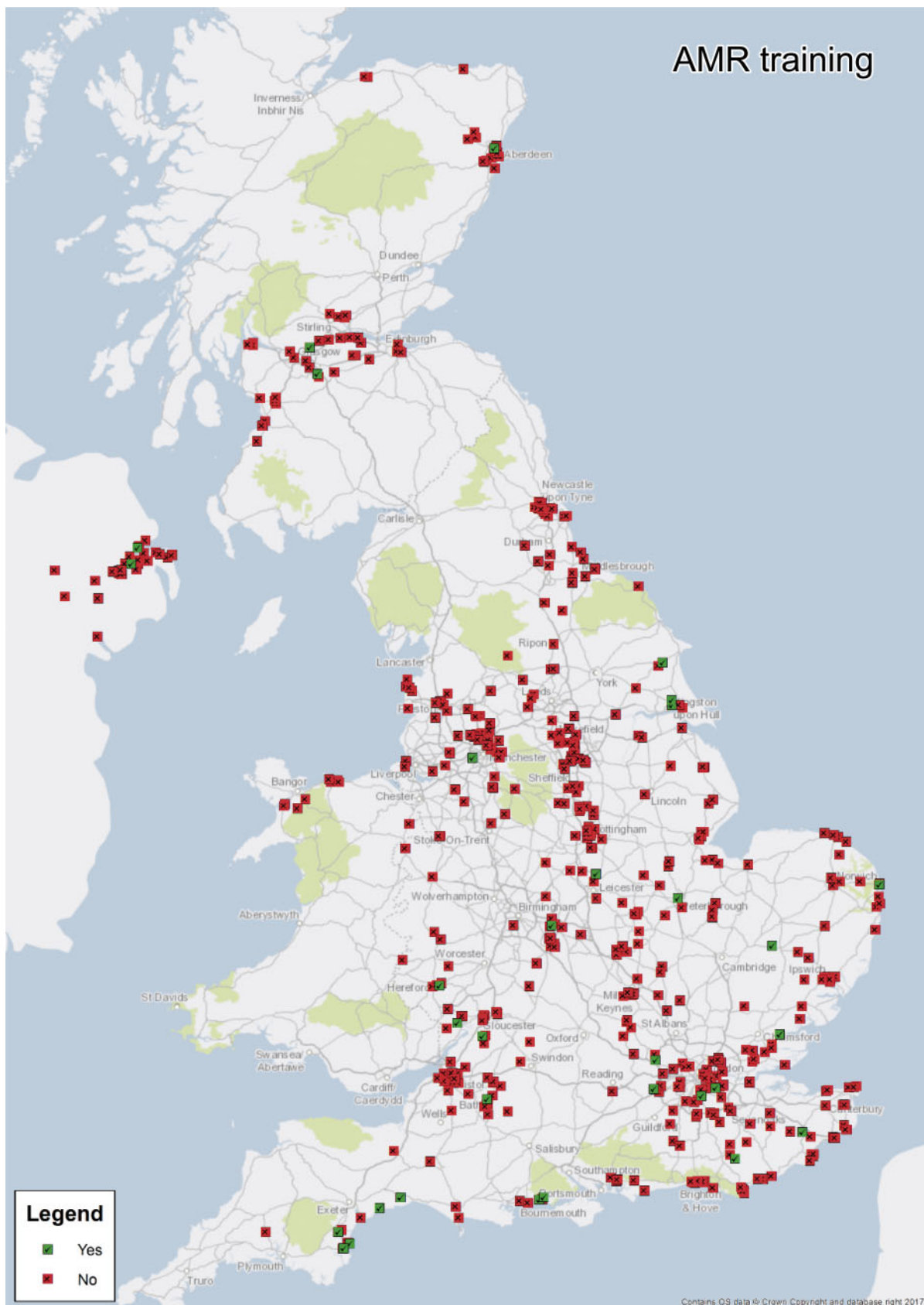


Figure 2. Distribution of antibiotic-related training availability across the UK as reported by LTCF staff. This figure appears in colour in the online version of *JAC* and in black and white in the print version of *JAC*.

