Report of the findings of a Point Prevalence Survey of Antimicrobial Use in HSE Mental Health Facilities

November 2021-January 2022

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Author: Bernie Love, Chief Antimicrobial Pharmacist, QPS, HSE Community Healthcare.

In conjunction with CHO-based Antimicrobial Pharmacists, Aisling Clancy (CHO 1), Mala Shah (CHO 4), Patricia Sheehan (CHO 5), Olivia Gallagher (CHO 6), Roisin Foran (CHO 7), Sarah Fagan (CHO 8), Margaret Donnelly (CHO 9) and Colm Devine, Chief Pharmacist (CHO6)

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- Professor Martin Cormican, AMRIC National Clinical Lead & Consultant Microbiologist
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- Dr Paul Ryan, GP Lead for AMRIC
- Dr Edel Doorley, GP Lead for AMRIC
- Dr Eimear Brannigan, Consultant in Infectious Diseases, Deputy Clinical Lead AMRIC
- Marie Philbin, Chief Antimicrobial Pharmacist, AMRIC.

Please note: The term 'patient' has been used throughout this report to indicate any patient or resident of Mental Health facilities.

1.0 EXECUTIVE SUMMARY

A baseline Point Prevalence Survey (PPS) of Antimicrobial Use was conducted in a sample of HSE Mental Health facilities (51 facilities, 1003 patients) from November 2021 to January 2022 in seven of the nine Community Healthcare Organisations (CHOs) to evaluate use of antimicrobials. A selection of different care types were examined, with approximately 60% (n=33) of all HSE Approved Centres nationally captured, 15% (n=16) of all HSE 24-hour staffed residences and 25% (n=2) of Continuing-Care units. This accounts for approximately one third of all inpatient HSE Mental Health facilities nationally. A variety of bed types were captured amongst these facilities, with 38% Acute, 29% Psychiatry of Later Life, 18% Rehabilitation and Recovery, and 16% Continuing Care.

Data was collected in all cases by CHO-based antimicrobial pharmacists (AMPs). Appointment of CHO-based antimicrobial pharmacists to support a national community antimicrobial stewardship programme in Ireland was a new service development for the HSE in 2020, with support from the Department of Health.

The evidence is limited regarding antimicrobial utilisation in Mental Health inpatient settings, nationally and internationally. Antimicrobial consumption in these settings would be considered lower than that of general hospitals and dedicated long-term care facilities for Older Persons, however an aging population, the nature of congregated care settings (where prevalence of healthcare-associated infection and antimicrobial resistance may be higher), and inclusion of specialties such as Psychiatry of Later Life, make it an area of interest for antimicrobial stewardship. Furthermore, antimicrobials have several drug–drug interactions with psychotropic drugs that can lead to adverse events or treatment failure.

Antimicrobial use in Mental Health inpatient settings has not been extensively examined before in Ireland however twenty five percent of the facilities (n=13) surveyed in this study had previously participated in a European-wide Point Prevalence Survey, of 'Healthcare-Associated Infection and Antimicrobial Use in Long-Term Care Facilities' (known as the HALT study) in May 2016.[1,2] In the HALT 2016 study, 23 long-term care facilities caring for residents with psychiatric conditions had participated (505 residents). The prevalence rate for antimicrobial use for these residents was 7.7%, with the overall national crude prevalence rate for Irish residential care settings found to be 9.8%. This was found to be twice as high as the European average for antimicrobial use (9.8% vs 4.9%).[1,2]

For CHO-based AMPs, assessment of prevalence and quality of antimicrobial use in Mental Health facilities including supporting systems and structures was considered a priority to identify any changes in practice in what was known about long-term care facilities from 2016, inform targets for improvement and provide a baseline from which to measure improvement. This report includes broad comparisons to findings of the HALT Study 2016.

Limitations to making comparison to HALT 2016 findings include differences in the quantity and types of facilities surveyed (such as inclusion of non-long term care beds for Mental Health), seasonal variation (summer versus winter) and that this survey was conducted during the COVID-19 pandemic which may have influenced findings.

Data collection was conducted in person by an AMP with the survey focused solely on antimicrobial use. However, in addition to certain data fields collected in HALT 2016, this PPS included additional information including a 30-day review of antimicrobials to give a richer dataset, assessment of adherence of active antimicrobial prescriptions to antimicrobial prescribing guidelines (www.antibioticprescribing.ie, or local guideline if applicable), duration of antimicrobial therapy and quality indicators of antimicrobial use (such as documentation of allergy, indication and stop date).

Summary of findings:

Quantity of antimicrobial use:

- Prevalence of total antimicrobial use was lower than the previously measured Irish dataset for long-term care Mental Health at 6.3% (n=66). However this compares to a European average prevalence of 4.9% for long term care facilities (LTCFs) in the HALT study 2016.[1,2] 71% of patients assessed were in long-term care i.e. had been in the facility for more than 30 days.
- 15% (153 patients receiving 197 antimicrobial prescriptions) of patients had received antimicrobial therapy within the previous 30 days.
- Prevalence of antimicrobial use for prophylaxis of infection was higher than the previously measured European average, accounting for 50% of total antimicrobial use, with 3.3% of all patients being on prophylactic therapy. European average prevalence of prophylaxis in HALT 2016 across all LTCFs was responsible for 29% of total antimicrobial use, with approximately 1.5% of residents on prophylaxis,[2] Irish Mental Health LTCFs in HALT 2016 had prophylaxis responsible for 29% of total antimicrobial use with 2.4% of patients on prophylaxis.[1]

Quality of antimicrobial prescribing:

- Documentation of allergy status was 95%, penicillin allergy was documented for 8% of patients. Anecdotally, the nature of allergy was not well defined for penicillin allergy.
- Adherence with choice of antimicrobial agent as per antimicrobial prescribing guidelines was 76% and adherence of dosing regimen as per guidelines was 75%.
- Indication for antimicrobial prescription was documented in 67% of cases.
- A stop/review date for antimicrobial therapy was specified in 47% of antimicrobial prescriptions (n=31). Therapeutic prescriptions had a documented stop/review date in 85% of cases. Prophylactic prescriptions only had a documented stop/review date in 9% of cases, which was less than ideal.
- Adherence with duration of antimicrobial therapy as per antimicrobial prescribing guidelines was only 46%.
- Some of the issues identified for non-adherence with guidelines regarding choice of antimicrobial agent(s) included use of broad spectrum agents in the absence of clear rationale, and use of nitrofurantoin in renal impairment (where use was contraindicated). (Further examples are provided in Appendix 1)
- Adherence to guidelines was considered non-assessable for 36% of prescriptions due to absence of guidelines or insufficient clinical information. A list of infections where

absence of community antimicrobial prescribing guidelines was identified was collated and this information has been submitted to the www.antibioticprescribing.ie website working group for review and development if deemed appropriate. (Appendix 2)

- Approximately two-thirds of patients had normal renal function and therefore this is not a significant issue in this population although of the patients captured, 59% were under 65 years of age. Approximately 10% of patients had some degree of renal impairment, with the remainder unknown. Renal function is an important aspect to consider when prescribing antimicrobials to minimise antimicrobial-related harm.

Types of antimicrobials in use:

- There was a lower proportion of 'green' (preferred) antimicrobials versus 'red' (reserved) antimicrobials (58% vs 38%) when compared to prescribing for GMS patients in Primary Care (67.5% vs 32.5%), or prescribing in HSE LTCFs for Older Persons (65% vs 30%). This is a simple categorisation used in community settings to differentiate agents which are less associated with adverse effects and development of antimicrobial resistance versus those which are more associated with adverse effects and development of antimicrobial resistance.[3] (Appendix 3)
- Although remaining the most common agent used for treatment of infection, the use of co-amoxiclav (a 'red' antimicrobial) had reduced from 41% of prescriptions as seen in Irish Mental Health LTCFs in HALT 2016[1] to 31% of therapeutic prescriptions in this PPS. An increase in percentage usage of Amoxicillin was noted from 2% in Irish Mental Health LTCFs in HALT 2016 to 7%.
- The use of clarithromycin and ciprofloxacin (both 'red' antimicrobials) accounted for 7% of therapeutic prescriptions over a 30-day period. Due to adverse effects and significant drug interactions (particularly in the context of psychotropic medications, lowering of seizure threshold in the case of ciprofloxacin, and polypharmacy often encountered in mental health patients), these should be avoided in this patient cohort if possible.

Focus on prophylaxis:

- The most common indication for prophylactic antimicrobial therapy (3.3% of all patients) was urinary tract infection (UTI) prophylaxis, which accounted for the majority of all prophylactic prescriptions (58%), and 1.9% of all patients, and this was followed by respiratory prophylaxis (24%), and 0.8% of all patients. This was a high prevalence in this cohort of patients, with the European average for all prophylaxis in LTCFs approximately 1.5% of residents surveyed in HALT 2016. [1]
- Azithromycin was the top agent used for prophylaxis in this PPS, a new finding compared to previous studies. This is a concern due to safety concerns regarding cardiac effects, QT prolongation, effects on liver function and hearing loss with prolonged use. It is limited to benefit in a small cohort of patients with severe chronic obstructive pulmonary disease (COPD), asthma or bronchiectasis, should only be initiated by or on discussion with Respiratory Medicine Physicians, and requires regular review every 6-12 months to assess ongoing benefit versus risk.[6]
- For the first time in Mental Health facilities, duration of prophylaxis was assessed and this study found that 64% of prophylactic prescriptions had been prescribed for a

duration in excess of six months, and 58% of prophylactic prescriptions had been prescribed for a duration in excess of twelve months which is longer than recommended.[5,6] It is recommended that a trial of urinary tract prophylaxis should not exceed six months.[5]

Systems and Structures to support Antimicrobial Stewardship:

- Seasonal influenza and COVID-19 vaccination was offered in 100% of facilities to all long-term care patients which is a very positive finding.
- Record keeping in relation to pneumococcal vaccination uptake had scope for improvement with only 27% of facilities keeping records of pneumococcal vaccination status in their LTC patients (recommended as a single dose in people over 65 years of age, and other at-risk groups).[7]
- There were a high proportion of facilities assessed (53%) who reported routine use of dipstick urinalysis to support diagnosis of UTI in asymptomatic patients. This practice is not recommended.[5] The remaining facilities (with the exception of three facilities who reported rare use) used dipstick urinalysis to support UTI diagnosis when accompanied by signs and symptoms of infection. The use of dipstick urinalysis in this context is not a useful guide to management for patients over 65 years of age and is not recommended. This is outlined in the recent publication of 'Position statements for the use of dipstick urinalysis in assessing evidence of UTI in adults' (October 2021).
- A very limited number of facilities were recording antimicrobial use locally (6%) to monitor antimicrobial consumption, and no feedback to prescribers or access to antimicrobial resistance summaries were identified. A process for collection of a standardised monthly minimum dataset to monitor ongoing prevalence of healthcare associated infection/antimicrobial resistance (HCAI/AMR) and antimicrobial consumption has been developed and made available to all HSE RCFs for Older Persons to facilitate ongoing national, regional and local surveillance, with analysis, reporting and feedback, this potentially could be explored and expanded to Mental Health facilities.
- Awareness of the National community antimicrobial prescribing guidelines, which are recommended for this patient cohort, amongst medical staff who prescribe antimicrobials was not assessed as part of this PPS. Awareness was low amongst nursing staff (4%). Use of acute hospital guidelines, whilst anticipated due to some instances of co-location with acute hospitals and close working relationships, was not encountered frequently.
- Access to antimicrobial stewardship (AMS) education was reported as being limited (8%).

The results of the survey show that there are opportunities for improvements to ensure that antimicrobial use in HSE Mental Health facilities is optimised. This in turn, will reduce the harm associated with antimicrobial use, improve the safety of patients in terms of minimising adverse effects, *Clostridioides difficile* infection and development of antimicrobial resistance.

The key recommendations from this survey are detailed below. The results for every facility surveyed in the PPS will be provided to facilities in the form of this report or a summarised CHO-level report, with direct engagement from the AMP to provide feedback, support and education and to facilitate quality improvement where necessary. Emphasis should be placed on National findings and recommendations as opposed to CHO-level findings due to small numbers.

2.0 KEY RECOMMENDATIONS

KEY RECOMMENDATIONS

- The extent and duration of antimicrobial prescriptions for prophylaxis of urinary tract infection should be addressed. Every patient on urinary prophylaxis in excess of six months should be reviewed with a view to deprescribing.

- The practice of routine use of dipstick urinalysis for asymptomatic patients (every patient on admission and/or every few months) to support diagnosis of a urinary tract infection should cease.

- All clinical staff involved in prescribing, dispensing and administering antimicrobials in HSE Mental Health facilities should be aware of and refer to www.antibioticprescribing.ie, which contains the National antimicrobial prescribing guidelines for community. Referral to these guidelines is recommended for this patient cohort.

- Where an antimicrobial is considered necessary, use of a Green agent (preferred) should be selected instead of a Red agent (reserved) where possible. Red agents (such as clarithromycin and ciprofloxacin) are more associated with adverse effects, development of antimicrobial resistance and drug interactions (particularly with co-prescription of psychotropic medications).

- Antimicrobials should be prescribed for the shortest effective duration for example three days for an uncomplicated lower urinary tract infections in females, five days for lower respiratory tract infections.

3.0 INTRODUCTION

A Point Prevalence Survey (PPS) of Antimicrobial Use was conducted in a sample of HSE Mental Health Facilities (MHFs) in the period November 2021 to January 2021 in seven of nine Community Healthcare Organisations (CHOs) in Ireland.

In 2020, the Department of Health provided significant funding to support the implementation of Ireland's National Action Plan on Antimicrobial Resistance (iNAP) 2017-2020, and subsequent action plan (iNAP2) 2021-2025. This funding enabled the recruitment of an antimicrobial pharmacist (AMP) in each of the nine CHOs in Ireland, to support delivery of a Community Antimicrobial Stewardship Programme. This survey, focused on antimicrobial stewardship in inpatient MHFs, was conducted by senior antimicrobial pharmacists and this report outlines the findings of the PPS conducted in 51 HSE Mental Health facilities across seven CHOs.

