AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

AURA
Antimicrobial Use and Resistance in Australia

AGED CARE NAPS National Antimicrobial Prescribing Survey

2019 AGED CARE NATIONAL ANTIMICROBIAL PRESCRIBING SURVEY REPORT

September 2020

NCAS National Centre for Antimicrobial Stewardship

GUIDANCE

VICNISS HEALTHCARE ASSOCIATED INFECTION SURVEILLANCE

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Summary

This report presents analyses of data collected for the 2019 Aged Care National Antimicrobial Prescribing Survey (AC NAPS) and includes comparisons with 2016, 2017 and 2018 AC NAPS data. The AC NAPS is a standardised surveillance tool that Australian aged care homes and multi-purpose services (residential aged care services) can use to monitor the prevalence of infections and antimicrobial use.

Monitoring of infections and antimicrobial use in residential aged care services is an important activity to support the safety and quality of care for residents of these services. The results, within this report, reinforce concerning and longstanding evidence of inappropriate antimicrobial use in Australian residential aged care services.

Analyses are presented of data on infections and antimicrobial use for 32,347 residents and 568 Australian residential aged care services that contributed to the 2019 AC NAPS.
There is no indication that the appropriateness, and therefore safety, of antimicrobial use in residential aged care services that contribute to AC NAPS has improved since 2015, when the AC NAPS was first conducted. The issues of concern, which require urgent attention, continue to be:

- Prolonged duration of antimicrobial use
- High rates of prn (as required) prescriptions for antimicrobials
- High rates of topical antimicrobial use, particularly for prn administration
- Prolonged prophylaxis for conditions that are not recommended by guidelines
- Poor documentation of indication, review and stop dates for antimicrobial prescriptions.

Notwithstanding variation from year to year in the cohort of AC NAPS contributors, the consistency of the issues identified by analyses of antimicrobial use demonstrates that there are significant opportunities for improvement. The small improvement in documentation of review and stop dates for antimicrobial use in residential aged care services that have participated in AC NAPS consistently from 2017 to 2019 (n = 154), and minimal change for other indicators of appropriateness, reinforces the need to identify specific strategies that respond to these issues and lead to improvement action in response to the resident safety issues identified by AC NAPS.

What does the 2019 AC NAPS data tell us?

Important findings of analyses of prescriptions reported to the 2019 AC NAPS include:

- Approximately 20% of these prescriptions were for prophylaxis, which is concerning as antimicrobials are rarely recommended for prophylaxis
- Almost one-third (30.4%) of all prescriptions were for topical antimicrobials, which also accounted for more than 90% of prn prescriptions, most commonly clotrimazole (74.1%). The prn use of clotrimazole may lead to inappropriate duration of therapy, and unnecessary use of antifungals, either topically or systemically, may contribute to the development of resistance.
- Almost one in six (15.0%) antimicrobials were prescribed for prn administration; which may reduce clinical review of antimicrobial choice at time of onset of infection, and decisions regarding duration of treatment, leading to extended duration of treatment
- There was an improvement in documentation of antimicrobial review or stop dates (64.7%), compared with 58.9% in 2018
- The most common clinical indications for prescriptions were cystitis; other - skin, soft tissue or mucosal; pneumonia; tinea; and non-surgical wound infections. Many of these conditions can be prevented by managing hydration and providing good basic hygiene care. Non-pharmacological management is also a key consideration for these conditions.

- Cefalexin, topical clotrimazole, amoxicillin–clavulanic acid, trimethoprim and doxycycline were the most commonly prescribed antimicrobials. Narrower spectrum agents than cefalexin and amoxicillin–clavulanic acid are recommended for many infections, as they are less likely to promote antimicrobial resistance.

What will be done?

The Australian Commission on Safety and Quality in Health Care (the Commission) will work with, and support the Aged Care Quality and Safety Commission and the providers of multi-purpose services, to promote antimicrobial prescribing improvement programs informed by the AC NAPS findings, in addition to ongoing surveillance of infections and antimicrobial use in residential aged care services.

The Commission will also continue to advocate, by communicating directly with residential aged care service provider organisations and general practitioners, for the development and implementation of effective infection prevention and control and antimicrobial stewardship (AMS) strategies to improve the safety of care provided to residents of aged care services. For example:

- Regular review of prescribing patterns, in collaboration with medical and nursing staff, particularly regarding prescriptions for antimicrobial prophylaxis, and compliance with Australian prescribing guidelines in relation to recommended duration and choice of antimicrobials
- Ensuring that analyses of AC NAPS data for each residential aged care service are shared with administrators, governance groups, and clinicians such as general practitioners, pharmacists and nurses, and used to develop targeted improvement strategies. This will be supported by additional targeted resources for these professional groups, and management
- Feedback mechanisms on issues identified by analyses of AC NAPS data for clinicians, governance and leadership groups, residents and their families
- Use of medication charts that are consistent with the Commission's National Residential Medication Chart to improve documentation
- Policies that require default, fixed-length courses of treatment and mandatory review dates, particularly for prn prescriptions[14]
- Consideration of the need for external expert support for aged care staff in relation to antimicrobial use, and diagnosis, prevention and control of infections
- Resources to support the implementation of policies and procedures that are consistent with the Australian Guidelines for the Prevention and Control of Infection in Health Care
- Infection prevention and control and AMS education for nurses, prescribers and family members of residents to raise awareness and skill levels in relation to recommended practice[15]
- Education for non-nursing staff who provide care to residents on the importance of infection prevention and control and basic personal and hygiene care

Introduction

About AC NAPS

The Aged Care NAPS, which was first piloted in 2015[1], is a standardised surveillance tool for use by Australian aged care homes and multi-purpose services (residential aged care services) to monitor the prevalence of infections and antimicrobial use. Aged Care NAPS was modelled on the European Centre for Disease Prevention and Control Healthcare-Associated Infection in Long Term Care Facilities (HALT) study.[2]

Aged Care NAPS has been conducted annually since 2015;[3-5] it is a collaborative project between the National Centre for Antimicrobial Stewardship (NCAS), the Guidance Group and Victorian Healthcare Associated Infection Surveillance System (VICNISS) Co-ordinating Centre. The Australian Commission on Safety and Quality in Health Care (the Commission) provides funding for AC NAPS to contribute data to the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System. AURA provides comprehensive and coordinated national surveillance of antimicrobial use and antimicrobial resistance.[6]

Australian aged care services

In Australia, aged care services are primarily provided through Commonwealth Home Support, home care packages and permanent or respite residential care in aged care homes. There are also five flexible service options that provide home support and/or residential care, including multi-purpose services. Multi-purpose services, located in all states, the Northern Territory and the External Territories (Norfolk Island), provide integrated health and aged care services for small regional and remote communities, where a standalone hospital and aged care home would not be viable.[7] Multi-purpose services are configured to best meet the needs of the communities they serve.

At 30 June 2019, 873 providers operated 2,717 residential aged care services; 62% of these services were located in major cities, and 61%, 26% and 13% were operated by not-for-profit organisations, private organisations, and government respectively. Victoria has a higher number of government aged care homes than other states and territories. There were 213,397 operational residential aged care places with an occupancy rate of 89% in 2018–19, excluding flexible aged care places. The three largest states – New South Wales, Victoria and Queensland – collectively accounted for 79% of these places.[8] Of the 8,472 government operational places, 60.6% were located in Victoria. Multi-purpose services (*n* = 179) provided 3,646 operational places.[7]

Optimal antimicrobial use, also known as antimicrobial stewardship (AMS), is supported by the Aged Care Quality Standards, particularly Standard 3(3) g which aims to minimise infection-related risks and antibiotic resistance through promotion of appropriate antibiotic prescribing.[9]

Methods

Time frame

The official data collection and submission period for the 2019 AC NAPS was 1 June to 31 August 2019.

Recruitment

All Australian residential aged care services are eligible to participate in AC NAPS. Since 2017, participation by Victorian state government residential aged care services has been mandatory, as part of the VICNISS Infection Control Indicator Program. The remainder of participants contribute voluntarily.