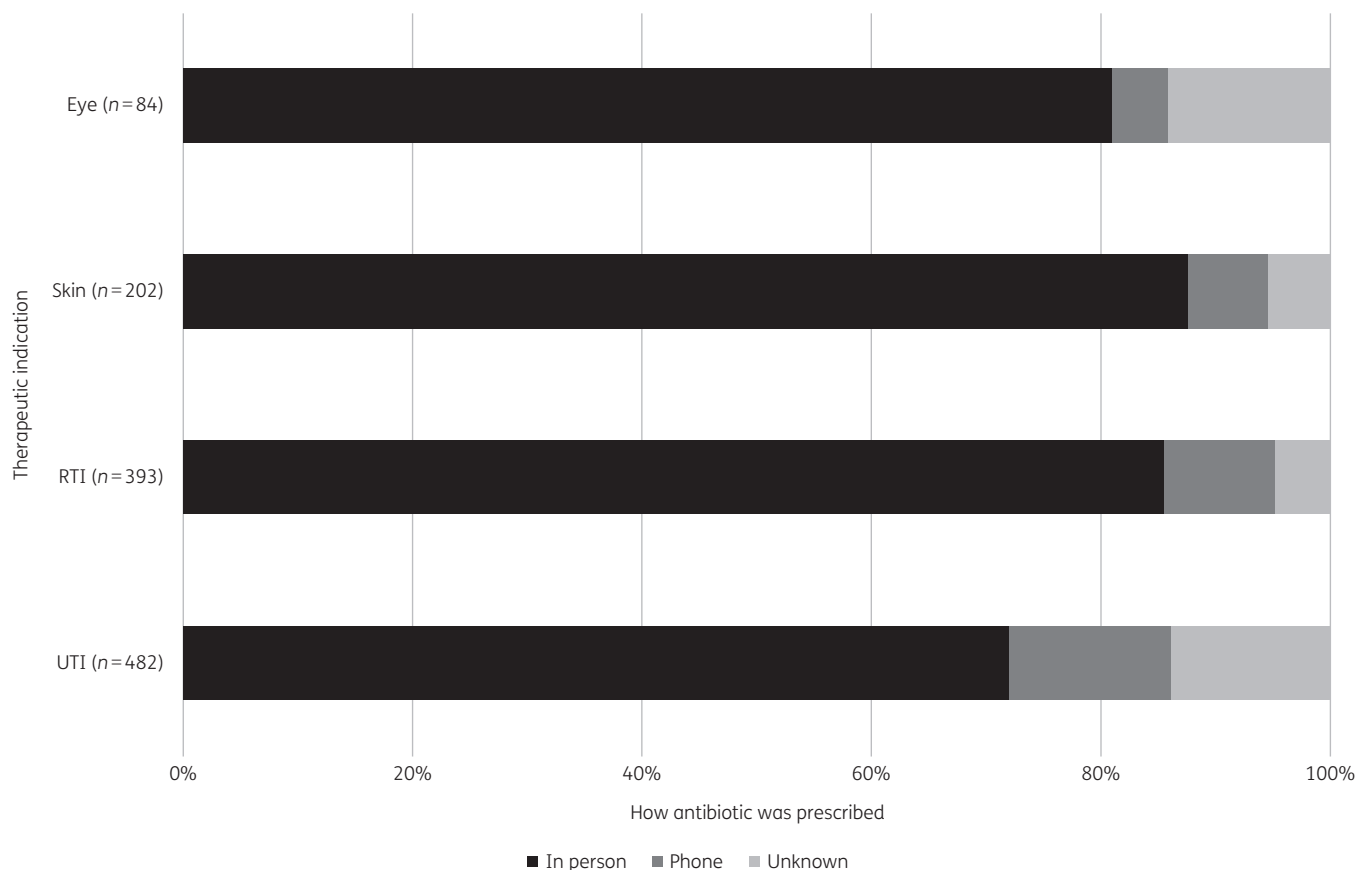


Figure 3. Distribution of whether an antibiotic was prescribed in person or by phone by therapeutic indication (UTIs, RTIs, skin infections and eye infections).

patient outcomes and delivering savings through reduced hospital admissions.³⁶

The majority of antibiotics were prescribed by the GP visiting the LTCF in person, which is similar to that found within previous European-wide surveys.²⁶ The high immobility of residents within these environments,³⁷ and the severity of their illness, could have resulted in LTCF staff calling the doctor out to visit the resident within the care home, rather than attending in person at the surgery. As a percentage of total UTIs, more residents appeared to be prescribed antibiotics via the phone than for other types of infections. It is unknown whether LTCF staff conducted urine dipstick tests on residents before calling the doctor or whether diagnosis and prescribing were based on symptoms alone (as is recommended for those over 65 years old).^{20,35}