Effective antimicrobial stewardship ensures the optimal selection, dose, and duration of an antimicrobial therapy that leads to the best clinical outcome for the treatment or prevention of an infection while producing the fewest toxic effects and the lowest risk for subsequent resistance. Current scientific literature emphasises the need to reduce the use of inappropriate antimicrobials in all health care settings due to antimicrobial resistance. The evidence is limited regarding antimicrobial utilisation in Mental Health inpatient settings and whether there are opportunities for improvement. Antimicrobial consumption in these settings would generally be considered lower than that of general hospitals and dedicated long-term care facilities (LTCFs) for Older Persons, however an aging population, the LTC provided to some patients, the nature of congregated care settings (where prevalence of healthcare-associated infection and antimicrobial resistance may be higher), and inclusion of specialties such as Psychiatry of Later Life, make it an area of interest for antimicrobial stewardship. Furthermore, antimicrobials have several drug–drug interactions with psychotropic drugs that can lead to adverse events or treatment failure.

Antimicrobial use in inpatient mental health care settings has not been extensively examined before in Ireland. In a European-wide Point Prevalence Survey of Healthcare-Associated Infection and Antimicrobial Use in Long-Term Care Facilities (HALT) 2016, 23 Mental Health LTCFs participated providing data for 505 residents.[1] The prevalence of antimicrobial use in this subgroup was 7.7%. The overall national crude prevalence for antimicrobial use in all Irish LTCFs was found to be twice that of the European average (9.8% vs 4.9%)[1,2] however the European prevalence for Mental Health LTCFs for benchmarking was not reported. In 2021, a study in Iowa, in the US, examined antimicrobial use across 111 mental health inpatient units.[4] This study found that 1 in 10 patients in a mental health unit were exposed to an antimicrobial during their stay, and whilst that exposure was lower than that of general hospitals, targets for major improvement were identified such as accurate diagnosis and treatment of urinary tract infections.[4]

For CHO-based AMPs, assessment of prevalence and quality of antimicrobial use in MHFs including supporting systems and structures was considered a priority to expand and identify any changes in practice from 2016 in long-term care, establish a baseline for all MHFs from which to measure improvement, and inform targets for improvement. This report includes

broad comparisons to findings of the HALT Study 2016. Limitations to making comparison to HALT 2016 findings include differences in the quantity and types of facilities surveyed (such as inclusion of non-LTC beds for Mental Health), seasonal variation (summer versus winter) and that this survey was conducted during the COVID-19 pandemic which may have influenced findings.

In contrast to HALT studies, where data collection was conducted by local data collectors within a facility, in this instance data collection was conducted in person by the AMP. Data on healthcare-associated infection was not gathered and the survey focused solely on antimicrobial use. However, in addition to antimicrobial data fields collected by HALT, this PPS collected and assessed additional information including adherence of antimicrobial prescribing to antimicrobial prescribing guidelines, rate of antimicrobial use over 30 days and duration of antimicrobial therapy. It is worth noting that non-adherence with guidelines should not necessarily be interpreted as poor practice, but simply that it deviates from the specified guidelines. It is recognised that clinical judgement applies to the use of all antimicrobial agents. Adherence was assessed to provide intelligence and examine where supports may be required or guidelines may need to be enhanced or developed. To provide an example; for treatment of an uncomplicated urinary tract infection (UTI), cefalexin is an option recommended in the National antimicrobial prescribing guidelines at a dose of 500mg twice daily, however, in the PPS, there was an instance where a dose of 500mg four times daily was prescribed. Whilst this dose is safe and effective, it was classified as non-adherent regarding dosing regimen when assessed against guidelines as it represents an opportunity for reducing antimicrobial exposure when a twice daily dose is considered adequate.

4.0 PPS OBJECTIVES

i. To assess the quantity of antimicrobial use in HSE Mental Health Facilities
ii. To assess the quality and type of antimicrobial use against relevant antimicrobial guidelines (www.antibioticprescribing.ie or local guideline if applicable)
iii. To examine systems and structures in place to support antimicrobial stewardship in HSE Mental Health Facilities
iv. To provide CHO-based Antimicrobial Pharmacists (AMPs), Health Service Executive (HSE), Mental Health Commission, Department of Health, the managers, doctors, nurses and pharmacists caring for patients in all of the participating facilities with information for action to influence positive antimicrobial stewardship practice
v. To provide a benchmark of antimicrobial use in HSE Mental Health Facilities against which future antimicrobial stewardship initiatives can be measured

5.0 METHODOLOGY

The Point Prevalence Survey (PPS) of Antimicrobial Use was conducted in a sample of HSE Mental Health Facilities in seven of nine CHO's (n=51) from November 2021 to January 2022. Due to differing prescribers and arrangements within single facilities (e.g. rehabilitation service, Psychiatry of Later Life specialty, off-site unit), a number of facilities requested

separate examination and results for different service types in their facility and this was facilitated.

The survey was conducted by CHO-based AMPs, facilitated by Mental Health Facility Managers and Staff, including Clinical Directors, and was led and co-ordinated by the Chief Antimicrobial Pharmacist in Quality & Patient Safety, HSE Community Healthcare. The National Antimicrobial Resistance and Infection Control (AMRIC) team were consulted on design, findings and recommendations.

Data collection forms, survey protocol and data entry tools were designed with reference to the previous HALT study in 2016, and the PPS in HSE Residential Care Facilities (RCFs) for Older Persons 2020/2021. All HSE MHFs were identified within the participating CHOs, a random sample was selected (incorporating different care types) and the Person in Charge (PIC) in each selected facility was contacted by the AMP in advance of the survey to arrange a suitable day and time for data collection. A selection of different care types were included, with approximately 60% (n=33) of all HSE Approved Centres nationally captured, 15% (n=16) of all HSE 24-hour staffed residences and 25% (n=2) of Continuing-Care units. This accounts for approximately one third of all inpatient HSE Mental Health facilities nationally. A variety of bed types were captured amongst these facilities, with 38% Acute, 29% Psychiatry of Later Life, 18% Rehabilitation and Recovery, and 16% Continuing Care. Generally, smaller sites were surveyed on one day; some larger sites took more than one day. Appropriate infection prevention and control precautions were taken to mitigate the risk of contracting and transmitting COVID-19.

On the day of the PPS, all eligible patients (i.e. those present at 8am who normally resided in the facility) were surveyed for demographic details, antimicrobials currently prescribed and antimicrobials prescribed over the previous 30 days. As per HALT study methodology, antivirals and topical antimicrobial agents were excluded.[1]

On the day of the site visit, where possible, available nursing and medical staff were also provided with education by the AMP regarding access to National community antimicrobial prescribing guidelines. Feedback was also provided by the AMP on any issues with antimicrobial use that were identified during the PPS.

Data were collected on paper forms and subsequently entered electronically to Microsoft Excel for analysis, with use of a HSE shared drive to facilitate national collation and analysis. All data were checked for errors, omissions and inconsistencies before analyses.

The output of this PPS includes this National report in addition to summarised CHO-level reports where considered necessary provided by AMP's to each of the participating facilities and CHO managers. Due to smaller numbers within individual CHOs, emphasis should be placed on national findings and recommendations.

6.0 FINDINGS:

Findings of the Point Prevalence Survey are presented in this section in a series of tables and figures. Study findings are explained in more detail in the discussion section that follows.

6.1 OVERVIEW OF FACILITY AND DEMOGRAPHIC DATA:

Table 1: Facility & Demographic data

		CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Facility Demographics									
Number of facilities/ services surveyed		7	11	6	5	7	9	6	**51**
Bed capacity		128	331	144	86	198	227	193	**1307**
% bed occupancy		80%	78%	81%	65%	69%	81%	78%	**77%**
Number of patients surveyed		103	257	116	56	136	184	151	**1003**
Proportion of LTC patients (>30days)		58%	76%	82%	77%	63%	68%	70%	**71%**
Type of beds surveyed	Psychiatry of Later Life/Old Age	12% *(n=12)*	32% *(n=82)*	50% *(n=58)*	55% *(n=31)*	13% *(n=17)*	39% *(n=72)*	10% *(n=15)*	**29%** *(n=287)*
	Acute	46% *(n=47)*	27% *(n=70)*	34% *(n=39)*	23% *(n=13)*	46% *(n=63)*	39% *(n=71)*	55% *(n=83)*	**38%** *(n=386)*
	Continuing care (non-acute)	35% *(n=36)*	24% *(n=62)*	3% *(n=4)*	0%	0%	5% *(n=9)*	31% *(n=47)*	**16%** *(n=158)*
	Rehab & Recovery	8% *(n=8)*	17% *(n=44)*	13% *(n=15)*	21% *(n=12)*	41% *(n=56)*	18% *(n=34)*	5% *(n=7)*	**18%** *(n=176)*
Patient Demographics									
% Male		51%	58%	56%	55%	52%	54%	61%	**56%**
Age (yrs)	<65	66%	56%	36%	36%	73%	65%	65%	**59%**
	65-75	23%	26%	29%	27%	21%	18%	21%	**23%**
	75-85	9%	13%	25%	32%	4%	15%	12%	**14%**
	>85	2%	5%	9%	5%	1%	2%	2%	**4%**

6.2 PRESENCE OF DEVICES:

Table 2: Prevalence of indwelling urinary catheters and intravascular devices

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Presence of devices								
Patients with Urinary Catheter	1% *(n=1)*	3% *(n=7)*	2% *(n=2)*	5% *(n=3)*	1% *(n=1)*	1% *(n=2)*	1% *(n=2)*	**2%** *(n=18)*
Patients with an IV line	0%	0%	0%	0%	0%	0%	0%	**0%**

6.3 QUANTITY OF ANTIMICROBIAL (AM) USE:

Table 3: Quantity of antimicrobial use on the day of survey

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Prevalence of antimicrobial (AM) use on day of survey								
Prevalence of Patients on active AM	5.8% *(n=6)*	6.6% *(n=17)*	9.5% *(n=11)*	8.9% *(n=5)*	2.9% *(n=4)*	6.5% *(n=12)*	5.3% *(n=8)*	**6.3%** *(n=63)*
% patients on therapeutic AM	1.9%	2.7%	5.2%	5.4%	2.2%	3.8%	2.6%	**3.2%**
% patients on prophylactic AM	3.9%	4.3%	4.3%	3.6%	0.7%	3.3%	2.6%	**3.3%**
Number of active AM prescriptions	6	18	11	6	4	13	8	**66**

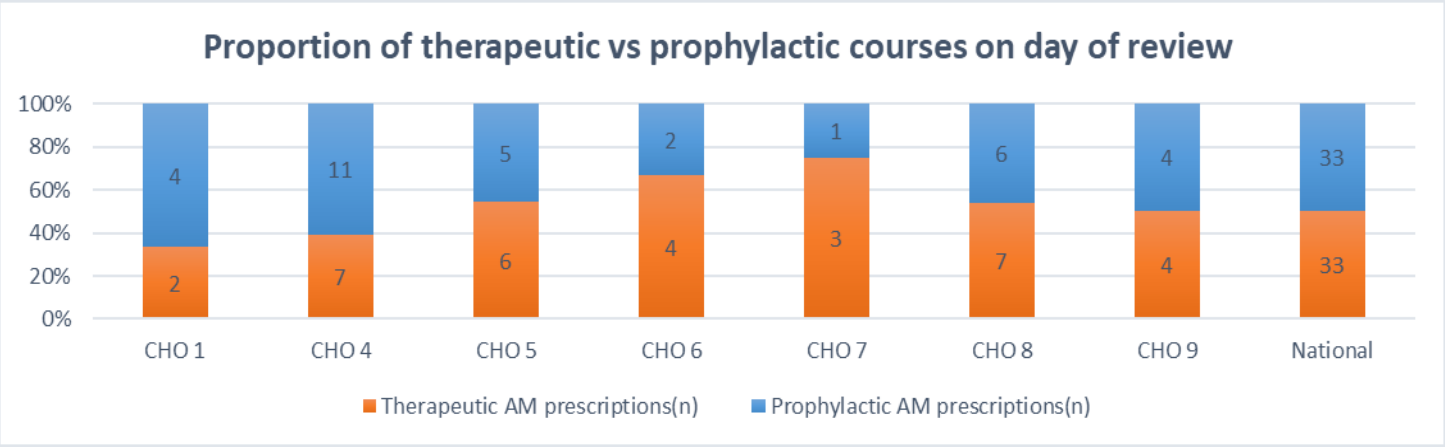


Figure 1: Proportion of therapeutic vs prophylactic antimicrobial use in each CHO on day of survey

There were 66 active AM prescriptions on day of survey. 50% were for treatment (3.2% of all patients), 50% were for prophylaxis (3.3% of all patients).