In 2019, a communication plan was developed to encourage and support participation by all eligible Australian aged care facilities. Numerous strategies were used including:

- Newsletters issued by the Australian Government Department of Health, the Commission, NCAS, VICNISS Coordinating Centre and the Australasian College for Infection Prevention and Control.
- Correspondence from the Commission and NCAS to key stakeholders including the then Australian Aged Care Quality Agency, major aged care service providers, the Royal Australian College of General Practitioners, Aged and Community Services Australia, Leading Aged Care Services and COTA Australia.
- Tweets issued by the Commission, NCAS and VICNISS to highlight for example, how to register and the official commencement and completion dates.

Survey method

Participating residential aged care services could choose one of two survey methods to collect data. Method 2 was recommended for smaller services that wished to expand their sample size to better assess their performance.

Method 1: A single-day point prevalence survey

On the survey day, all residents are screened to determine if they:

- Have an antimicrobial prescription, and/or
- Have signs and symptoms of a suspected infection.

Method 2: A single-day point prevalence survey plus an additional one month retrospective survey

On the survey day, all residents are screened to determine if they:

- Have an antimicrobial prescription, and/or
- Have signs and symptoms of a suspected infection.

In addition, all residents present on the survey day are screened to determine if they had an antimicrobial prescription on any day during the previous month that was ceased prior to the survey day.

Data collection forms

Aged Care Home form

Each participating facility completed the Aged Care Home form (Appendix 1). Resident-level data fields included listing the number of residents present on the survey day. All residents who were present on the survey day were eligible for inclusion.

Antimicrobials and Infections form

To simplify data collection, for 2019 the separate 2018 Antimicrobials and Infections data forms were merged. For the new ‘Antimicrobials and Infections form’, data fields about the initial mode of antimicrobial prescription (example, written by prescriber, phone or fax order), urinary catheters, urinary dipsticks and signs and/or symptoms of suspected infections on the antimicrobial start date or the six days prior were deleted.

The Antimicrobials and Infections form (Appendix 2) was completed for residents who:

- Were prescribed an antimicrobial on the survey day (Methods 1 and 2), and within the previous month (Method 2 only)
- Had at least one sign and/or symptom of a suspected infection present on the survey day (Methods 1 and 2).

Data were collected about key prescribing elements, including the choice of antimicrobial agent, dose, route of administration, frequency, start date and documentation of a review or stop date. For prescriptions for prn administration, data were also collected on whether the antimicrobial had been administered on the survey day or in the six days prior. Antimicrobial prescriptions included all antibiotics, antiviral, antifungal and anti-parasitic agents in all formulations. Hexamine hippurate, an antibacterial antiseptic, was included due to its common use for urinary tract infection prophylaxis.[10]

The indication and body system for the prescription were reported according to a standardised list. If an indication was not included on the list, the surveyor was required to report 'Other' and the body system; for example, 'Other – urinary tract'.

If the antimicrobial start date was known, and the therapy had commenced less than six months before the survey day, data were collected about microbiology specimens taken on the antimicrobial start date or in the six days prior. Culture and sensitivity data were collected from finalised respiratory swab, skin/wound swab, sputum, urine and 'other' microbiology reports. If more than one specimen of the same type was collected within the specified timeframe, only the most recent result was reported.

A list was provided for recording signs and/or symptoms of infections documented on the survey day and, if present, in the two days prior. The list was divided into six body systems: urinary tract, respiratory tract, skin or soft tissue, oral, eye, and other. A list was also provided of constitutional criteria, or signs and symptoms common to many different infection types; these included: fever, leucocytosis, change in mental status from baseline, acute functional decline in activities of daily living, and results of full blood examination. The methodology for collection of infection data included reviewing medical histories, staff handover notes, incident reports, wound-care folders or verbal information provided by a senior clinician.

Electronic AC NAPS

On the survey day, hard copy data collection forms were completed by the surveyors and then used to assist with electronic data entry. Registered surveyors could access the e-versions via the NAPS web portal.

Once the data were entered, a new two page dashboard report could be generated and downloaded immediately via the NAPS web portal. These reports enabled participating residential aged care services to compare their performance against their last year and national aggregate data. Key results were presented in simple table or graph format. Surveyors were encouraged to forward the reports to those who are able to influence resident care, including administrators and clinicians such as general practitioners, pharmacists and nurses.

Data Definitions and Data Analysis

Data quality processes for the AC NAPS dataset included identification and correction of missing, miscoded and out-of-range errors. Duplicate and non-finalised resident records were excluded; surveys that included only non-finalised resident records were omitted. For those residential aged care services that participated more than once each year, only their last survey was included. Changes to the dataset and decisions about how to assess certain data fields were documented.

A suspected infection was defined as at least one sign or symptom of infection on the survey day and if present, other signs and/or symptoms in the two days prior to the survey day. More than one suspected infection could be reported for each resident. An electronic decision algorithm was applied to each suspected infection to determine whether or not the McGeer *et al* infection surveillance definitions were met. These widely referenced definitions, which were specifically developed for use in long term care facilities, were last revised in 2012 to take into account the most recent evidence and the availability of improved diagnostics for surveillance.[11]

Each infection was classified by the surveyor as facility- or non-facility associated. Facility-associated infections were those for which the resident's signs and/or symptoms commenced at least two calendar days after (re)admission into the facility. Non-facility associated infections were those for which the resident's signs and symptoms commenced within two calendar days of being admitted into the residential aged care service.

The prevalence of infection was calculated as the proportion of residents present on the survey day who had signs and/or symptoms of at least one suspected infection. The prevalence of antimicrobial use was calculated as the proportion of residents present on the survey day who were prescribed at least one antimicrobial.

To analyse antimicrobial use, Method 1 and Method 2 antimicrobial data were usually combined. Antimicrobials prescribed on a known start date within six months and still prescribed on the survey day only were included in exact duration and date of administration estimates. This is because both the start and survey date were required for these analyses.

Support

Throughout the year, the NAPS Co-ordinating team provided email and telephone assistance as required. Surveyors were encouraged to access the AC NAPS resources webpage for: the updated User Guide; frequently asked questions; documents about registration, data collection and data submission; and the eLearning module. The eLearning module outlined how to prepare for the survey, the methodology and how to complete the data collection forms. As requested, online training sessions were delivered for different provider groups.

Considerations for data interpretation

AC NAPS data

2016–2018 data included in the analyses for this report differs from previous reports: some data were retrospectively entered and, as noted in the Methodology section, an extensive data cleaning process was undertaken before commencing analysis. Also, as part of merging the separate 2018 Antimicrobials and Infections data collection forms, some data fields were omitted for 2019 that may have been previously included and some new data fields were included.

Sampling

For some states and territories, remoteness and provider type categories there was a relatively small number of participating residential aged care services. Also, unlike aged care homes, multi-purpose services are all government-operated and provide a range of health services.

Over time, different cohorts of residential aged care services have participated in the annual AC NAPS. Each year, the number of participating residential aged care services has increased, new services have participated and some services that previously participated have chosen not to participate.

Signs and Symptoms

A suspected infection was defined as at least one sign and/or symptom of infection on the survey day and/or the two days prior to the survey day. In many cases prescriptions audited were prescribed more than three days prior to the survey day. As signs and symptoms are likely to be most significant in the time period just prior to or on commencement of antimicrobial prescriptions, the number of suspected infections defined in this report may under-represent the true number of antimicrobial prescriptions where signs and symptoms were present prior to the prescription commencing.

Infection surveillance definitions

Signs and symptoms of infection in older residents may be atypical, so failure to meet the McGeer *et al* definitions may not fully exclude the presence of a true infection. In addition, the McGeer *et al* definitions require microbiological confirmation for some infections (for example, urinary tract infections). This means that these infections will not be confirmed unless microbiological specimens are collected. Specimens for microbiological testing are less likely to be collected in residential aged care services, compared to acute care services. The McGeer *et al* definitions are generally useful to compare the proportion of defined infections between facilities over time as opposed to being used to rule in or rule out the clinical need for a prescription.

Variation

The survey was conducted on a single day during winter. The results may have been different on another day during winter or another season. Certain respiratory infections, for example, are usually more frequent in winter.