Issues were identified with missed doses due to the resident refusing to take the antibiotic, because they were sleeping at the time or because of problems with timing. Many of these issues could have been resolved prior to the situation arising by pharmacists working closely with the LTCF staff to pre-empt potential issues such as medication form, but also support them with understanding of timing of medication regimens to fit around residents' sleeping and eating patterns. Dispensing of antibiotics for LTCF residents is done by community pharmacists; the data from interventions made by the pharmacists during the survey reinforce the importance of clinical and allergy checks at the point of dispensing to

ensure any issues are identified and resolved at an early stage, enabling the resident to have an effective treatment as soon as is needed. Missed doses of antibiotics were less common for RTIs and more common for skin and eye infections, which could have potentially been as a result as LTCF staff finding these infections less serious and not realizing the implications of not completing the course.

Very few staff had received training in antibiotics and the high turnover of staff in this type of sector³¹ can result in problems with maintaining staff knowledge and awareness. Training programmes should support LTCF staff in understanding preventative measures, recognizing warning symptoms with minor infections and use of antibiotics. Working collaboratively with the community pharmacy team would enable carers to identify early signs of infection with residents and treatment using homely remedies, supporting self-care. This gap in knowledge may have contributed to the high numbers of residents being prescribed antibiotics.

Whilst governments across the UK are investing in providing healthcare professional support to LTCFs,²⁹ it can often be difficult to implement sustainable programmes that support both residents and carers, particularly when dealing with high staff turnover and acute prescriptions that may or may not be written by a resident's regular doctor. To embed programmes into practice requires close collaboration with both local and national care home providers, with regular support from the community pharmacy team involved in dispensing chronic and acute prescriptions.

Limitations

Data collected are part of a PPS and therefore only provide a snapshot at that point of time. Whilst the data for England, Northern Ireland and Scotland are likely to provide a good representation based on previous PPS sample sizes,²⁴⁻²⁶ Wales is under-represented and therefore the Welsh data cannot be classed as an accurate reflection of practice. No data were collected on the type of LTCF (private versus local authority) and therefore we cannot assume that the sample is representative based on this factor. However, the PPS was conducted within LTCFs based on routine visits that the care services pharmacists were carrying out as part of their normal day to day activity (which includes support for a wide variety of homes comprising privately owned, local authority-funded, independent and national chains). No screening criteria were used to target specific homes for the PPS and therefore it is likely to provide a reasonably good understanding of current practice.

Staff response to antibiotic-related training would have been influenced based on the staff available on the day of the PPS, which may have been affected by how long they had been working within the LTCF. This highlights the issue within these environments, that even if training had been provided to the LTCF staff within that particular establishment in the past, because of the staff turnover within these environments, newer staff may not have been aware of its previous availability. Data on indication were taken from the patient's record and from discussion with staff, although, as with any infection, unless a culture is taken, there is always the possibility that it may have been misdiagnosed (or treated with antibiotics as a precaution). Missed doses due to social leave or hospital visits may be overstated due to the fact that these records are based on missed doses within the LTCF itself, although the resident may have actually been given their medication whilst away from the facility. No data were collected on how many of the residents within the homes were catheterized (just those on antibiotics) and therefore it is not possible to identify whether these residents were associated with a higher likelihood of antibiotic prescription.

Conclusions

This PPS provides information on antibiotic usage in LTCFs across the UK, providing the largest data set to date for England, identifying high prophylactic use (particularly for UTIs). There is a role for pharmacy teams working collaboratively within the LTCF environment (and with other healthcare professionals including nurses, doctors and microbiologists) providing a greater focus on antimicrobial stewardship, supporting the national ambition to reduce inappropriate prescribing by 50% by 2021. This includes ongoing training and support for carers on self-care for residents (recognizing warning signs) and practical advice on how to support residents in taking antibiotics (such as timings and dose form).

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Transparency declarations

T. T., C. L. K., H. E. and C. H. and A. R. are employees of Boots UK, but do not own any stocks or shares. D. A.-O., E. B. and P. H. received no funding from Boots UK.

Author contributions

All authors were involved in the design of the study and contributed to the writing of the paper. T. T. is the primary author. T. T. and C. L. K. analysed the data. H. E., C. H., A. R. and C. K. provided support with regard to data collection.

Supplementary data

Survey questions are available as [Supplementary data](#) at JAC Online.

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