Table 4: Quantity of Antimicrobial Use over 30 days

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Prevalence of antimicrobial use over 30 days								
% Patients on AM therapy in the last 30 days	14% *(n=14)*	16% *(n=40)*	19% *(n=22)*	18% *(n=10)*	8% *(n=11)*	21% *(n=38)*	12% *(n=18)*	**15%** *(n=153)*
Number of AM agents prescribed over 30 days	18	53	27	20	13	45	21	**197**
Rate of AM days per 1000 patient days	73.4	89.4	90.8	129.0	25.9	89.5	54.0	**76.8**

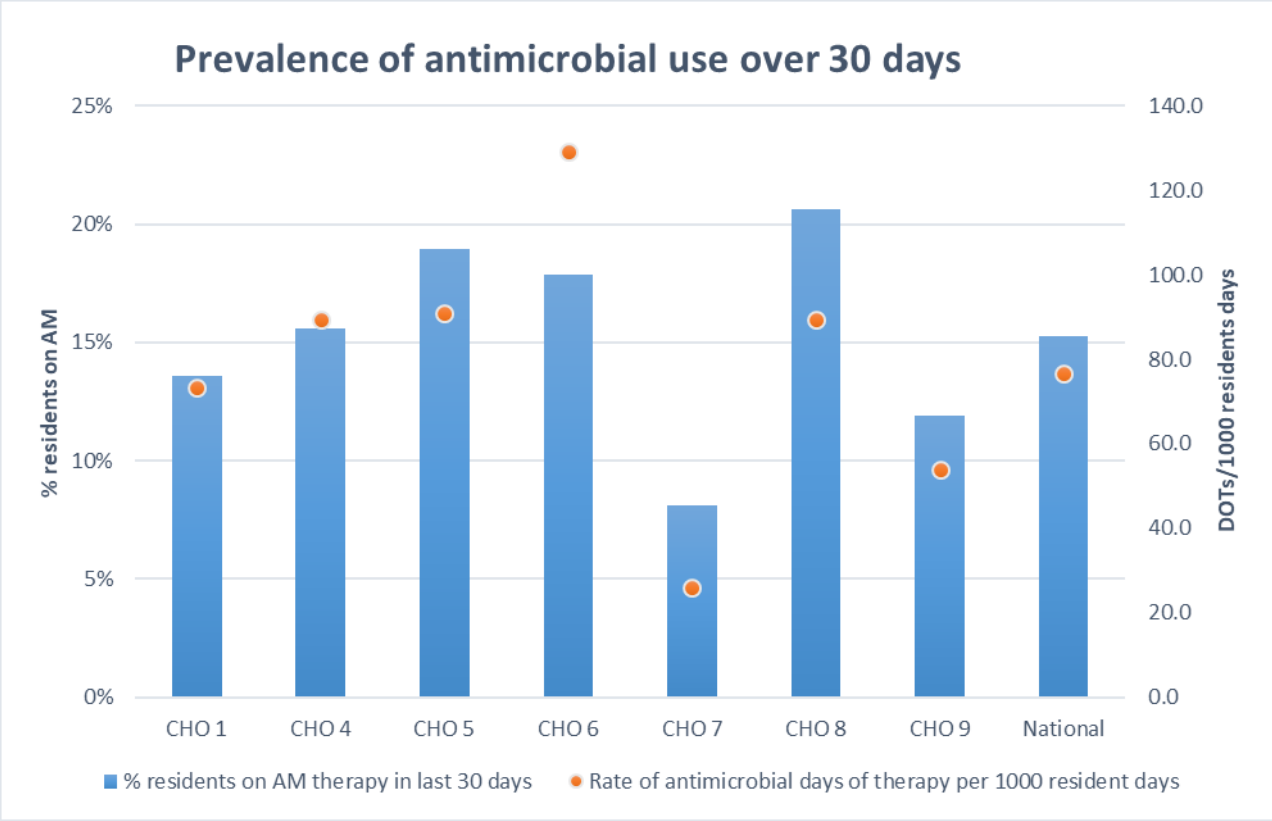


Figure 2: Prevalence of antimicrobial use in each CHO over a 30-day period

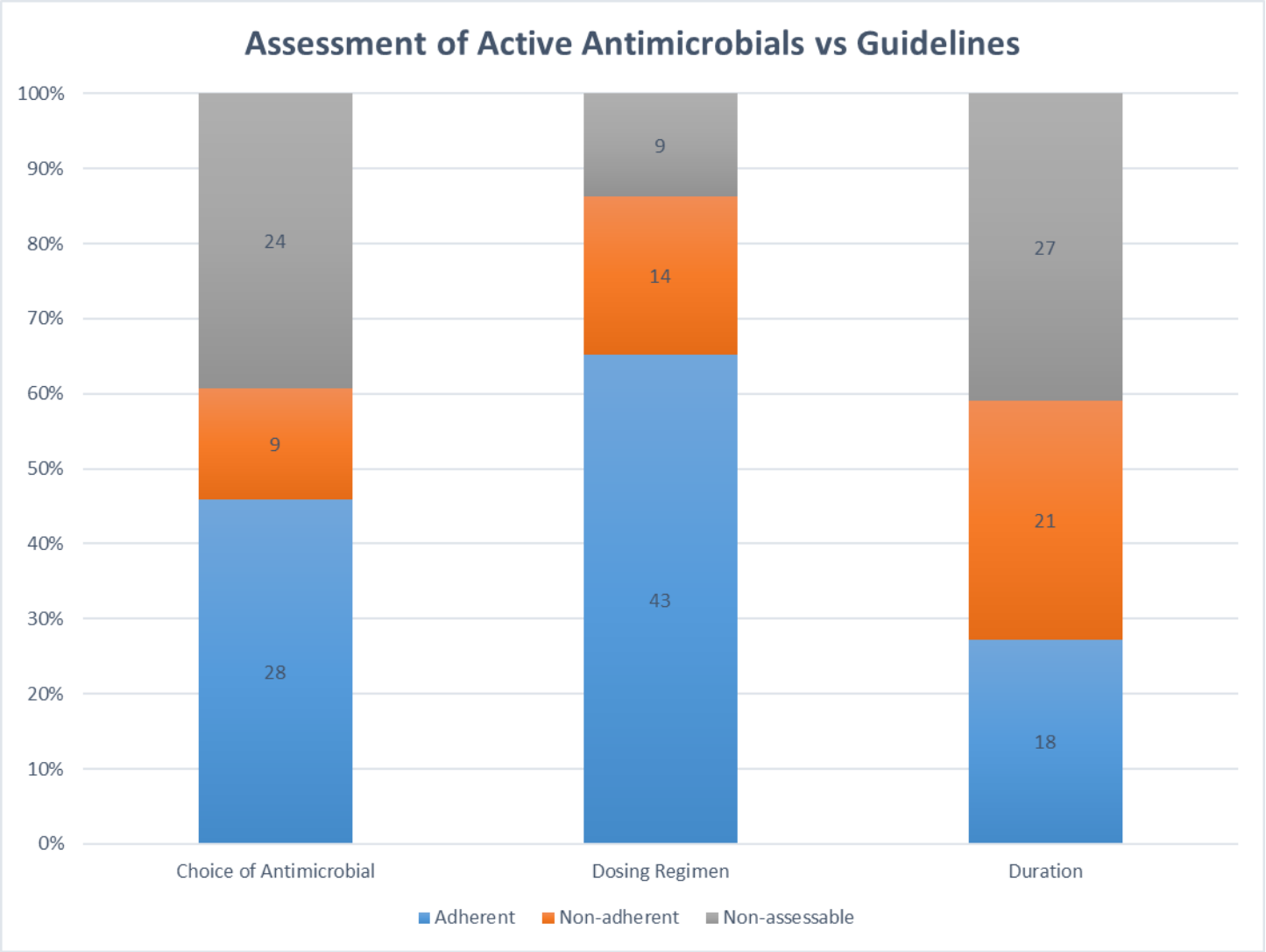
6.4 QUALITY OF ANTIMICROBIAL USE:

A series of indicators were assessed for antimicrobial prescriptions on the day of survey based on good practice for antimicrobial stewardship and medication safety.

Table 5: Quality indicators of antimicrobial use

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Allergy status documented$	85% *(n=88)*	93% *(n=240)*	97% *(n=112)*	98% *(n=55)*	97% *(n=132)*	96% *(n=176)*	96% *(n=145)*	**95%** *(n=948)*
Documentation of indication	50%	78%	55%	100%	100%	38%	75%	**67%**
Documentation of stop/review date	33%	33%	36%	67%	75%	54%	63%	**47%**
Stop/Review date for therapeutic	100%	86%	67%	75%	100%	86%	100%	**85%**
Stop/Review date for prophylactic	0%	0%	0%	50%	0%	17%	25%	**9%**
Urine specimens sent to laboratory prior to antimicrobial prescribing for therapeutic UTI								
Specimen sent	100% *(n=1)*	100% *(n=1)*	40% *(n=2)*	NA	67% *(n=2)*	75% *(n=3)*	75% *(n=3)*	**67%** *(n=12)*
Assessment of Renal Function for patients on Antimicrobials *(within 6 months)*								
CrCl >50ml/min	50%	53%	73%	60%	50%	58%	100%	**63%**
CrCl 30-50ml/min	0%	6%	0%	0%	25%	17%	0%	**6%**
CrCl 10-30ml/min	0%	6%	18%	0%	0%	0%	0%	**5%**
CrCl <10ml/min	0%	0%	0%	0%	0%	0%	0%	**0%**
Unknown	50%	35%	9%	40%	25%	25%	0%	**25%**
Assessment as per prescribing guidelines (www.antibioticprescribing.ie or local) *(*non-assessable if insufficient information available or guideline not available)*								
Adherence with choice of agent*	100% *(n=2)*	80% *(n=8)*	71% *(n=5)*	67% *(n=2)*	100% *(n=2)*	78% *(n=7)*	50% *(n=2)*	**76%** *(n=28)*
Adherence with dosing regimen^	67% *(n=4)*	93% *(n=13)*	14% *(n=1)*	100% *(n=6)*	100% *(n=3)*	69% *(n=9)*	88% *(n=7)*	**75%** *(n=43)*
Adherence with duration	0% *(n=0)*	56% *(n=5)*	43% *(n=3)*	100% *(n=3)*	0% *(n=1)*	44% *(n=4)*	43% *(n=3)*	**46%** *(n=18)*

^ In absence of laboratory results/documented recent measure of renal function (within 6 months), renal function was assumed to be normal and dosing regimen assessed accordingly.



Whilst 76% of assessable prescriptions were adherent with antimicrobial prescribing guidelines, this reflects less than 50% of all prescriptions. Absence of guidelines for the infection type and/or insufficient information resulted in 36% (n=24) prescriptions being non-assessable. See Appendix 2

Examples of non-adherence and commentary are detailed in Appendix 1

Figure 3: Adherence of antimicrobial use (Choice, Dosing & Duration) versus Antimicrobial Prescribing Guidelines

6.4 TYPES OF ANTIMICROBIAL USE

Table 6: Categorisation of red/green usage

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Category of antimicrobials prescribed over 30 days								
A "green/red" antibiotic categorisation is a simple tool which has been developed to assist community prescribers in choosing an antibiotic which is preferred (Green; has fewer side effects and less likely to lead to resistant infections vs Red; more associated with adverse drug reactions and antibiotic resistance and should be reserved).[3] (Appendix 3)								
% Red Agents	33% *(n=6)*	47% *(n=25)*	30% *(n=8)*	16% *(n=3)*	38% *(n=5)*	36% *(n=16)*	52% *(n=11)*	**38%** *(n=74)*
% Green Agents	61% *(n=11)*	47% *(n=25)*	63% *(n=17)*	79% *(n=15)*	54% *(n=7)*	64% *(n=29)*	43% *(n=9)*	**58%** *(n=113)*
% Other*	6% *(n=1)*	6% *(n=3)*	7% *(n=2)*	5% *(n=1)*	8% *(n=8)*	0%	5% *(n=1)*	**5%** *(n=9)*

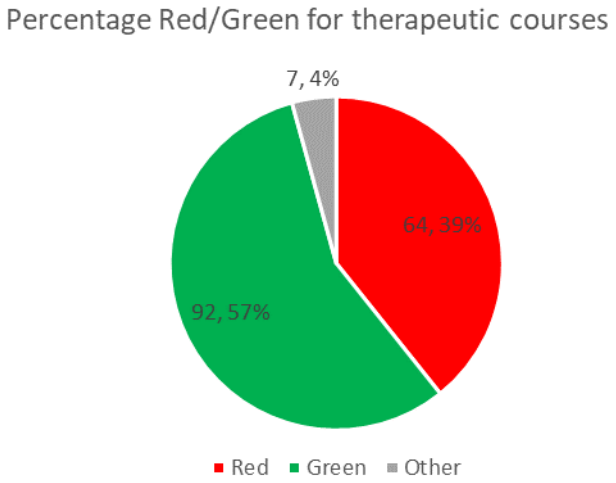


Figure 4: Percentage of red/green agent usage for therapeutic courses

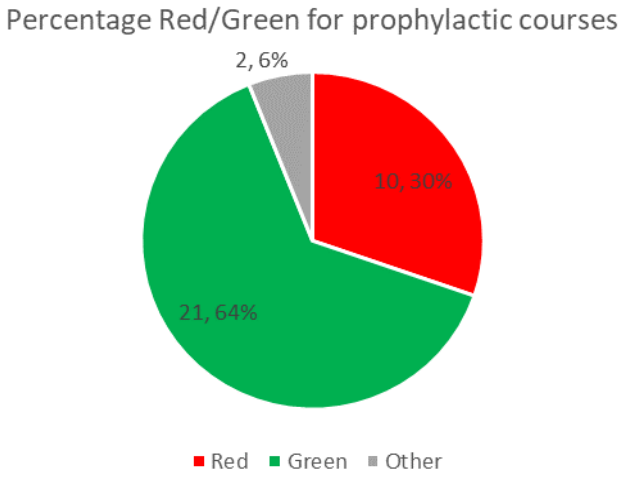


Figure 5: Percentage of red/green agent usage for prophylactic courses

*Antibiotics encountered not covered by the red/green classification were classified as 'Other': Co-trimoxazole (x3), Metronidazole (x3), Minocycline (x2). Fluconazole (x1) therapy were also categorised as 'Other'

TYPES OF ANTIMICROBIALS cont'd

Table 7: Route & Indication for antimicrobial use

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Route of Antimicrobial Therapy over 30 days								
Oral	100%	100%	100%	100%	100%	100%	100%	**100%**
Indication for Antimicrobial Therapy over 30 days								