Validation

The analysis relied on the validity of local assessments. There was no additional external validation undertaken.

Results

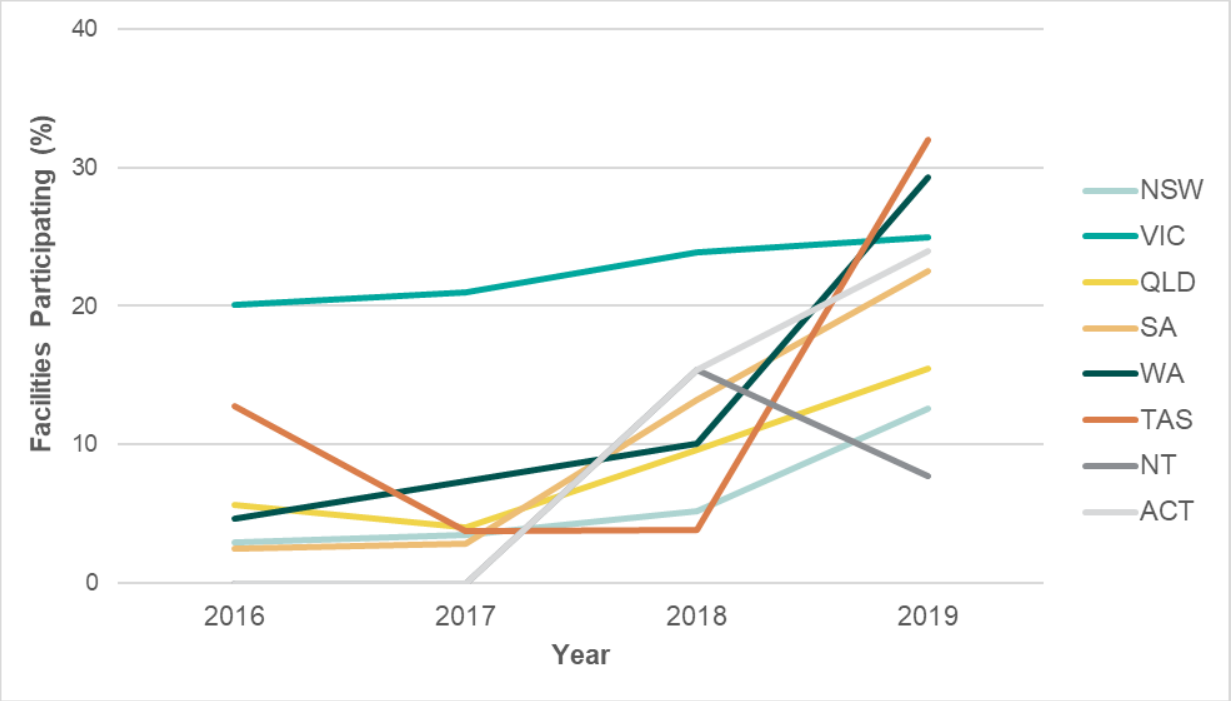
Participation

In 2019, 568 residential aged care services (510 aged care homes and 58 multi-purpose services) collected and submitted AC NAPS data at least once during the official timeframe. Seven residential aged care services participated more than once. Since 2017,154 residential aged care services have participated at least once each year during the official data collection period.

For the first time since the 2015 AC NAPS pilot, there were more participating services from other states and territories combined than from Victoria (*n* = 373, 65.7%); 119 (21.0%) participants were from NSW. About three quarters of participating residential aged care services were located in either major cities (*n* = 249, 43.8%) or inner regional areas (*n* = 175, 30.8%). Also for the first time, more than half (*n* = 312, 54.9%) were not-for-profit operated.

The percentage of participating residential aged care services increased for most states and territories. Representation within the AC NAPS cohort varied from 7.7% (Northern Territory) to 32.0% (Tasmania) (Figure 1), and across remoteness areas from 14.7% (major cities) to 29.5% (outer regional).

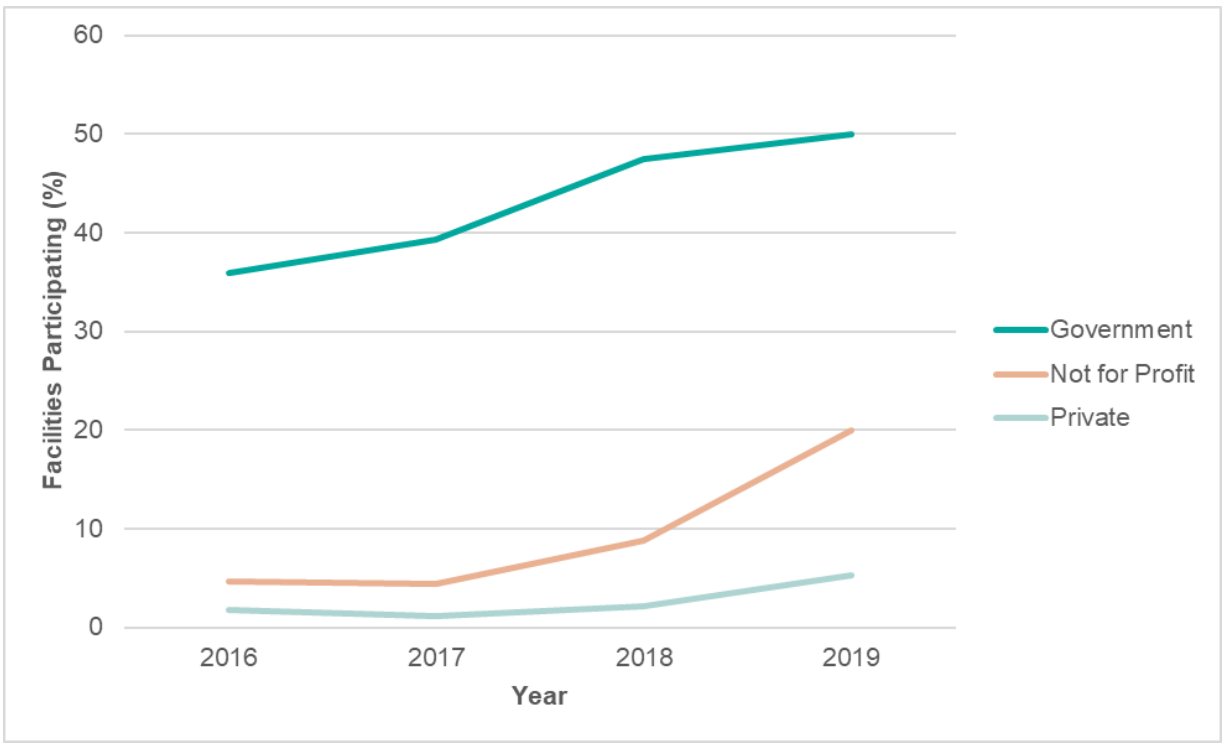
Figure 1: Percentage of participating facilities by state and territory, AC NAPS contributors 2016–2019



Source: Facility form
See Appendix 3 Tables A1 and A2 for percentage values

The percentage of participating residential aged care services increased for all provider types. Nationally, half (50.0%) of all government-operated residential aged care services and smaller proportions of not-for-profit (20.0%) and private (5.3%) services participated (Figure 2). See Appendix 3 for a more detailed breakdown of residential aged care services by location and provider type.