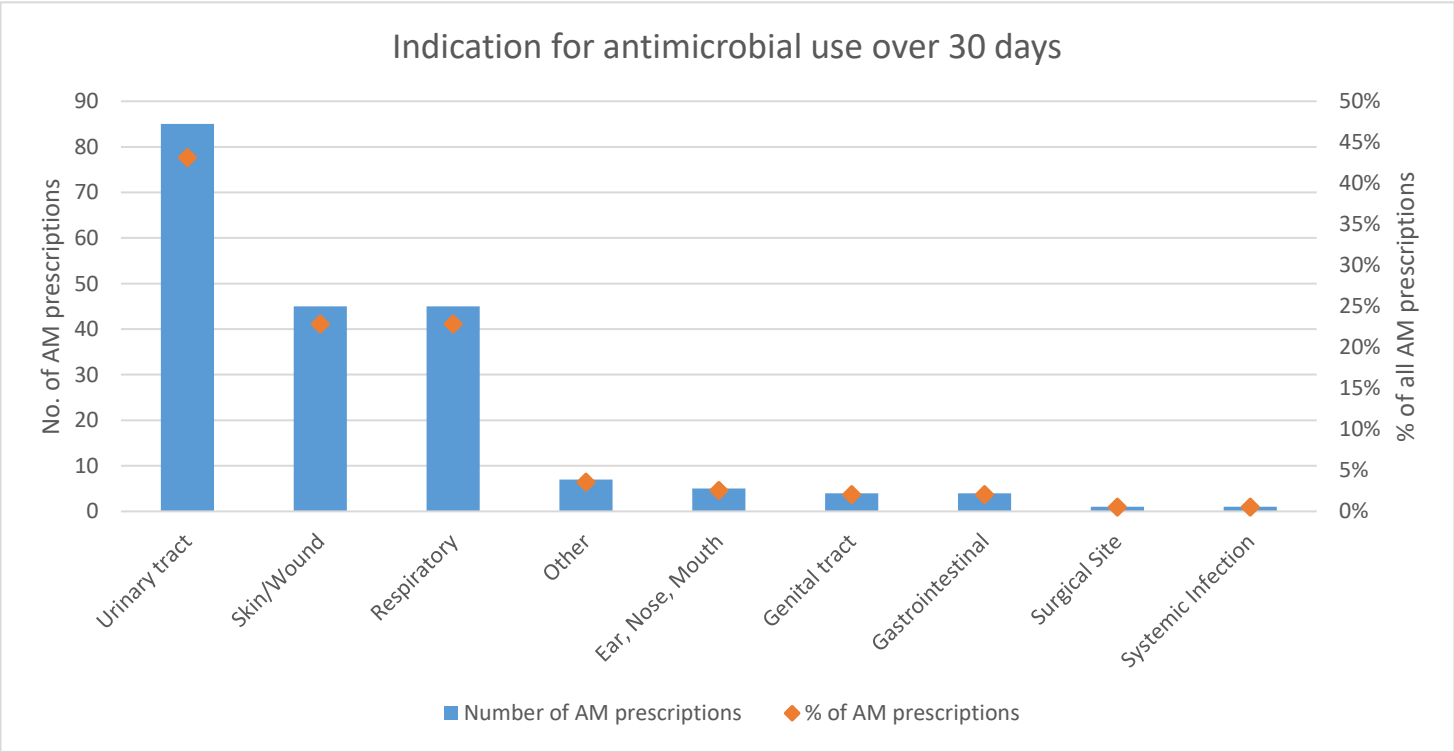


Figure 6: Most common indications for antimicrobial use

Infection of the urinary tract (43%), respiratory tract (23%) or skin/wound (23%) accounted for the majority (89%) of antimicrobial prescriptions.

TYPES OF ANTIMICROBIALS cont'd

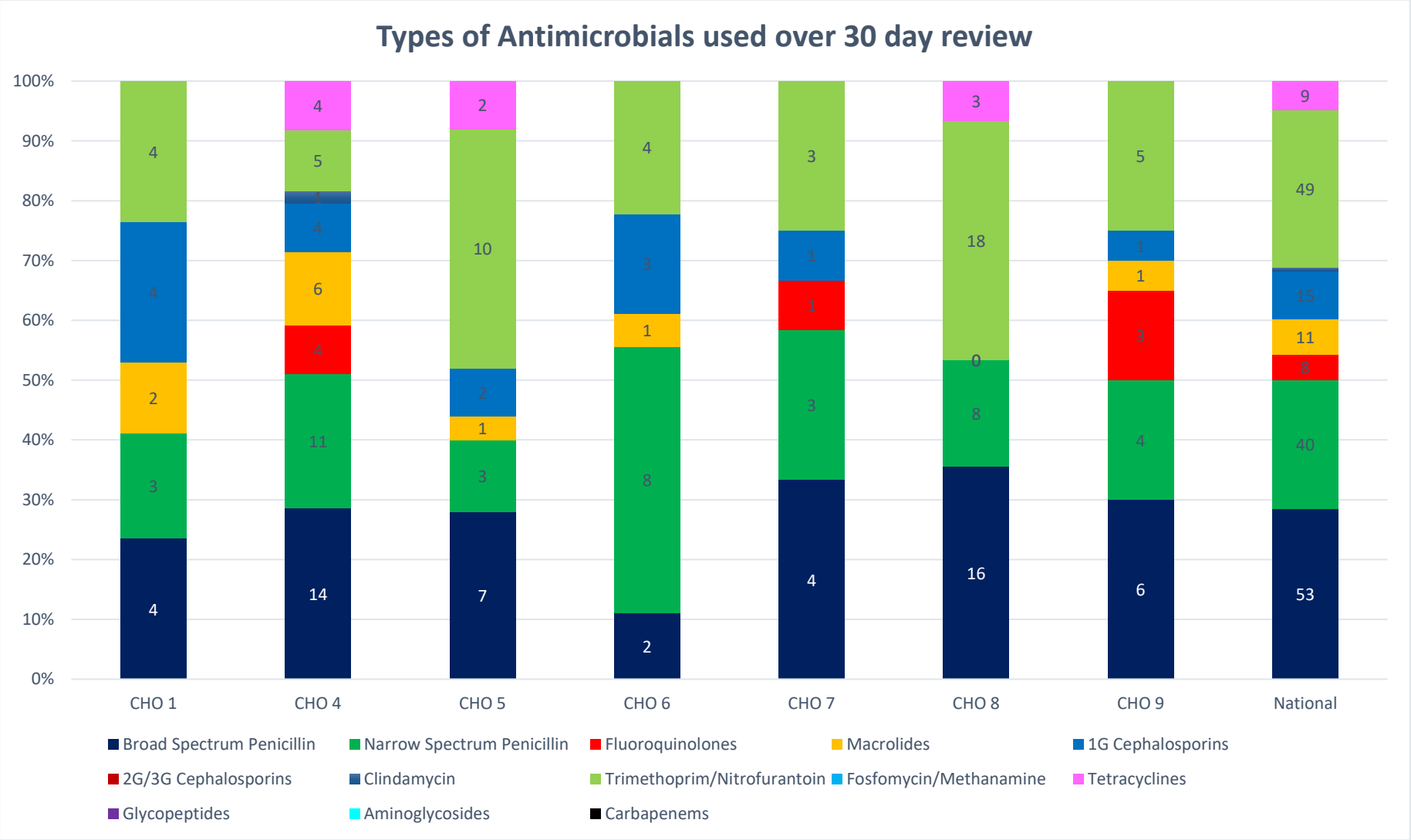
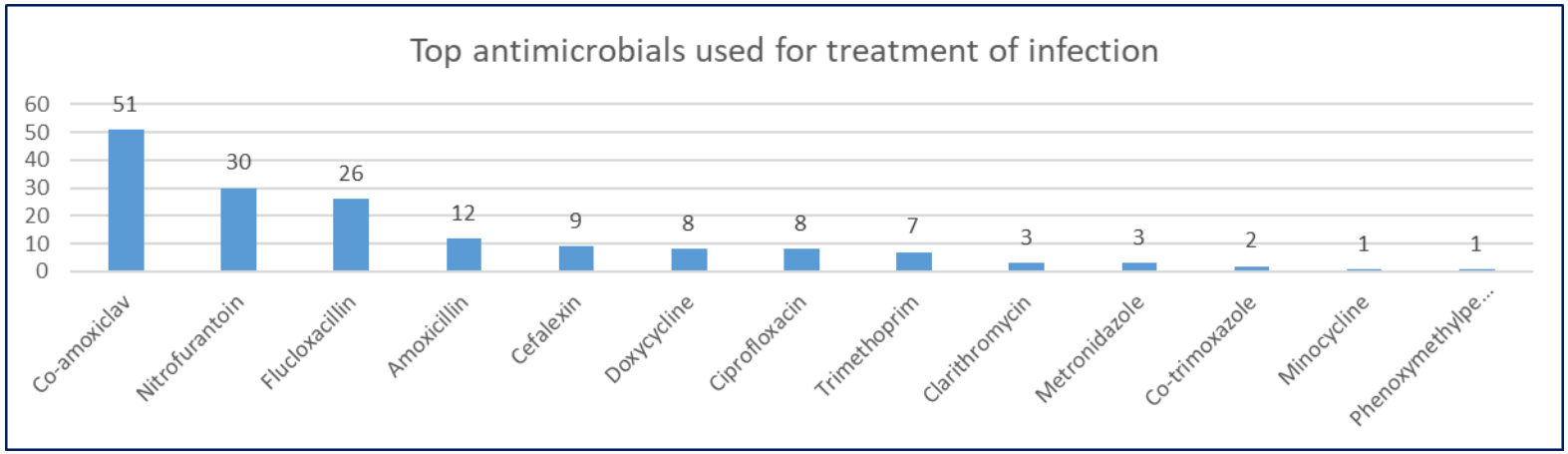


Figure 7: Specific types of antimicrobials in use over a 30-day review

TYPES OF ANTIMICROBIALS cont'd

Top 10 Antimicrobial Agents used for Treatment of infections over 30 days



Median course duration was 7 days

Figure 8: Top 10 antimicrobials used for treatment of infection over a 30-day review

Top ten antimicrobial agents used per active infection type over 30 days

Table 8: Top ten antimicrobial agents used per active infection type

Urinary tract infection *(n=66)**	Respiratory tract infection *(n=37)*	Skin/Wound Infection *(n=42)*
1. Nitrofurantoin *(n=30)*	1. Co-amoxiclav *(n=20)*	1. Flucloxacillin *(n=25)*
2. Co-amoxiclav *(n=15)*	2. Amoxicillin *(n=7)*	2. Co-amoxiclav *(n=10)*
3. Cefalexin *(n=8)*	3. Doxycycline *(n=5)*	3. Doxycycline *(n=2)*
4. Trimethoprim *(n=7)*	4. Ciprofloxacin *(n=2)*	4. Minocycline *(n=1)*
5. Ciprofloxacin *(n=5)*	5. Clarithromycin *(n=2)*	5. Phenoxymethylpenicillin *(n=1)*
6. Co-trimoxazole *(n=1)*	6. Metronidazole *(n=1)*	6. Clindamycin *(n=1)*
7. -	7. -	7. Lymecycline *(n=1)*
8. -	8. -	8. Cefalexin *(n=1)*
9. -	9. -	9. -
10. -	10. -	10. -

**As a representative sample, 11% (n=2) of 18 active prescriptions (on the day of PPS) for treatment of Urinary Tract Infections were for urinary catheter-associated infections.*

6.5 FOCUS ON PROPHYLAXIS

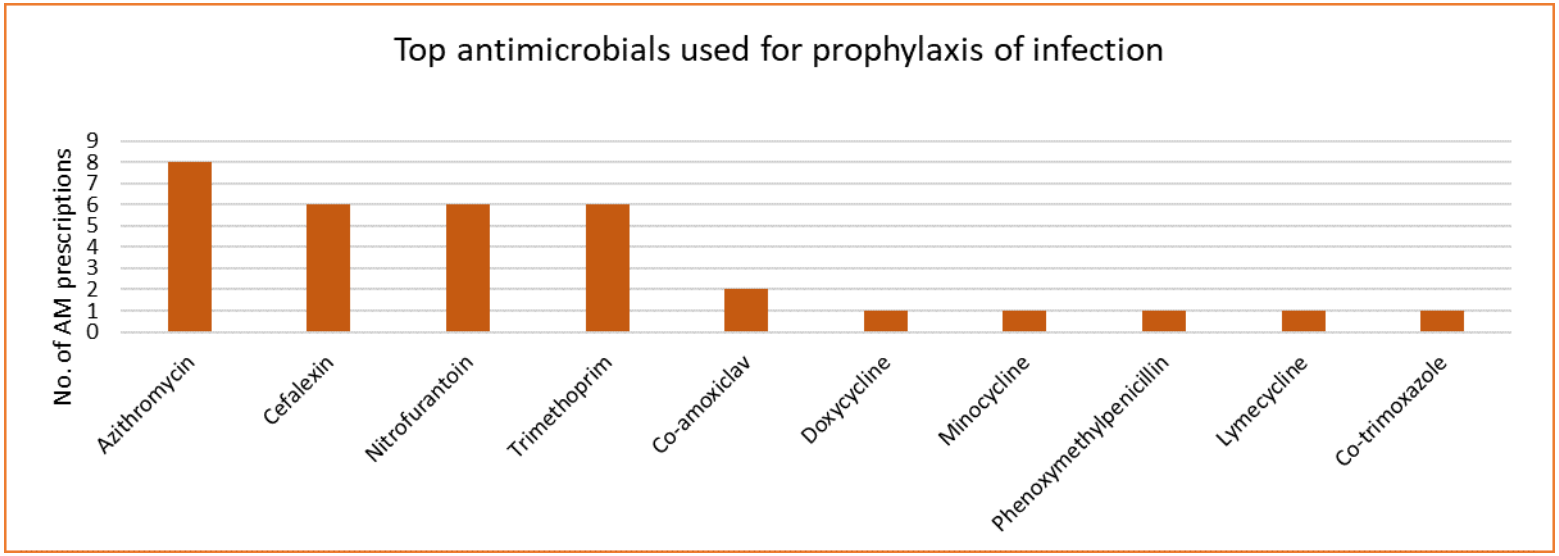


Figure 9: Top 10 antimicrobials used for prophylactic antimicrobial therapy

Table 9: Indication for prophylactic antimicrobial use

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Indication for prophylaxis as a proportion of all prophylaxis								
Urinary tract	50% *(n=2)*	45% *(n=5)*	80% *(n=4)*	50% *(n=1)*	0%	83% *(n=5)*	50% *(n=2)*	**58%** *(n=19)*
% all patients on urinary prophylaxis	1.9%	1.9%	3.4%	1.8%	0%	2.7%	1.3%	**1.9%**
Respiratory Tract	50% *(n=2)*	27% *(n=3)*	20% *(n=1)*	50% *(n=1)*	0%	0%	25% *(n=1)*	**24%** *(n=8)*
Skin/Wound	0%	18% *(n=2)*	0%	0%	0%	0%	25% *(n=1)*	**9%** *(n=3)*
Other	0%	9% *(n=1)*	0%	0%	100% *(n=1)*	17% *(n=1)*	0%	**9%** *(n=3)*