Figure 2: Percentage of participating facilities by provider type, AC NAPS contributors, 2016–2019



Source: Facility form
See Appendix 3 Tables A1 and A2 for percentage values

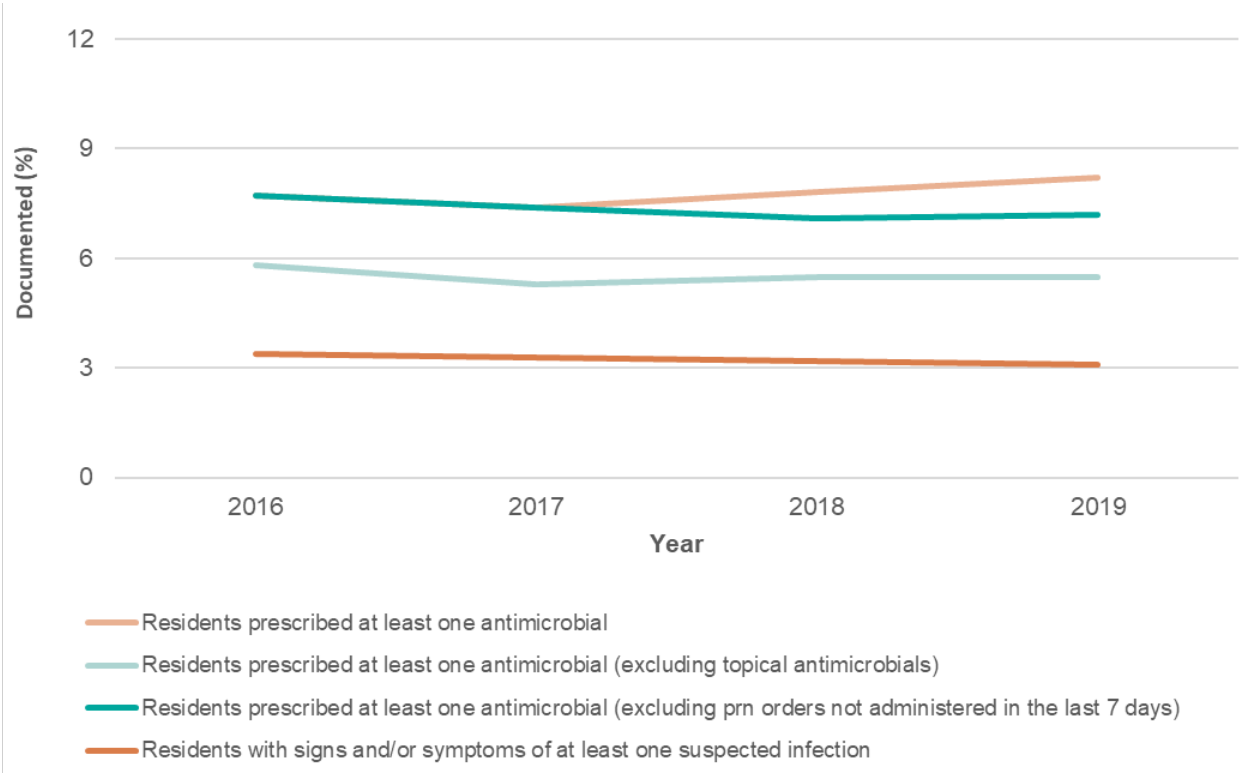
The number of residents whose records were audited in 2019 significantly increased (*n* = 32,347); in 2017 and 2018, 10,727 and 18,245 residents' records were audited respectively. Similar to previous years, over half (58.8%) of these residents were older than 85 years, and about one-third (32.1%) were male. One in 20 residents (*n* = 1,529, 4.7%) had been admitted to a hospital in the previous 30 days, and 2.9% (*n* = 943) had an indwelling catheter on the survey day.

Most participating residential aged care services reported that they employed a person responsible for coordinating an infection prevention and control program (87.3%), and that policies and procedures detailing the requirements for standard and transmission-based precautions were in place (98.9%). Less frequently, residential aged care services reported that they employed a person responsible for coordinating an AMS program (80.6%), and had policies and procedures detailing AMS requirements (87.9%). About three quarters of prescribers were reportedly easily able to access the Therapeutic Guidelines: Antibiotic[12] (76.1%); 67.3% of residential aged care services reported access to the Australian Medicines Handbook: Aged Care Companion (67.3%).[13]

Prevalence of infections and antimicrobial use

The prevalence of residents who had a suspected infection and who were prescribed an antimicrobial remained constant. In 2019, the prevalence of residents who had signs and/or symptoms of at least one suspected infection on the survey day was 3.1% (*n* = 1,017). The prevalence of residents prescribed at least one antimicrobial was 8.2% (*n* = 2,643). If all topical antimicrobials or if all prn orders not administered in the last seven days were excluded, the prevalence of residents prescribed at least one antimicrobial was 5.5% (*n* = 1,768) and 7.2% (*n* = 2,340) respectively (Figure 3).

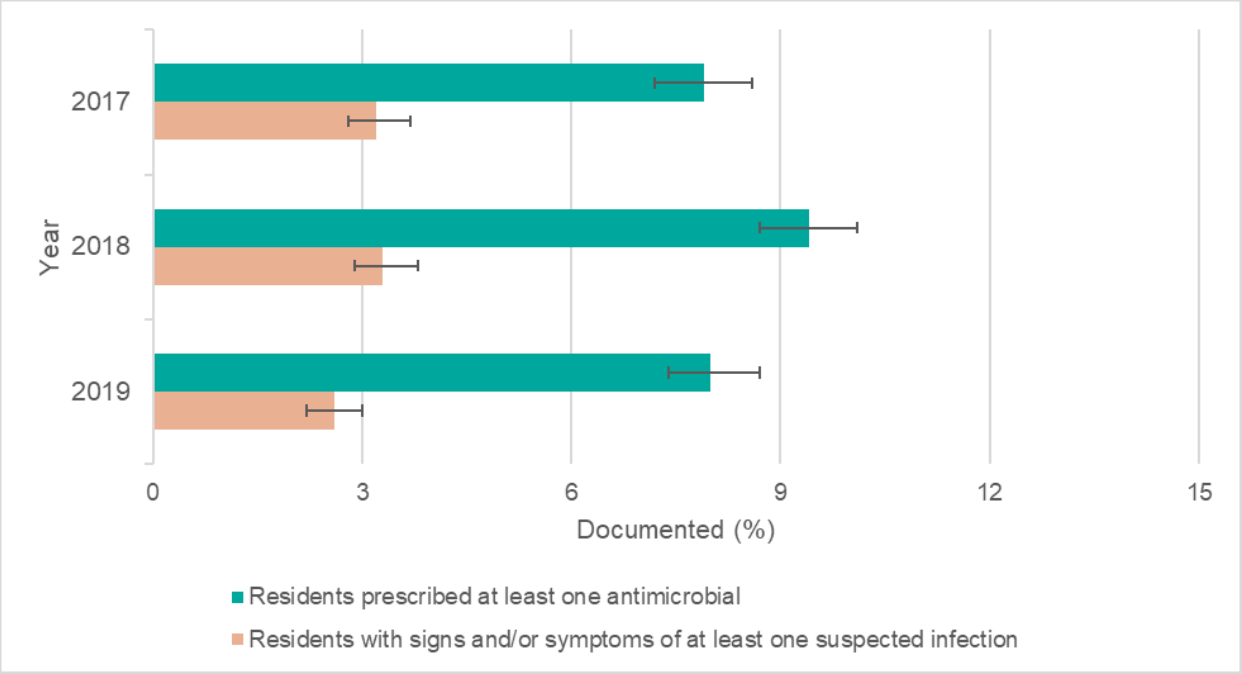
Figure 3: Prevalence of suspected infections and antimicrobial use, AC NAPS contributors, 2016–2019



Source: Antimicrobial and infection form Sections 2 and 5 Method 1 and 2 data
See Appendix 3 Table A4 for percentage values

For the 154 residential aged care services that participated annually from 2017 to 2019, there was no significant change in the prevalence of residents with signs and/or symptoms of at least one suspected infection or in the prevalence of residents prescribed one or more antimicrobials (Figure 4).

Figure 4: Prevalence of suspected infections and antimicrobial use for facilities that have participated annually, AC NAPS contributors, 2017–2019



Source: Antimicrobial and infection form Sections 2 and 5 Method 1 and 2 data
See Appendix 3 Table A5 for percentage and confidence intervals values

Suspected infections on the survey day

A total of 1,017 residents were reported to have a total of 1,041 suspected infections on the survey day. Suspected skin or soft tissue (32.1%), respiratory tract (31.2%) and urinary tract (23.1%) infections were most commonly reported. About three-quarters (74.1%) of these suspected infections were facility-associated (>48 hours post admission) and 29.0% met the McGeer *et al* infection surveillance definitions (Table 1).

Table 1: Number and percentage of suspected infections by body system and location of acquisition, AC NAPS contributors, 2019

Body System	No. of Suspected Infections*	Suspected Infections >48 Hours Post Admission		Suspected Infections that met McGeer *et al* Definition	
		No.	%	No.	%
Skin or Soft Tissue	334	230	68.9	127	38.0
Respiratory Tract	325	256	78.8	96	29.5
Urinary Tract	240	191	79.6	12	5.0
Eye	64	46	71.9	60	93.8
Oral	29	22	75.9	7	24.1
Other Systems	49	26	53.1	0	0.0
Total	**1,041**	**771**	**74.1**	**302**	**29.0**

Source: Antimicrobial and infection form Section 5
*A resident could have more than one suspected infection across different body systems.

Antimicrobial Use

Antimicrobial use data collected by both Method 1 and Method 2 were combined for the analyses presented in this section, unless otherwise stated. The unit of analysis is antimicrobial prescriptions. A total of 3,134 residents were prescribed a total of 3,735 antimicrobials; 3,040 were still prescribed on the survey day.

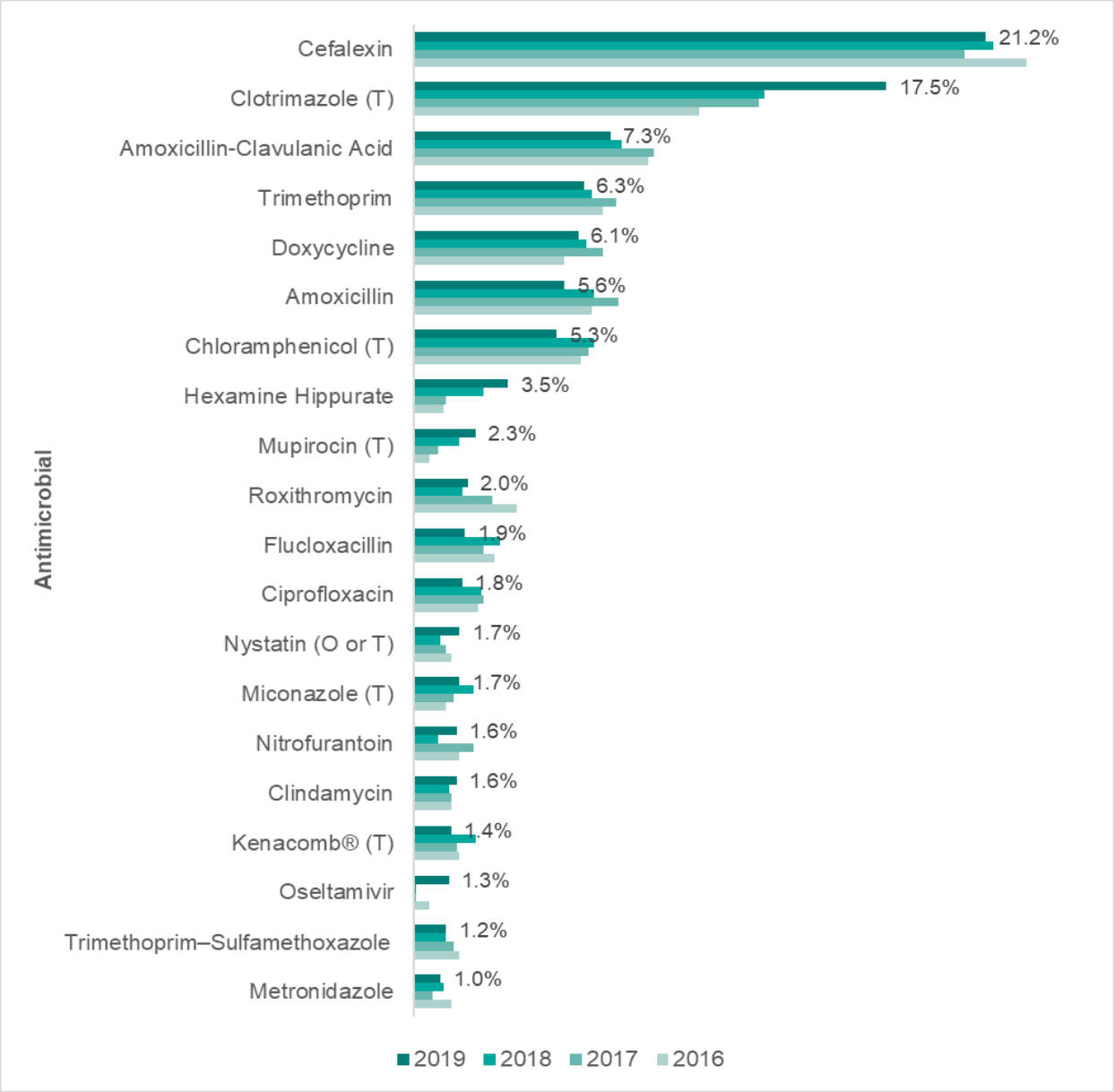
Duration

The start date was unknown for 0.9% (*n* = 35) of the antimicrobial prescriptions; 5.5% (*n* = 206) were commenced more than six months prior to the survey day. For those antimicrobials still prescribed on the survey day, with a known start date that was less than six months prior to the survey day, 43.4% (*n* = 1,318) had been commenced more than seven days prior to the survey day.

Most commonly prescribed antimicrobials

Most antimicrobials were prescribed for oral (*n* = 2,545, 68.1%) or topical (*n* = 1,136, 30.4%) administration. The majority of prescriptions were for therapeutic use (*n* = 3,003, 80.4%), the remainder were for prophylaxis. As in previous years, cefalexin (*n* = 790, 21.2%), clotrimazole (*n* = 654, 17.5%) and amoxicillin–clavulanic acid (*n* = 274, 7.3%) were the most frequently prescribed antimicrobials (Figure 5).

Figure 5: Most commonly prescribed antimicrobials, AC NAPS contributors, 2016–2019*.



Source: Antimicrobial and infection form: Section 2. Method 1 and 2 data.
See Appendix 3 Table A6 for percentage values
T = Topical
Kenacomb contains triamcionolone, neomycin, nystatin and gramicidin

Cefalexin (75.2%) and clotrimazole (86.9%) were most commonly prescribed for therapeutic use (Table 2).

Table 2: Cefalexin and clotrimazole prescriptions, therapeutic and prophylactic use, AC NAPS contributors, 2019

Antimicrobial	Category	No.	%	% of Therapeutic Prescriptions (*n* = 3,003)	% of Prophylactic Prescriptions (*n* = 732)	% of Total Prescriptions (*n* = 3,735)
Cefalexin (*n* = 790)	Therapeutic	594	75.2	19.8	NA	15.9
	Prophylactic	196	24.8	NA	26.8	5.2
Clotrimazole (*n* = 654)	Therapeutic	568	86.9	18.9	NA	15.2
	Prophylactic	86	13.1	NA	11.7	2.3

Source: Antimicrobial and Infection form: Section 2 Method 1 and 2 data
NA= Not applicable

Almost one in six (*n* = 455, 15.0%) antimicrobials still prescribed on the survey day (*n* = 3040) were for prn administration; the majority of these (*n* = 413, 90.8%) were for topical antimicrobials, most commonly clotrimazole (*n* = 337, 74.1%). About three quarters of these (*n* = 339, 74.5%) had been prescribed for durations of between one week and six months. For both 2018 (*n* = 27) and 2019 (*n* = 63), about 14% were administered on the survey day or in the six days prior (Table 3).