6.5 FOCUS ON PROPHYLAXIS cont'd

Table 10: Focus on prophylactic antimicrobial use

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Duration of prophylaxis								
Less than 6 months	0%	0%	60% *(n=3)*	50% *(n=1)*	0%	17% *(n=1)*	50% *(n=2)*	**21%** *(n=7)*
6-12 months	0%	0%	0%	50% *(n=1)*	0%	17% *(n=1)*	0%	**6%** *(n=2)*
More than 1 year	75% *(n=3)*	82% *(n=9)*	40% *(n=2)*	0%	0%	50% *(n=3)*	25% *(n=1)*	**55%** *(n=18)*
Unknown	25% *(n=1)*	18% *(n=2)*	0%	0%	100% *(n=1)*	17% *(n=1)*	25% *(n=1)*	**18%** *(n=6)*
Where was prophylactic prescription initiated?								
Mental Health facility	25% *(n=1)*	27% *(n=3)*	80% *(n=4)*	0%	0%	50% *(n=3)*	50% *(n=2)*	**39%** *(n=13)*
Acute hospital	50% *(n=2)*	27% *(n=3)*	0%	100% *(n=2)*	100% *(n=1)*	17% *(n=1)*	25% *(n=1)*	**30%** *(n=10)*
Other	0%	0%	20% *(n=1)*	0%	0%	0%	25% *(n=1)*	**6%** *(n=2)*
Unknown	25% *(n=1)*	45% *(n=5)*	0%	0%	0%	33% *(n=2)*	0%	**24%** *(n=8)*
Patients prescribed Urinary Tract Infection prophylaxis								
% with urinary catheter	50% *(n=1)*	40% *(n=2)*	0%	0%	0%	0%	50% *(n=1)*	**21%** *(n=4)*
% Male	50% *(n=1)*	40% *(n=2)*	50% *(n=2)*	100% *(n=1)*	0%	20% *(n=1)*	0%	**37%** *(n=7)*

6.6 SYSTEMS & STRUCTURES IN PLACE TO SUPPORT ANTIMICROBIAL STEWARDSHIP

Table 11: Systems & Structures in place to support antimicrobial stewardship

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
GOVERNANCE								
Is there a governance committee where antimicrobial stewardship (AMS) is discussed? (IPC/AMS, HCAI/AMR, IPCC or Drugs & Therapeutics)								
% facilities reporting to governance committee where AMS discussed	100%	100%	100%	0%	100%	100%	100%	**90%**
Is there a named person onsite with responsibility for AMS?								
% facilities with named person for AMS	14%	18%	17%	0%	0%	33%	0%	**14%**
LABORATORY/DIAGNOSTICS								
Is there access electronically to lab reports on site?								
Electronic access to laboratory results on site	71%	64%	100%	100%	43%	44%	67%	**67%**
Is dipstick urinalysis performed for detection of UTIs triggering C&S?								
Routinely Every patient on admission and/or every patient periodically (e.g. three monthly)	43% *(n=3)*	73% *(n=8)*	17% *(n=1)*	80% *(n=4)*	43% *(n=3)*	67% *(n=6)*	33% *(n=2)*	**53%** *(n=27)*
Sometimes *When patient has signs and symptoms of infection*	29% *(n=2)*	27% *(n=3)*	83% *(n=5)*	20% *(n=1)*	43% *(n=3)*	33% *(n=3)*	67% *(n=4)*	**41%** *(n=21)*
Rarely	29% *(n=2)*	0%	0%	0%	14% *(n=1)*	0%	0%	**6%** *(n=3)*

6.6 SYSTEMS & STRUCTURES IN PLACE TO SUPPORT ANTIMICROBIAL STEWARDSHIP cont'd

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
ANTIMICROBIAL GUIDELINES								
Which antimicrobial guidelines are accessed by nursing staff onsite?								
www.antibioticprescribing.ie	0%	0%	17% *(n=1)*	0%	0%	0%	17% *(n=1)*	**4%** *(n=2)*
Acute hospital guidelines	0%	0%	0%	0%	29% *(n=2)*	11% *(n=1)*	17% *(n=1)*	**8%** *(n=4)*
Local guidelines	0%	0%	0%	0%	0%	0%	17% *(n=1)*	**2%** *(n=1)*
None	100% *(n=7)*	100% *(n=11)*	83% *(n=5)*	100% *(n=3)*	71% *(n=5)*	89% *(n=8)*	50% *(n=3)*	**86%** *(n=44)*
EDUCATION ON ANTIMICROBIAL USE AND STEWARDSHIP (AMS)								
Is there any training on antimicrobial use for staff?								
% facilities reporting access to AMS education	0%	0%	0%	0%	0%	0%	67%	**8%**
MEDICAL CARE								
Who provides medical care?								
Directly employed Psychiatry team	43% *(n=3)*	45% *(n=5)*	40% *(n=2)*	40% *(n=2)*	0%	44% *(n=4)*	17% *(n=1)*	**33%** *(n=17)*
Personal GP/practice	0%	55% *(n=6)*	0%	0%	43% *(n=3)*	0%	17% *(n=1)*	**20%** *(n=10)*
Both Psychiatry and GPs	57% *(n=4)*	0%	60% *(n=4)*	60% *(n=3)*	14% *(n=1)*	44% *(n=4)*	30% *(n=3)*	**37%** *(n=19)*
Acute Consultant & Team	0%	0%	0%	0%	43% *(n=3)*	0%	17% *(n=1)*	**8%** *(n=4)*
Other	0%	0%	0%	0%	0%	12% *(n=1)*	0%	**2%** *(n=1)*
Does a clinical pharmacist attend onsite to review prescriptions?								
% facilities reporting Rx review by clinical pharmacist	71% *(n=5)*	27% *(n=3)*	0% *(n=0)*	60% *(n=3)*	43% *(n=3)*	44% *(n=4)*	50% *(n=3)*	**39%** *(n=20)*

SYSTEMS & STRUCTURES IN PLACE TO SUPPORT ANTIMICROBIAL STEWARDSHIP cont'd

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	National
Nurse prescribers who can prescribe antimicrobials								
Facilities with nurse prescribers for AM	0%	0%	0%	0%	0%	0%	0%	**0%**
ICT SUPPORT FOR AMS								
Access to electronic healthcare record (EHR)								
Proportion of facilities with EHR	0%	0%	0%	0%	14% *(n=1)*	22% *(n=2)*	0%	**6%** *(n=3)*
% of facilities with ePrescribing/ medications on EHR	0%	0%	0%	0%	14% *(n=1)*	0%	0%	**2%** *(n=1)*
ANTIMICROBIAL SUPPLY								
Where are antimicrobials supplied from?								
Single Community Pharmacy	43%	45%	0%	0%	57%	0%	33%	**27%**
Several Community Pharmacies	0%	0%	0%	0%	0%	33%	0%	**6%**
Onsite pharmacy (from wholesale)	0%	9%	0%	0%	0%	44%	0%	**10%**
Onsite pharmacy (from hospital)	14%	45%	0%	100%	0%	0%	0%	**14%**
Hospital direct to unit/patient stock	43%	0%	100%	0%	43%	22%	67%	**43%**
Is there an emergency stock of antimicrobials held onsite?								
Emergency stock of AM held onsite#	29%	64%	100%	100%	43%	56%	67%	**63%**
Is there a restricted antimicrobial policy in place?								
Restricted AM policy in place	0%	0%	0%	0%	43%	0%	0%	**6%**

SYSTEMS AND STRUCTURES TO SUPPORT ANTIMICROBIAL STEWARDSHIP cont'd

	CHO 1	CHO 4	CHO 5	CHO 6	CHO 7	CHO 8	CHO 9	Overall
ANTIMICROBIAL CONSUMPTION AND SURVEILLANCE								
Collection of local antimicrobial consumption data								
% facilities who collect local AM consumption	14%	9%	0%	0%	14%	0%	0%	**6%**
Feedback to prescribers on antimicrobial consumption in facility								
% facilities providing AM consumption feedback	0%	0%	0%	0%	0%	0%	0%	**0%**
Local antimicrobial resistance patterns available								
% facilities with AM resistance surveillance	0%	0%	0%	0%	0%	0%	0%	**0%**
VACCINATION								
Influenza vaccination								
% facilities who offer seasonal influenza vaccine to at-risk LTC patients	100%	100%	100%	100%	100%	100%	100%	**100%**
COVID-19 vaccination								
% facilities who offer COVID-19 vaccine to at-risk LTC patients	100%	100%	100%	100%	100%	100%	100%	**100%**
Pneumococcal vaccination								
% facilities reporting record-keeping for pneumococcal vaccination for at-risk LTC patients	0%	27%	0%	40%	57%	11%	67%	**27%**

7.0 DISCUSSION:

Facility and demographic data:

A PPS of antimicrobial use was conducted in a sample of HSE Mental Health facilities (n=51) in CHOs 1,4,5,6,7,8 and 9 between November 2021 and January 2022, with data collected by CHO-based antimicrobial pharmacists. Twenty five percent (n=13) of facilities had previously participated in the HALT 2016 study of LTCFs.[1]

With a bed occupancy rate of 77%, a total of 1003 patients were eligible for inclusion and assessed on the day of survey. Of all bed types captured, 38% were Acute, 29% were Psychiatry of Later Life, 18% were Rehabilitation and Recovery, and 16% were Continuing-Care. The length of stay for the majority of patients (71%, n=711) captured was in excess of 30 days and was therefore classed as long-term care (LTC).

Male patients slightly predominated (56%), with 44% of patients included being female. Forty one percent of patients were over 65 years of age, with four percent of patients over 85 years of age. Fifty nine percent of patients were under 65 years of age.

It was identified that 2% (n=18) of patients had a urinary catheter in-situ (2% in Irish Mental Health LTCFs in HALT 2016)[1], with 0% of patients having an intravenous access device in-situ on the day of survey (0% in Irish Mental Health LTCFs in HALT 2016)[1].

Quantity of antimicrobial use

Overall prevalence of patients on antimicrobials, on the day of survey was 6.3% (ranging from 2.9% in CHO 7 to 9.5% in CHO 6 although numbers within individual CHOs are small). This compares to a crude prevalence of 7.7% in Irish Mental Health LTCFs in the HALT study 2016[1] and is therefore lower, however the variety of MHFs and inclusion of non-LTC beds (previously not assessed) may have influenced this figure. The European average prevalence for residents in LTCFs on antimicrobials in the 2016 HALT study was 4.9%,[2] therefore the overall rate of antimicrobial use in MHFs in Ireland remains higher than this European average for LTC.

This survey found, on a 30-day review of all patients, approximately one in six patients (15%, n=153) were identified as having had antimicrobial therapy within the previous month (197 different prescriptions). The days of therapy (DOTs) per 1000 patient days was also calculated; a standardised measure of assessing prevalence of antimicrobial use which can be used as a benchmark. This calculated measure was 76.8 DOTs per 1000 patient days overall, and ranged from 26 to 129 DOTs per 1000 patient days across CHOs. Interestingly, in the 2021 US study of 111 mental health units, the median inpatient antibiotic DOT per 1,000 days present was 73.5 and therefore this Irish finding is comparable to same.[4]

A large proportion of antimicrobial use was for prophylaxis of infection (50%) versus treatment of infection (50%). In Irish Mental Health LTCFs in HALT 2016, 71% of antimicrobials were prescribed for treatment, 29% for prophylaxis, with the overall European prevalence reporting treatment responsible for 69.5% of antimicrobial use and prophylaxis for 29.4%.[1,2] This indicates an increased proportion of prophylactic antimicrobial use in MHFs since 2016. Overall 3.3% of all patients were on prophylactic antimicrobials (ranging from 0.7% in CHO 7,

to 5.4% in CHO 6), compared to HALT 2016 for Irish Mental Health LTCFs where 2.4% were prescribed prophylactic antibiotics, and a European average of 1.5% in all LTCFs in HALT 2016.[1,2] 3.2% of patients were on treatment courses (ranging from 1.9% in CHO 1 to 5.4% in CHO 6).

Quality of antimicrobial use

A series of quality indicators were assessed for antimicrobial prescriptions on the day of survey based on good practice for antimicrobial stewardship and medication safety.

Documentation of allergy status:

Documentation of allergy status (on the medication chart) for all patients assessed was good, with completion in 95% of patients, similar in each CHO. Overall incidence of penicillin allergy was 8%. Although not measured, anecdotally, nature of allergy was not well documented which would influence whether or not a patient with a penicillin allergy would be tolerant of an agent with cross-reactivity such as a cephalosporin.[5] Documentation of allergy status is recommended for all patients.

Documentation of Indication:

Indication for the antimicrobial was documented in the medical notes and/or medication chart for 67% of antimicrobial prescriptions (85% for therapeutic prescriptions, 48% for prophylactic prescriptions). The reason for prescribing an antimicrobial should be clearly documented in all cases. This should be shared with relevant people involved in the person's care to allow better management during follow-up care and/or transfer of care to another healthcare or community setting. Similar to the acute setting, and LTCF setting, there is potential to standardise medication charts, where in use, in inpatient Mental Health settings to incorporate indication as a field on antimicrobial prescriptions. This information would then be easily accessible to all staff involved in prescribing, dispensing and administering antimicrobial agents.

Microbiological specimens for urinary tract infection:

National guidelines for diagnosis and management of urinary tract infections in LTC residents over 65 years recommend sending a urine specimen to a laboratory for culture and susceptibility for symptomatic urinary tract infection.[5] Although not specified in National guidelines (which should be addressed), this is also good practice for any patient, of any age, in a congregated healthcare setting due to the increased risk of healthcare-associated infection and antimicrobial resistance. Urinary tract infections are one of the most prevalent type of infection in healthcare facilities and antimicrobial resistance is frequently encountered. Urine culture and susceptibility results should be used to guide initial treatment or direct treatment options, should the patient fail to respond to empiric choice. For treatment courses of antimicrobials for urinary tract infection (n=18) on the day of the survey, it was identified that a urine specimen had been sent to a laboratory for culture and susceptibility in 67% of cases. Due to limitations in electronic laboratory result access, in a

proportion of cases, it was unknown whether urine specimens had been sent or not (17%, n=3).