Table 3: Antimicrobials prescribed for prn administration, duration of prescription and administration on the survey day or in the six days prior, AC NAPS contributors, 2018–2019*

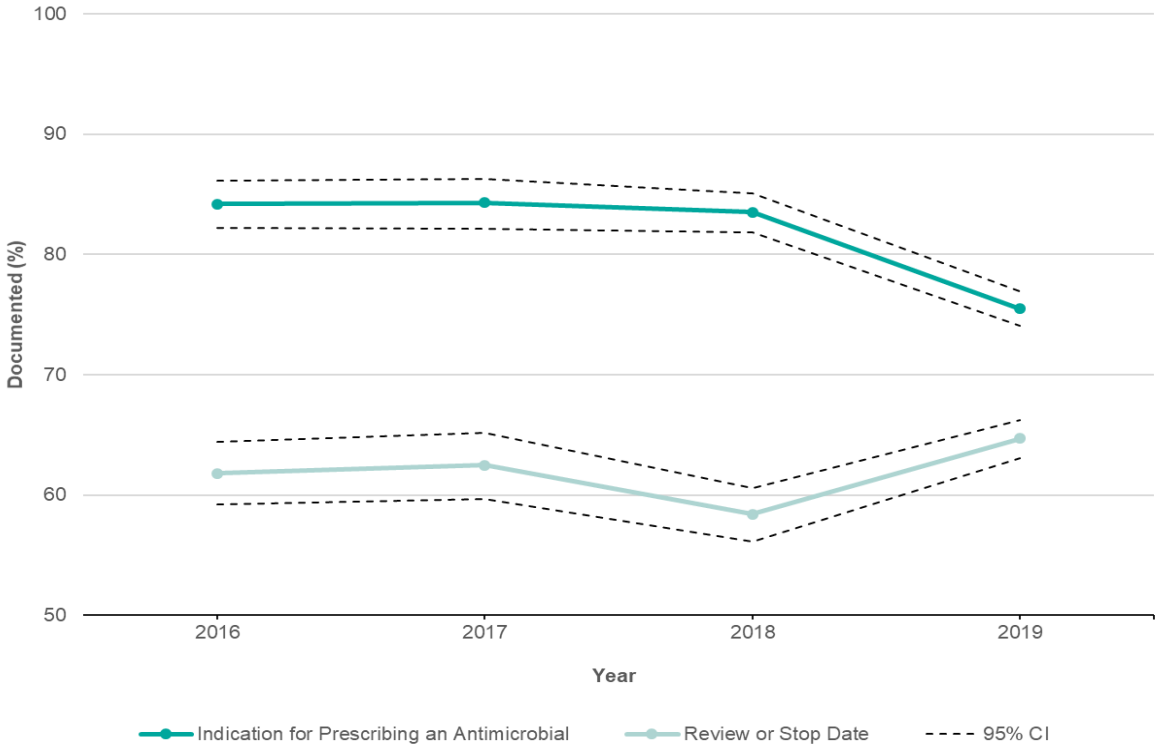
Duration of Prescription	2018			2019		
	Number of antimicrobials prescribed for PRN administration	Administration on survey day or six days prior		Number of antimicrobials prescribed for PRN administration	Administration on survey day or six days prior	
		No.	%		No.	%
Less than 1 week	6	4	66.7	25	10	40.0
1 week to 6 months	122	16	13.1	339	38	11.2
Greater than 6 months	58	7	12.1	80	14	17.5
Unknown	8	0	0.0	11	1	9.1
Total	**194**	**27**	**13.9**	**455**	**63**	**13.8**

Source = Antimicrobial and infection form: Section 2.
*Includes antimicrobials still prescribed on the survey day only.

Quality indicators

In 2019, compared with previous years, there was a decrease in the percentage of antimicrobial prescriptions (*n* = 2,820, 75.5%) that had an indication documented for prescribing an antimicrobial. At the same time, there was an increase in the percentage of antimicrobial prescriptions (*n* = 2415, 64.7%) that had a review or stop date documented (Figure 6).

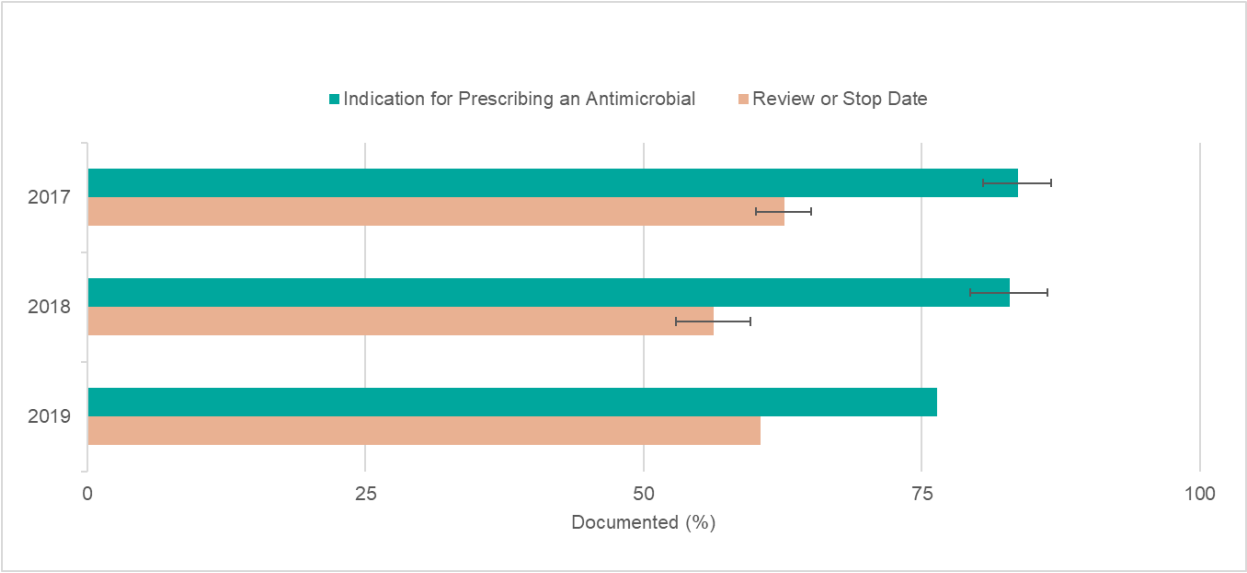
Figure 6: Key quality indicators for all participating facilities, AC NAPS contributors, 2016–2019



Source: Antimicrobial and infection form: Section 2 Method 1 and 2 data.
See Appendix 3 Table 7 for percentage values

For the 154 residential aged care services that participated annually from 2017 to 2019, there was no significant change in the documentation of an indication for prescribing an antimicrobial (*n* = 601, 76.4%) or review or stop date (*n* = 476, 60.5%) (Figure 7).

Figure 7: Key quality indicators for facilities that have participated annually, AC NAPS contributors, 2017-2019.

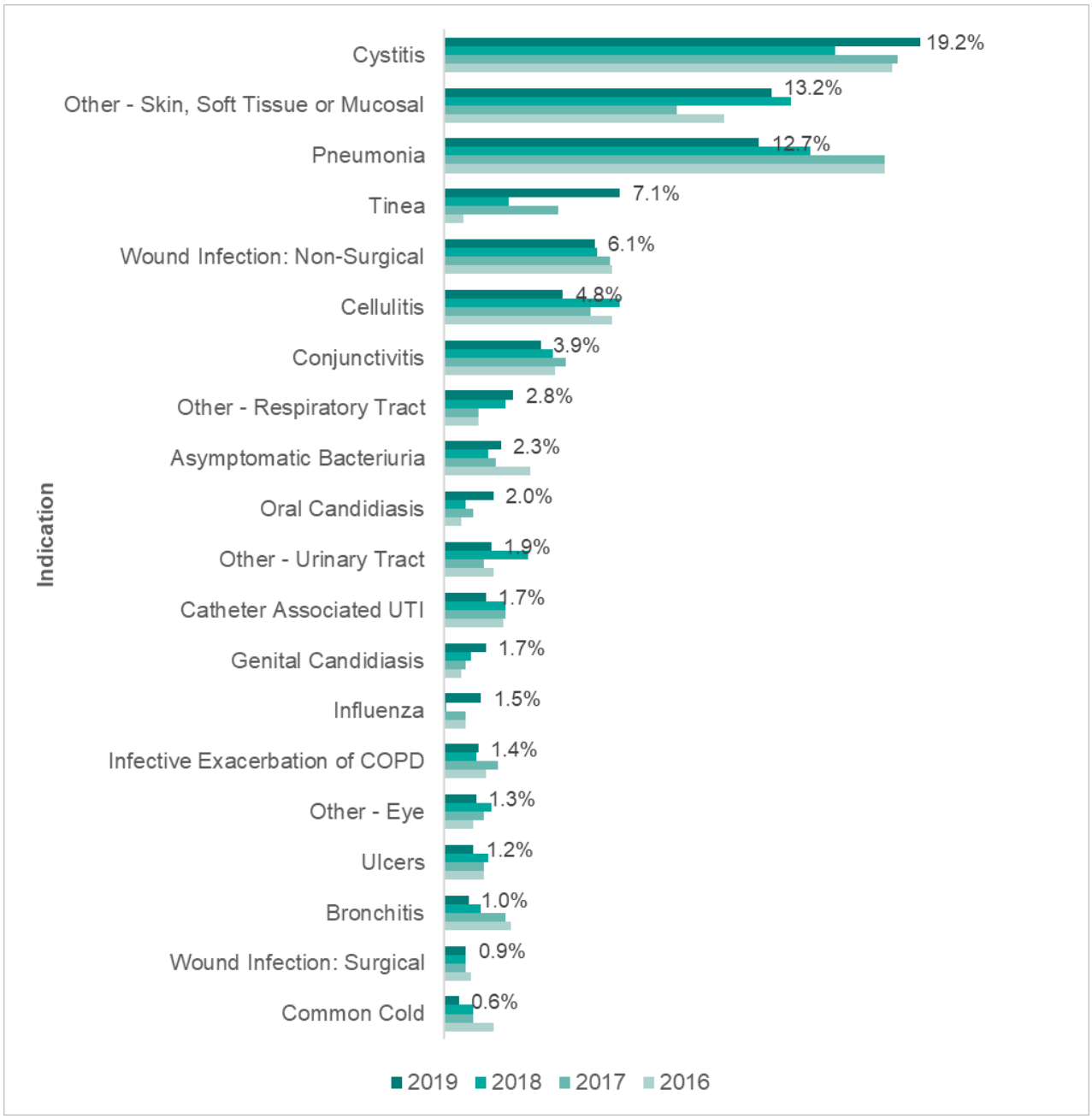


Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Appendix 3 Table 8 for percentage and confidence interval values

Common indications for prescribing antimicrobials

The top five known indications for prescribing antimicrobials from 2016 to 2019 were: cystitis; other - skin, soft tissue or mucosal; pneumonia; wound infection (non-surgical); and tinea (Figure 8). The indication was reported as unknown for a small proportion of prescriptions (*n* = 187, 5.1%).

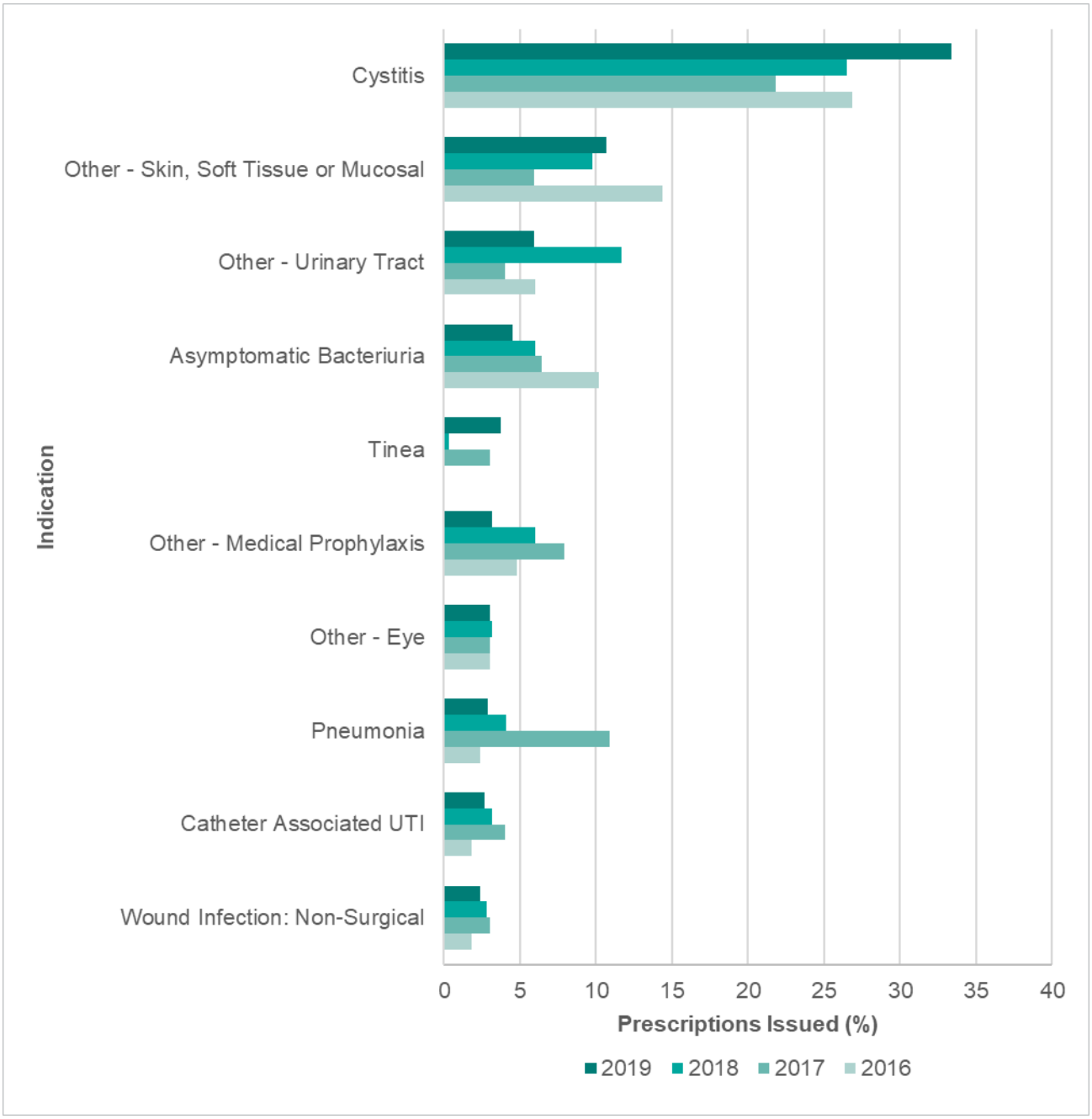
Figure 8: Most common indications for antimicrobial prescriptions, AC NAPS contributors, 2016–2019



Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Appendix 3 Table 9 for percentage values
Only top 20 indications listed
Unknown indications for commencing an antimicrobial excluded
UTI = Urinary tract infection; COPD = Chronic Obstructive Pulmonary Disease

Antimicrobials were consistently and most commonly prescribed for prophylactic indications associated with the urinary tract. In 2019, about half of the 694 prophylactic prescriptions were for cystitis (33.4%), other-urinary tract (5.9%, asymptomatic bacteriuria (4.5%) and catheter-associated urinary tract infection (2.7%) (Figure 9).