Renal function:

Renal impairment is common in the elderly population and therefore information about renal function was included in the data collected for all patients on active antimicrobial therapy on the day of survey. This informed assessment of appropriateness of antimicrobial agent(s) and dosage regimens. Several commonly prescribed antimicrobials require dose adjustment in moderate to severe renal impairment to avoid over-exposure and increased risk of adverse effects. It was found that approximately two thirds (63%) of all patients on active antimicrobial therapy had laboratory test results indicative of normal renal function (>50mL/min), 11% had either mild or moderate impairment (6% and 5% respectively) and none had severe impairment. For one quarter of patients, information about renal function was not assessable due to lack of access to electronic laboratory results and/or absence of recent renal function test results (within six months). Although not identified as a significant concern in MHFs, it should be noted that nitrofurantoin, a common antimicrobial used for treatment and prophylaxis of urinary tract infection is contraindicated for even short courses if creatinine clearance (CrCl) is less than 30 millilitres/minute (mL/min), and for longer courses (greater than seven days) if CrCl is less than 45 mL/min.[5] The antibacterial efficacy of nitrofurantoin depends on the renal secretion into the urinary tract (site of action), and in patients with renal impairment, renal secretion of nitrofurantoin is reduced. This may reduce the antibacterial efficacy, which may result in treatment failures and also increases the risk of adverse effects (with systemic accumulation). Of 16 prescriptions for nitrofurantoin identified on the day of survey, one was contraindicated due to the presence of renal impairment, and in three instances, renal function was unknown (in patients aged 60-86 years). Renal function is an important aspect to assess and consider when prescribing antimicrobials to minimise antimicrobial-related harm.

Adherence with guidelines:

Adherence with antimicrobial prescribing guidelines was assessed to identify opportunities to improve antimicrobial use, identify any gaps in guidelines and/or to identify where additional supports and education are required. This took the form of assessing adherence against local guidelines (if available) or in the absence of same, adherence with the National community antimicrobial prescribing guidelines (www.antibioticprescribing.ie). Given that 57% of MHFs assessed were getting their antimicrobial supply from acute hospitals, due to close working relationships with hospitals and co-location in some instances, it was expected that local (hospital) guidelines would be encountered as the guidelines in use. This was not the case, as only 8% (n=4) of facilities reported use of acute hospital guidelines as per nursing staff, with 86% reporting that no guidelines were in use. An attempt was made to ascertain this information from prescribers but remained largely unknown due to limited access to prescribers on the day of survey. As discussed in the introduction, non-adherence with guidelines should not necessarily be interpreted as poor practice, but rather that it is in not in line with the stated guideline and may represent an opportunity to optimise antimicrobial use. It is recognised that clinical judgement applies to the use of all antimicrobial agents. This

is the first time adherence with antimicrobial prescribing guidelines has been assessed on this scale in Irish MHFs.

It was observed that for the 66 active antimicrobial prescriptions on the day of survey, adherence to guidelines of 36% (n=24) of these could not be assessed by the AMP due to insufficient clinical information or absence of guidelines. A list of infections where absence of community guidelines were identified is included in Appendix 2.

For assessable prescriptions (n=42), the choice of antimicrobial agent was identified as adherent with guidelines (first-line agent, alternative option or directed appropriately as per relevant culture result) in 76% of prescriptions. The dosing regimen was considered adherent in 75% of assessable prescriptions. Examples of non-adherence for choice and/or dosing are detailed in Appendix 1.

Duration of therapy was considered adherent in only 46% of instances. This was significantly impacted by UTI prophylaxis in excess of 6 months, lower respiratory tract infections being treated with 7 days of therapy, and uncomplicated UTI (in females) being treated with 7 days of therapy. Of note, the recommended duration of treatment courses for lower respiratory tract infection (now five days) and uncomplicated urinary tract infection in females (now three days) changed in the National community antimicrobial prescribing guidelines in November 2020 upon review and update. A new guideline was also developed and launched in November 2020 regarding deprescribing UTI prophylaxis recommending review with a view to deprescribing at 3-6 months. All antimicrobial prescriptions (including prophylaxis) should have a review date or stop date documented at time of initiation. This survey found that only 47% of total antimicrobial prescriptions had a documented stop/review date on the medication chart or medical notes (85% for therapeutic prescriptions, 9% for prophylactic prescriptions). The most commonly encountered course length for treatment of infection was seven days, across all common indications, and this was the median course length in every CHO.

Types of antimicrobial use

Red/Green antibiotic use:

A “green/red” list of antibiotics (see Appendix 3) is a simple tool which has been developed by the National AMRIC Team and the HSE Medicines Management Programme to assist prescribers in community settings choosing an antibiotic, when indicated, which is preferred over one which should be reserved.[3] Green agents are either associated with fewer adverse effects or are less likely to lead to widespread development of resistance due to their narrow spectrum of activity. Red agents are either more associated with adverse effects or widespread development of resistance due to their broad spectrum of activity. Antimicrobial agents used over a 30-day period in facilities were assessed for their red/green classification. It was not expected, nor would it likely be appropriate, to find 100% green agents as there are infection types or clinical scenarios where a red agent would be the recommended treatment option. In September 2021, for the previous twelve-month period, the average red/green breakdown nationally in primary care for people on the General Medical Services

(GMS) Scheme was 67.5% green and 32.5% red. The PPS of antimicrobial use conducted in HSE LTCFs for Older Persons 2020/2021 found a prevalence of 65% green, and 30% red. In comparison, this survey found a lower proportion of green agents and a higher proportion of red agents used in HSE MHFs, with 58% green, 38% red. For treatment of infection, 56% of agents used were green, with 39% of agents used being red. For prophylactic antimicrobials, 64% of agents used were green, 30% of agents were red. There was variation noted from one CHO to the next although numbers are small within CHOs so it is difficult to ascertain any definitive patterns. There were only a small proportion of antimicrobial agents encountered which were not covered by the red/green classification namely metronidazole, co-trimoxazole and minocycline.

Route of antimicrobial therapy:

The route of therapy for all antimicrobial therapy assessed over the 30-day period was oral in all CHOs, with parenteral use not encountered. Only one site reported that their facility may use IV/IM on occasion. Where parenteral use is utilised, it is recommended that this practice has supporting structures in place in terms of ensuring safe parenteral administration, safe injection practice and care of devices, parenteral-to-oral switch criteria and therapeutic drug monitoring (as applicable to aminoglycoside and glycopeptide administration). The availability of these supporting structures was not assessed as part of this survey. To minimise discomfort caused to patients by the use of the intramuscular route, it should only be used when other administration routes are not feasible. Its use should be reviewed daily with a view to changing to an alternative route.

Indication for antimicrobial use:

The most common infection types for which antimicrobials were prescribed included urinary tract (43%), respiratory tract (23%) and skin and wound (23%). This is a similar finding to HALT 2016, where infections of these types predominated in LTCFs and this was similar across Europe.[1,2]

Specific types of antimicrobials in use:

Overall, the breakdown of specific antimicrobial types was for the most part similar across the CHOs with variation on the proportion of different antibiotic classes used. The most common antimicrobial encountered over the 30-day period was co-amoxiclav (n=53), accounting for approximately one quarter (27%) of all antimicrobial prescriptions. Nitrofurantoin or trimethoprim accounted for one quarter of prescriptions (25%). Narrower spectrum penicillins accounted for 20% of prescriptions. First generation cephalosporins accounted for 8% of prescriptions and use of tetracyclines and macrolides each accounted for approximately 5% of prescriptions. Use of fluoroquinolones was responsible for 4% of all prescriptions. There was minimal use of clindamycin (n=1) and use of broader cephalosporins (second or third generation) was not encountered.

The data above provides useful baseline information for AMPs to target and measure effect of future AMS activities. Although the data includes a high proportion of prophylactic prescriptions in addition to treatment prescriptions, with the exception of co-amoxiclav which

is a concern, it is encouraging to see relatively low usage of agents that are associated with a high risk of *Clostridioides difficile* infection (fluoroquinolones, clindamycin and broader cephalosporins).

For treatment of infection, the top five antimicrobial agents, in order of frequency, were co-amoxiclav (31%), nitrofurantoin (18%), flucloxacillin (16%), amoxicillin (7%) and cephalexin (5%). Ciprofloxacin was the sixth most common antimicrobial used for treatment of infection (5%). In HALT 2016 amongst Irish Mental Health LTCFs, a similar trend was identified with co-amoxiclav (a 'red' agent) the most frequently prescribed agent for treatment of infection accounting for 41% of prescriptions therefore a reduction in this proportion to 31% is positive.[1] In 2016, this was followed by nitrofurantoin (20%), cephalexin (12%), flucloxacillin (5%), trimethoprim (5%) with amoxicillin only responsible for 2% of treatment prescriptions.[1] An increase, albeit small, in the proportion of amoxicillin, a more narrow spectrum agent, in place of co-amoxiclav, is a positive finding. The use of flucloxacillin accounted for a higher proportion of treatment prescriptions in MHFs than previously identified in Mental Health LTCFs. This was predominantly reported for skin/wound infections including self-harm injuries/lacerations.

Given clarithromycin and ciprofloxacin are 'red' agents due to adverse effects and significant drug interactions (particularly in the context of psychotropic medications, lowering of seizure threshold in the case of ciprofloxacin, and polypharmacy often encountered in mental health patients), these should be avoided in this patient cohort if possible. It is worth noting that these agents collectively accounted for 7% of treatment prescriptions (n=11) over 30 days. Where encountered, potential drug-drug interactions were identified from medications co-prescribed in all instances. Examples are provided in Appendix 1. Doxycycline, as a green agent, would be one preferred option for penicillin allergy where possible and although unlicensed, a dispersible tablet is available and reimbursable for people with dysphagia.

Focus on prophylaxis

The use of antimicrobials to prevent infection (prophylaxis) is not uncommon, particularly in LTCFs across Europe.[2] However, it is acknowledged that the evidence for this practice is limited. 3.3% of patients in this study were on antimicrobial prophylaxis on the day of survey, compared to 2.4% in Irish Mental Health LTCFs in HALT 2016.[1] This accounted for a significant proportion of antimicrobial prescriptions on the day of survey (50%).

The top five agents used were azithromycin (n=8), trimethoprim (n=6), cephalexin (n=6), nitrofurantoin (n=6) and co-amoxiclav (n=2). In HALT 2016, the specific breakdown of agents used for prophylaxis in Irish Mental Health LTCFs was not reported however use of azithromycin was not noted. The appearance of azithromycin (a 'red' agent) as the top agent used for prophylaxis of infection is a concern.

The most common reason for prophylaxis was for urinary tract infection (58% of all prophylactic prescriptions, 1.9% of patients), with respiratory prophylaxis accounting for 24% of all prophylactic prescriptions (0.8% of patients). For Mental Health LTCFs in HALT 2016, the most common reason for prophylaxis was also urinary tract infection (2.2% of all patients[1]),

the prevalence of this was therefore found to be slightly decreased in this survey although the non-LTC patients may have affected this figure. On the other hand, the percentage of patients on respiratory prophylaxis in Mental Health LTCFs in HALT 2016 was 0.2%, this was found to be increased in this study to 0.8% which is a concerning trend. It was noted that under half of all prophylactic prescriptions had been initiated within the facility (39%), with the remaining proportion initiated external to the facility or unknown (30% in the acute hospital setting, 16% unknown).

Antimicrobial prophylaxis for urinary tract infections (UTIs) may be considered in people for whom the number of UTIs are of such frequency or severity that they chronically impinge on function and well-being, but the decision to prescribe should not be taken lightly and non-antimicrobial measures, and other potential causes of symptoms should be fully investigated.[5] Recurrent UTI in adults is defined as two or more symptomatic UTIs in the previous six months or three or more symptomatic UTIs in the previous twelve months.[5] Urinary growth of bacteria in an asymptomatic individual (asymptomatic bacteriuria) is common, particularly in older people. Recurrent growth of bacteria in urine in an asymptomatic patient is not classified as a recurrent UTI and does not warrant treatment or prophylaxis.

Azithromycin, for respiratory prophylaxis, has safety concerns with prolonged use in terms of cardiac effects, QT prolongation, liver function and hearing loss in addition to antimicrobial resistance.[6] The majority of this agent's use was in Psychiatry of Later Life, and approximately 50% of these prescriptions were initiated in the acute setting. The benefit of azithromycin prophylaxis is generally limited to a small cohort of patients with either severe COPD, asthma or bronchiectasis and should only be initiated by or on discussion with a Respiratory Medicine Physician as it requires regular review every 6-12 months to assess ongoing benefit versus risk.[6] Assessment of criteria for initiation, and regular review, was outside the scope of this survey however future surveys may need to address this issue.

Upon initiation of any antimicrobial prophylaxis, the patient must be fully informed of potential risks associated with antimicrobial exposure, including increased susceptibility to *Clostridioides difficile* infection, *Candida spp.* infections and other adverse effects (dependent on the antimicrobial selected). The increased likelihood of infection with antimicrobial resistant organisms which may have limited treatment options is also important and should be fully discussed, and that the agent used for prophylaxis may be lost as a future potential therapeutic agent. It is recommended that a trial of urinary tract prophylaxis should not exceed six months, and azithromycin prophylaxis for severe COPD, asthma or bronchiectasis should not exceed one year without review of benefit versus risk.[5,6]

This survey examined the duration of all prophylactic prescriptions, which was not examined in HALT 2016, and it found that 55% of prophylactic prescriptions had been prescribed and administered for over one year (n=18), which was the point at which further review to determine date of initiation was considered irrelevant. Of particular concern was that in three instances (in patients aged 70-78 years), the antimicrobial agent prescribed in excess of one

year duration was nitrofurantoin. Chronic pulmonary reactions and chronic active hepatitis, occasionally leading to hepatic necrosis, can occur in people treated with nitrofurantoin. These adverse effects are generally associated with long-term therapy (usually after six months), and are more common in the elderly, and in those with renal impairment. Any urinary prophylactic prescription in excess of six months should be reviewed with a view to stopping.[5] Further advice on deprescribing UTI prophylaxis is available online at: https://www.hse.ie/eng/services/list/2/gp/antibiotic-prescribing/conditions-and-treatments/urinary/deprescribing-uti-prophylaxis/

Antimicrobial prophylaxis is generally not recommended and rarely required or beneficial for the prevention of symptomatic UTI in people who are catheterised.[5] It is therefore of concern that 21% (n=4) of patients prescribed UTI prophylaxis were catheterised. These were classified as 'non-assessable' due to insufficient clinical information, however it is likely that a proportion of them would be non-adherent. The antimicrobial agents being used for prophylaxis of catheter-associated UTI were co-amoxiclav (n=2), cephalexin (n=1) and nitrofurantoin (n=1).

Due to a longer urethra in males compared to females, urinary tract infections are relatively uncommon in men, however incidence can increase in older people. The reason for this is generally associated with incomplete bladder emptying (such as prostatic enlargement), abnormalities of the urinary tract (including surgery) and/or immunocompromise. Men with recurrent UTI should be referred to an urologist for further investigation as it is likely to be secondary to associated conditions. Of note, this survey found that 37% (n=7) of patients on urinary prophylaxis were male, three of these were catheterised.

Systems and Structures to support antimicrobial stewardship

Governance:

Overall, 90% of facilities surveyed have access to a governance committee within their CHO where Antimicrobial Stewardship is discussed, although knowledge of this committee was limited at sites. Types of committees include an overarching CHO IPC/AMS committee, an Infection Prevention & Control Committee (IPCC), or a Drugs and Therapeutics Committee (DTC). A CHO IPC/AMS committee, as recommended by the National AMRIC Team (with Terms of Reference) has been established in the vast majority of participating CHOs. Availability of appropriate expertise to discuss, advise and support AMS has been a rate-limiting factor for establishment of these committees but is now available from the CHO AMP. Fourteen percent of facilities reported having a named person responsible for AMS within their facility.

Access to laboratory:

Electronic access to laboratory reports onsite (for biochemistry or microbiology results for example) was found to be 67%, with a range from 43% in CHO 7 and 100% in CHO 5 and 6. In the absence of electronic laboratory report access, facilities relied on paper reports being mailed from laboratories and filed appropriately in medical notes, or laboratory reports were

inaccessible to staff onsite and accessible only to GPs looking after the patients. This was often the case for 24 hour staffed residences, which seems practical. Timely access to electronic laboratory results can however aid treatment decisions and ensure optimal use of antimicrobials, decreasing the risk of inappropriate antimicrobial prescribing e.g. need/choice of agent based on culture and susceptibility findings. Electronic access to laboratory reports are recommended where practical and feasible.

Practices around dipstick urinalysis prior to initiating antimicrobial therapy for UTIs:

Information was sought regarding the frequency with which dipstick urinalysis was used to support UTI diagnosis. Fifty three percent of facilities surveyed reported routine use of dipstick urinalysis to support diagnosis of UTI or to out rule UTI. Routine use was defined as dipstick urinalysis performed on every patient either on admission or at regular intervals (e.g. every 2-3 months) regardless of symptoms. The majority of remaining facilities (41%) reported use of dipstick urinalysis 'sometimes' which was defined as dipstick urinalysis performed on patients with signs or symptoms of UTI. Only three facilities, all 24-hour staffed residences, reported 'rare' use of dipstick urinalysis to assess for evidence of UTI.

The routine use of dipstick urinalysis results to guide initiation of antimicrobial therapy for UTI in asymptomatic patients is unacceptably high as this practice is not recommended.[5] This is supported by best practice 'Position statements for the use of dipstick urinalysis for assessing evidence of UTI in Adults' issued in October 2021. Absence of signs and symptoms of a UTI equate to absence of a UTI. Asymptomatic bacteriuria (ASB), the presence of bacteria in the urine without symptoms of a UTI, can be present at any age and in any population but is particularly common in those aged over 65 years and is very common in those persons with an indwelling urinary catheter. ASB is not harmful but it will most likely cause a positive urine dipstick result for leukocytes and/or nitrites. Patients do not require antimicrobial treatment unless signs and symptoms of a urinary tract infection are present.

In the presence of signs and symptoms of UTI, due to the high prevalence of ASB in patients over 65 years (up to 70%), or at any age with a catheter (up to 100%), dipstick urinalysis results are unreliable to support diagnosis of UTI, do not add anything to the clinical picture and are not a useful guide to management.[5] A decision-aid to support management of suspected UTI in older persons (over 65years) in residential care is now available nationally. This applies to MHFs for this age group. However, given the proportion of patients under 65 years of age in MHFs identified in this study, use of dipstick urinalysis 'sometimes' i.e. in the presence of signs and symptoms of a UTI, is reasonable for this age-group as a dipstick urinalysis may be useful as an aid to UTI diagnosis particularly for females under 65 years of age. Clinical judgement is advised however in interpretation of dipstick urinalysis, even in this younger population, due to other factors (in younger females) which can increase the incidence of ASB such as diabetes, immobility, pregnancy or post-menopause and in consideration that 5% of pre-menopausal healthy females may have presence of ASB.[8]

Access to guidelines:

The National community antimicrobial prescribing guidelines (www.antibioticprescribing.ie) have been available for a number of years and are recommended for use in community

settings including mental health facilities. Knowledge and awareness of the guidelines however amongst nursing staff surveyed across all facilities was low with only 4% of facilities reporting the National guidelines as the guidelines in use within the facility. 8% reported use of acute hospital guidelines, and 2% reported some local guidance. The remaining proportion of facilities (86%) reported no access to antimicrobial prescribing guidelines. Given the encouraging rate of adherence with prescribing guidelines, this is not expected to be the case amongst medical prescribers although this information was not available. Use of the National community antimicrobial prescribing guidelines are the preferred guidelines for patients being cared for in MHFs. This population is borne in mind upon guideline development and review. These guidelines are easily available through a mobile-friendly website. They have additional clinical information relevant to community prescribers and therapies are provided as oral options (which is the preferable route of administration and common practice in MHFs). All staff who prescribe, dispense and administer antimicrobials for Mental Health settings should also be aware and cognisant of guideline advice to ensure best use of antimicrobials.

Education on Antimicrobial Stewardship:

In the vast majority of facilities (92%), nursing staff reported no access to education on use of antimicrobials and antimicrobial stewardship, replicating the findings of HALT 2016.[1] As part of this PPS, the antimicrobial pharmacists provided informal education to available staff members during PPS facility visits, raising awareness of the guidelines and some key messaging relating to use of antimicrobials and will continue to provide this support to relevant staff within their CHO. AMPs also provide AMS education and support to the IPC Link Practitioner Programme. Staff onsite were very willing to participate in impromptu and informal AMS education sessions. In addition to face-to-face sessions and direct engagement by AMPs, a suite of IPC and AMS eLearning modules are now available on HSeLanD. This includes a module on ‘Antimicrobial Stewardship in Practice’ and another on ‘Prevention and Management of Urinary Tract infection’. These modules in particular are recommended and available for any healthcare staff involved in prescribing, dispensing or administering antimicrobials. All staff should be encouraged to complete these modules, and uptake amongst staff should be assessed.

Access to medical care:

Medical care for the HSE MHFs was, for the most part, either provided by a combination of GP and Psychiatry team(s) (37%), by directly employed Psychiatry team(s) (33%), or had their care provided by a GP/GP Practice (20%). The latter model was more prevalent in 24-hour staffed residences. In 10% of facilities, medical care was being provided by the acute setting (Consultant and team) however 100% of facilities surveyed had access to a Consultant Psychiatrist. This demonstrates the variety of prescribers which may be involved in clinical decision-making in MHFs regarding antimicrobial prescribing and potential challenges regarding communication across specialties. Of note, no facilities reported having nurse prescribers who could prescribe antimicrobials. Onsite access to a clinical pharmacist was reported in 39% of facilities (often acute units) which is encouraging for medication use in general, including medicines optimisation, reconciliation and medication safety. Regular

prescription review by clinical pharmacists has been well documented for ensuring optimal use of antimicrobials, and access to same is advocated by national and international guidelines for antimicrobial stewardship. The frequency of prescription review by clinical pharmacists varied from daily, weekly, monthly or three monthly.

Antimicrobial supply:

An examination of where antimicrobials were supplied from was undertaken and it was identified that 27% of facilities utilise a single community pharmacy, with 7% using the patients' own pharmacy. The remaining 67% had either onsite pharmacies within the facility (24%) or were being supplied directly from acute hospital pharmacies (43%). This is relevant nationally in the context of antimicrobial consumption monitoring. The current consumption data for community incorporates wholesale supply to, or dispensed data from, community pharmacies. The current consumption data for acute hospitals incorporates dispensed antimicrobials to acute beds only (excludes supply to non-acute settings including Mental Health units). Antimicrobial consumption in 67% of HSE MHFs surveyed is therefore currently not captured or monitored nationally (on wholesale or dispensed community pharmacy data or acute data) which highlights a gap.

The majority of facilities (63%, mainly Approved Centres) reported keeping an emergency stock of antimicrobials onsite for access out-of-hours. For the vast majority (94%), there was no restriction policy in place for agents which could or could not be stocked/ prescribed and available out-of-hours. Commonly encountered stock, which was flagged as a concern included 'red' agents; ciprofloxacin, cefaclor, clindamycin, clarithromycin and stock of co-amoxiclav was commonplace. It was noted that often facilities who did hold emergency stock, did not necessarily have stock of first line empiric choice antimicrobials for common infections (such as UTI, respiratory tract infections, skin/wound infections) for example co-amoxiclav in stock, but amoxicillin not in stock. This can result in either a delay to first dose whilst awaiting receipt of supply of first-line empiric choice, or else prescription of an alternative agent in stock (potentially non-preferred) due to its availability. It is recommended that any emergency stock available within facilities aligns where possible to first-line treatment options of common infections as per National community prescribing guidelines and stock of non-preferred ('red') agents be reserved or restricted where possible. Of note, nitrofurantoin (immediate-release) was commonly stocked, with little to no stock of nitrofurantoin (slow release- *Macrobid®*) identified despite 40% of nitrofurantoin therapeutic prescriptions being aligned to 'slow release' dosing regimen with a frequency of twice daily.

Antimicrobial consumption and surveillance:

Only 6% of facilities surveyed kept some form of antimicrobial consumption tracking record, and no facilities reported feedback to prescribers on antimicrobial use or antimicrobial resistance trend summaries for their setting. A process for collection of a standardised monthly minimum dataset to monitor ongoing prevalence of healthcare associated infection/antimicrobial resistance and antimicrobial consumption has been developed and made available to all HSE LTCFs for Older Persons to facilitate ongoing National, regional and

local surveillance, with analysis, reporting and feedback. This system has potential for expansion to HSE MHFs.

Vaccination:

Seasonal influenza vaccination and COVID-19 vaccination should be offered to all LTC patients and staff of Mental Health facilities, with up-to-date records maintained of patient and staff immunisation status. This survey assessed whether LTC patients were being offered these vaccines and found that 100% of LTC patients in HSE MHFs were being offered the vaccines. Uptake by staff was not assessed on this occasion.

In addition to annual seasonal influenza vaccination and COVID-19 vaccinations, all at-risk LTC patients for example those over 65 years of age should be offered pneumococcal vaccine if not previously vaccinated over the age of 65 years.[7] Up-to-date and accessible vaccination records should be maintained for every LTC patient. This survey assessed whether record-keeping was in place for pneumococcal vaccination status of LTC patients and found that only 27% of facilities had this information regarding their patients which leaves significant room for improvement.

8.0 CONCLUSION:

In conclusion, this survey measured and evaluated antimicrobial use across inpatient HSE Mental Health facilities, an area not extensively examined for antimicrobial use and stewardship previously. It found a moderate prevalence of antimicrobial use in HSE MHFs, lower than general hospitals or LTCFs for Older Persons, however higher than the European average for antimicrobial use in LTCFs (4.9%) with 6.3% of patients on antimicrobial therapy, and approximately 1 in 6 receiving an antimicrobial over a 30 day period. The rate of antimicrobial use, DOTs per 1000 patient days, was very similar to that reported in a study across 111 Mental Health Units in the United States.[4]

The main reasons for all antimicrobials were for treatment or prophylaxis of three main indications, infections of the urinary tract, respiratory tract or skin/wound infections. This is consistent with findings from previous studies in LTCFs, and European patterns.[2]

Half of antimicrobial use was for prophylaxis of infection, with 3.3% of all patients being on prophylactic therapy. This was higher than that identified in Irish Mental Health LTCFs in HALT 2016 (2.4%), and was twice as high as the European average for LTCFs reported in 2016 (approx. 1.5%).[1,2]

The main indication for prophylactic antimicrobial therapy was for urinary tract infection prophylaxis (58% of all prophylactic prescriptions), and accounted for 1.9% of all patients, reduced from that reported in Irish Mental Health LTCFs in 2016 (2.2%). Prevalence of respiratory prophylaxis (24% of all prophylactic prescriptions) had increased from 0.2% of patients in Irish Mental Health LTCFs in HALT 2016, to 0.8% of patients in this study.

Regarding the quality and types of antimicrobial use, a number of positive findings were identified and a number of findings were identified for improvement as follows:

- Documentation of allergy status was very good (95%)
- Seasonal influenza and COVID-19 vaccination was offered in 100% of facilities to all LTC patients which is excellent.
- There was a lower proportion of 'green' (preferred) antimicrobials versus 'red' (reserved) antimicrobials when compared to other community settings.
- The use of co-amoxiclav (a 'red' antimicrobial) reduced from 41% of therapeutic prescriptions in Irish Mental Health LTCFs in HALT 2016 to 31% of therapeutic prescriptions which is positive although may be impacted by inclusion of non-LTC patients and the higher proportion of flucloxacillin identified. Co-amoxiclav however was the most common agent encountered for treatment of infection which raises concerns due its broad spectrum nature and propensity for adverse effects such as *Clostridioides difficile* infection, secondary *Candida* infections, and widespread impact of this agent on development of antimicrobial resistance.
- There was no use of broader spectrum cephalosporins, and limited use of Clindamycin which is positive.
- Use of clarithromycin or ciprofloxacin ('red' antimicrobials) collectively accounted for 7% of therapeutic prescriptions which raise concern of adverse effects and drug-drug interactions particularly with psychotropic medications.
- Relatively high adherence, albeit with scope for further improvement, for choice of antimicrobial agent (76%) versus antimicrobial prescribing guidelines and dosing regimen (75%). Unfortunately over one third of prescriptions could not be assessed for adherence due to absence of guidelines, or insufficient clinical information.
- Quality indicators requiring more significant improvement include documentation of indication (67%), documentation of a stop date or review date for every antimicrobial prescription (47%) and duration of antimicrobial therapy which was adherent to guidelines in only 46% of prescriptions.
- Duration of prophylaxis was assessed and 64% of prophylactic prescriptions had been prescribed in excess of 6 months, with 55% in excess of one year duration, which is longer than recommended.
- One of the main themes identified for non-adherence of choice of therapy was use of broader spectrum agents than necessary in the absence of clear rationale.

Systems and structures to support antimicrobial stewardship in HSE MHFs are in development and progressing within CHOs e.g. governance which is aided by the presence of the AMP to provide expertise for AMS, and establishment of multidisciplinary CHO IPC/AMS teams following significant investment by the Department of Health. As with the quality of antimicrobial use, a number of positive findings were determined and some with room for improvement.

- Pneumococcal vaccination record-keeping for LTC patients has scope for improvement, with only 27% of facilities tracking records of pneumococcal vaccination status for their at-risk patients.
- There was a high prevalence of facilities using urinary dipsticks routinely to support diagnosis of a UTI (53%). The routine use of urinary dipsticks to support diagnosis of

UTIs in asymptomatic patients is unacceptably high as this practice is not recommended and leads to overuse and unnecessary use of antimicrobials. This is outlined in the recent publication of 'Position statements for the use of dipstick urinalysis to assess for evidence of urinary tract infection in adults'.

- There was limited antimicrobial consumption monitoring and no feedback to prescribers on same, nor access to antimicrobial resistance summaries.
- Access to AMS education was limited amongst nursing staff and awareness of the National community antimicrobial prescribing guidelines (recommended for this patient cohort) was low amongst nursing staff but can be improved and addressed by the CHO-AMPs in the future. Education is also now supported by a suite of HSeLanD modules for IPC and AMS including 'Antimicrobial Stewardship in Practice' and 'Prevention and Management of Urinary Tract Infections' which are particularly relevant to this report.

Next Steps:

The results for every facility surveyed will be provided to each facility in the form of this report or a summarised CHO-level report, with direct engagement from the AMP to provide feedback, support and education where necessary. The results of the survey show that some improvements are necessary to make sure that antimicrobial use in HSE MHFs is optimised. This in turn, will reduce the harm associated with antimicrobial use, improve the safety of patients in terms of adverse effects, *Clostridioides difficile* infection and minimise development of antimicrobial resistant pathogens. The key recommendations have been determined and are detailed in section 2.0.

9.0 REFERENCES:

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10.0 LIST OF ABBREVIATIONS (IN ALPHABETICAL ORDER)

ADR	Adverse Drug Reaction
AM	Antimicrobial
AMRIC	Antimicrobial Resistance and Infection Control
AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
AMP	Antimicrobial Pharmacist
ASB	Asymptomatic bacteriuria
CHO	Community Health Organisation
COPD	Chronic Obstructive Pulmonary Disease
CrCl	Creatinine Clearance
C&S	Culture & Sensitivity
DTC	Drugs & Therapeutics Committee
GP	General Practitioner
HALT	Healthcare-associated infection and Antimicrobial use in Long-Term care facilities
HCAI	Healthcare-associated infection
HSE	Health Service Executive
iNAP	Irelands National Action Plan on Antimicrobial Resistance
IPC	Infection Prevention & Control
IPCC	Infection Prevention and Control Committee
IPCT	Infection Prevention and Control Team
LTC	Long-Term Care
LTCF	Long-term care facility
MHF	Mental Health Facility
PPS	Point Prevalence Survey
RCF	Residential Care Facility
RTI	Respiratory Tract Infection
UTI	Urinary Tract Infection
1G	1st generation
2G	2nd generation
3G	3rd generation

11.0 APPENDICES

Appendix 1: Examples of non-adherence, drug-drug interactions and commentary

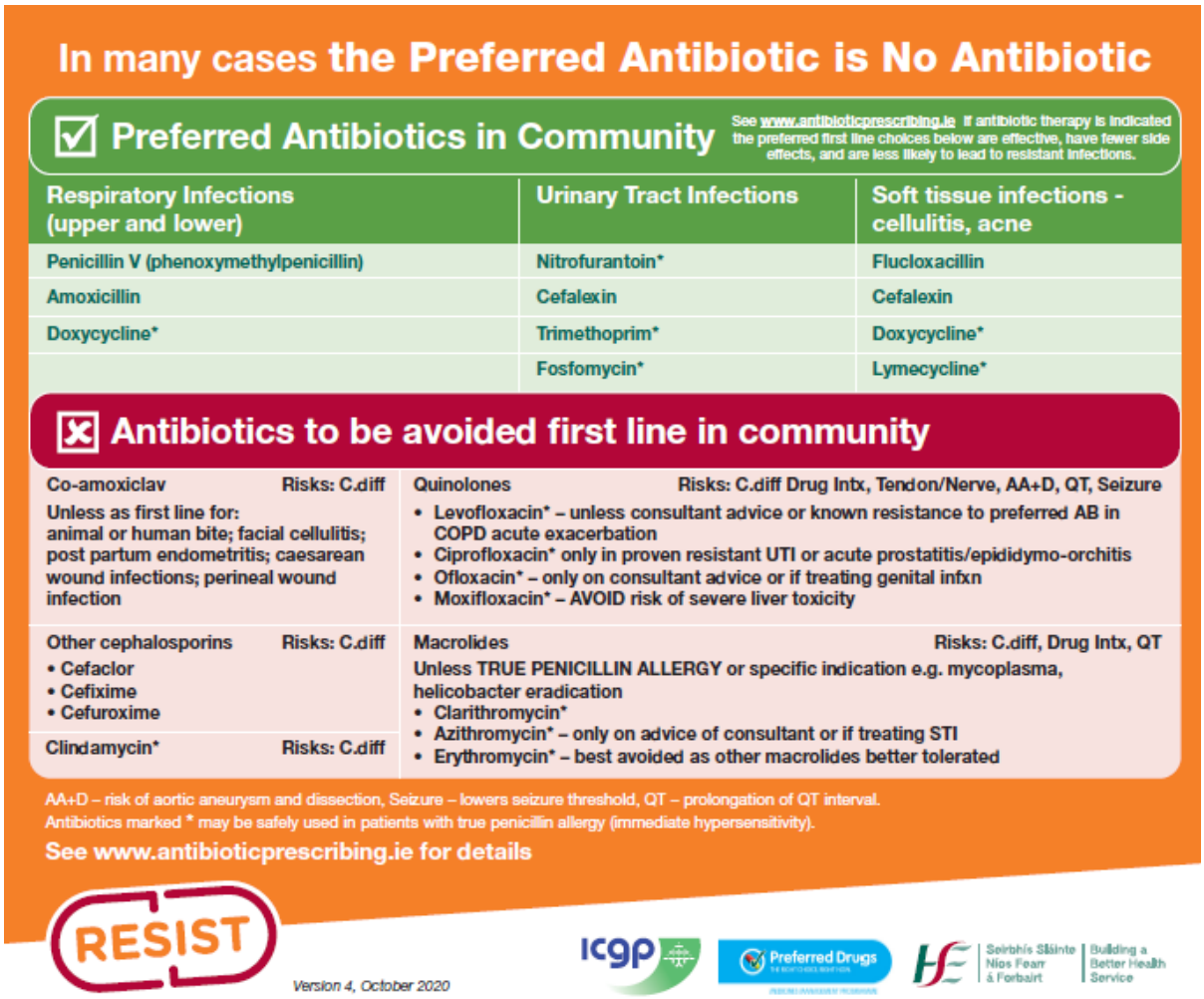
Case report of non-adherence	Commentary
Ciprofloxacin prescribed for 7 days for treatment of a lower respiratory tract infection (LRTI) in a 60-year-old male. Recent sputum result indicates growth of *Strep. Pneumo* and *H.influenzae*, sensitive to Penicillin or Tetracycline. No penicillin allergy. Recent course of co-amoxiclav (within previous 30 days) for LRTI. Patient is co-prescribed Clozapine for management of schizophrenia.	Use of broad spectrum agent in preference to narrower spectrum option such as doxycycline (in absence of clear rationale) increases risk of antimicrobial-related harm. Ciprofloxacin has poor potency against *Streptococcus Pneumoniae* and, due to potentially permanent and disabling adverse effects, its use is only recommended where no safer alternative exists according to safety alerts from the European Medicines Agency. Co-prescription with clozapine results in potentially severe drug-drug interaction i.e. clozapine toxicity and/or QT prolongation, warranting either a dose reduction of clozapine (by ~30%) or close ECG monitoring.
Four cases where Nitrofurantoin prescribed 100mg BD (intending slow release preparation, *Macrobid*®, which has action for 12 hrs (although not specified)), but Nitrofurantoin 100mg immediate release (*Macrodantin*®) being administered which only has action for 6 hrs.	Vigilance required regarding formulation selection. Infection being under-treated in all cases, risking treatment failure, escalation, and/or prolonged course. Immediate release nitrofurantoin has action for only 6 hours, slow release preparation has action for 12 hours. Preparations are not interchangeable.
Nitrofurantoin for prophylaxis of urinary tract infection (for over 1 year) where its use was contraindicated due to presence and extent of renal impairment, CrCl 29mL/min.	Prolonged courses of nitrofurantoin (in excess of 7 days) are contra-indicated when CrCl <45mL/min. Limited efficacy to site of action, increased risk of accumulation and systemic side effects including pulmonary fibrosis and chronic hepatitis. Any trial of UTI prophylaxis should be reviewed with a view to stopping at 3-6months.
Co-prescription of minocycline (prophylaxis for >3years) and Lymecycline (prophylaxis for 1month) for acne.	Antimicrobial class/pharmacological duplication- unnecessary exposure to two tetracyclines with no clinical benefit. For management of acne, oral antibiotic use should be reviewed and use limited to 3months if possible (max 6 months), with ongoing management provided by non-antimicrobial topical agent.[5]
'Antibiotic cycling' for UTI prophylaxis in 81year old female, commenced 2 months previous. Alternating trimethoprim for 3 months followed by nitrofurantoin for 3 months. On trimethoprim at time of review, which was recently held for 7 days to treat* a UTI with Nitrofurantoin. *High suspicion that UTIs are being diagnosed/treated/prevented based on dipstick urinalysis results; 4 urine culture results in previous 2-3 months indicated low levels of WCC indicating that infection was unlikely.	Antibiotic cycling for prophylaxis is not recommended as it results in potential loss of 2 future therapeutic options. If a breakthrough infection occurs on urinary tract infection prophylaxis, the prophylactic agent should be reviewed with a view to stopping (antibiotic without benefit). Absence or low levels of WCC in a urine culture would mean an infection is unlikely. Alternative diagnosis in a symptomatic patient may need to be considered. Dipstick urinalysis is unreliable in patients over 65years.

Appendix 2: A list of infections encountered where absence of community antimicrobial prescribing guidelines were identified (as hosted on www.antibioticprescribing.ie)

The following list has been submitted to the www.antibioticprescribing.ie editorial group and website working group for their review and consideration. It is acknowledged that the infections listed below may not be appropriate or necessary for community antimicrobial prescribing guidelines, as their management may always be guided from the acute setting.

List of infections for consideration:
Urinary tract:
Catheter-associated UTI: Current guidelines state prophylaxis 'generally not appropriate' for catheterised patients. Consider providing enhanced detail in guideline. 21% (n=4) of patients on UTI prophylaxis had a catheter in situ.
Recurrent UTI in males: Guideline currently available for recurrent UTI in females with referral to urology advised for male patients. Consider if additional guidance required for recurrent UTIs in male patients- 37% (n=7) of patients on urinary prophylaxis in this study were male.
Respiratory tract:
Azithromycin for respiratory prophylaxis: National guideline in progress
Skin/Wound:
Scalp folliculitis: no current guideline
Diabetic foot ulcer: no current guideline
Other:
Splenectomy prophylaxis: no current guideline
PCP prophylaxis: no current guideline

Appendix 3: Red/Green preferred antibiotics in community settings



In many cases the Preferred Antibiotic is No Antibiotic

☑ Preferred Antibiotics in Community

See www.antibioticprescribing.ie If antibiotic therapy is indicated the preferred first line choices below are effective, have fewer side effects, and are less likely to lead to resistant infections.

Respiratory Infections (upper and lower)	Urinary Tract Infections	Soft tissue infections - cellulitis, acne
Penicillin V (phenoxymethylpenicillin)	Nitrofurantoin*	Flucloxacillin
Amoxicillin	Cefalexin	Cefalexin
Doxycycline*	Trimethoprim*	Doxycycline*
	Fosfomycin*	Lymecycline*

☒ Antibiotics to be avoided first line in community

Co-amoxiclav — Risks: C.diff

Unless as first line for: animal or human bite; facial cellulitis; post partum endometritis; caesarean wound infections; perineal wound infection

Other cephalosporins — Risks: C.diff

- Cefaclor
- Cefixime
- Cefuroxime

Clindamycin* — Risks: C.diff

Quinolones — Risks: C.diff Drug Intx, Tendon/Nerve, AA+D, QT, Seizure

- Levofloxacin* – unless consultant advice or known resistance to preferred AB in COPD acute exacerbation
- Ciprofloxacin* only in proven resistant UTI or acute prostatitis/epididymo-orchitis
- Ofloxacin* – only on consultant advice or if treating genital infxn
- Moxifloxacin* – AVOID risk of severe liver toxicity

Macrolides — Risks: C.diff, Drug Intx, QT

Unless TRUE PENICILLIN ALLERGY or specific indication e.g. mycoplasma, helicobacter eradication

- Clarithromycin*
- Azithromycin* – only on advice of consultant or if treating STI
- Erythromycin* – best avoided as other macrolides better tolerated

AA+D – risk of aortic aneurysm and dissection, Seizure – lowers seizure threshold, QT – prolongation of QT interval.
Antibiotics marked * may be safely used in patients with true penicillin allergy (immediate hypersensitivity).

See www.antibioticprescribing.ie for details

RESIST

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