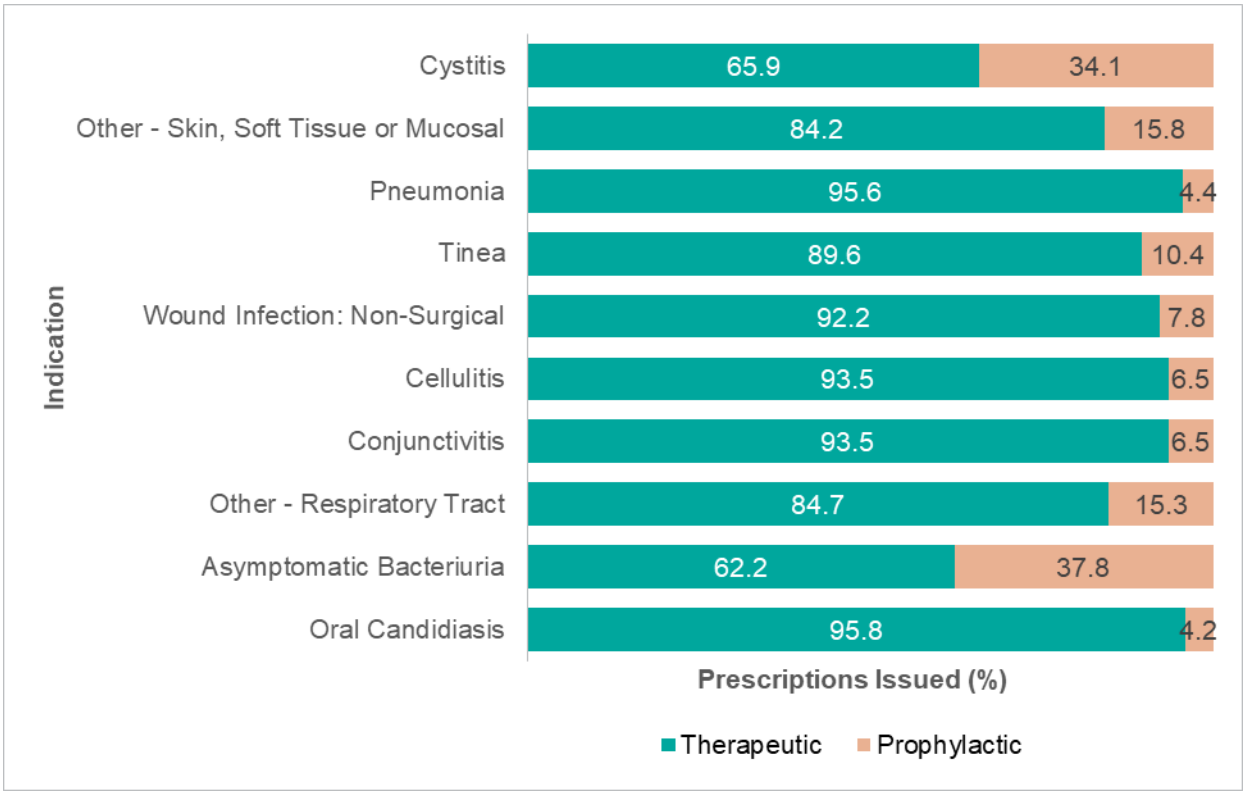
Figure 9: Most common prophylactic indications for antimicrobial prescriptions, AC NAPS contributors, 2016–2019



Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Appendix 3 Table 10 for percentage values
Only top ten prophylactic indications listed
Unknown indications for commencing an antimicrobial excluded
UTI = Urinary tract infection

Therapeutic use of antimicrobials was more common in skin and soft tissue and respiratory tract infections (Figure 10).

Figure 10: Comparison of therapeutic and prophylactic antimicrobial prescriptions for common indications, AC NAPS contributors, 2019



Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Appendix 3 Table 11 for percentage values
Only top ten indication listed
Unknown indications for commencing an antimicrobial excluded

Most commonly prescribed antimicrobials for common indications

The most commonly prescribed antimicrobials for cystitis was cefalexin (37.6%), trimethoprim (25.0%) and hexamine hippurate (13.4%) (Table 4).

Table 4: Commonly prescribed antimicrobials for cystitis, pneumonia and tinea, AC NAPS contributors, 2019

Cystitis (*n* = 680)			**Pneumonia (*n* = 452)**			**Tinea (*n* = 251)**		
Antimicrobial	**No.**	**%**	**Antimicrobial**	**No.**	**%**	**Antimicrobial**	**No.**	**%**
Cefalexin	256	37.6	Amoxicillin–clavulanic acid	120	26.5	Clotrimazole	222	88.4
Trimethoprim	170	25.0	Amoxicillin	90	19.9	Miconazole	16	6.4
Hexamine hippurate*	91	13.4	Doxycycline	81	17.9	Terbinafine	5	2.0
Nitrofurantoin	46	6.8	Cefalexin	53	11.7	Kenacomb®**	5	2.0
Amoxicillin–clavulanic acid	37	5.4	Roxithromycin	37	8.2	Fluconazole	2	0.8

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data.
Only top five prescribed antimicrobials listed
*Hexamine Hippurate is an antibacterial antiseptic
**Kenacomb ® contains triamcinolone, neomycin, nystatin and gramicidin

Discussion

There was a large increase in the number of AC NAPS contributors in 2019, which indicates that Australian residential aged care services value the opportunity to participate in surveillance of antimicrobial use and infections. The increase was particularly apparent in states where participation by government-funded residential aged care services is not mandatory (as is the case in Victoria), and for the not-for-profit sector. Continuing very low participation by private aged care providers is disappointing, given that there has been targeted promotion of the value of AC NAPS to this sector; and just under one third (32.4%) of all multi-purpose services participated.

The Aged Care Quality Standards, which were introduced for all residential aged care services from 1 July 2019, likely influenced the sustained increase in AC NAPS participation since 2017. These Standards require demonstration of minimisation of infection risks and practices to promote appropriate antibiotic use.[9] However, it is important to note that surveillance on its own is not sufficient to demonstrate that risks are being addressed, or that the Standards are met. Rather, evidence that the Standards are met would include development and implementation of quality improvement strategies informed by analyses of data from programs such as AC NAPS.

The 2019 AC NAPS has identified the same resident safety issues in relation to antimicrobial use as previous surveys since 2015. The issues of concern, which require urgent attention, continue to be:

- Prolonged duration of antimicrobial use
- High rates of prn prescriptions for antimicrobials
- High rates of topical antimicrobial use, particularly for prn administration where not usually indicated
- Prolonged prophylaxis for conditions where not recommended by guidelines
- Poor documentation of indication, review and stop dates for antimicrobial prescriptions.

Notwithstanding variation from year to year in the cohort of AC NAPS contributors, the consistency of the issues identified by the analyses as the number of contributors has increased suggests that these issues are likely widespread in Australian residential aged care services.

Findings such as increases in the proportion of prn prescriptions prescribed for longer than six months are concerning, but may reflect practises in new contributor services. The shorter the time from initial audit, the less time a service has to act and improve on the findings. However, for long term contributors the only improvement related to documentation of indication or review dates.

The minimal improvement in the appropriateness of antimicrobial use in services that have participated in AC NAPS consistently from 2017 to 2019 (n = 154), reinforces the need for strategies that will lead to improvement action in response to resident safety issues. This finding also highlights the importance of strategies to address reported barriers to improvement in antimicrobial use in residential aged care services, including difficulties in diagnosis of infections (sample collection, cognitively impaired residents), staffing issues (off-site general practitioners and pharmacists, nursing staffing levels and workload), off-site laboratory services, and family expectations.[14, 15]

Continuing reports of high rates of topical antimicrobial use, the duration of use and the large proportion of prn prescriptions are concerning, in relation to compliance with prescribing guidelines and the potential to contribute to the development of antimicrobial resistance. The use of prn prescriptions may reduce clinical review of antimicrobial choice at time of onset of infection, including decisions regarding duration of treatment.

Analyses of AURA data from the National Alert System for Critical Antimicrobial Resistances and Australian Passive AMR Surveillance have identified emerging, and worsening rates of antimicrobial resistance in residents of Australian aged care services. These include daptomycin-nonsusceptible *Staphylococcus aureus*, carbapenemase-producing Enterobacterales (CPE) and methicillin-resistance in *S. aureus*.[17]

Skin and soft tissue infections are commonly caused by *S. aureus*, which is spread by contact with contaminated surfaces and hands of healthcare workers, hence the importance of environmental cleaning and hand hygiene. *Staphylococcus aureus* can also be spread from person to person, especially in group living situations such as residential aged care services where people with skin infections may inadvertently share personal things like bed linen, towels, or clothing. There is also a risk of transmission of these resistances within residential aged care services, and in hospitals due to the frequent movement of residents between these two settings.

As in previous years, the most commonly prescribed topical antimicrobial for residents of AC NAPS contributor services was clotrimazole, followed by chloramphenicol. Clotrimazole is a recommended treatment for a number of conditions, including mucocutaneous candidiasis; and chloramphenicol is infrequently indicated for common infections. Use of clotrimazole is generally recommended only for two weeks. The use of clotrimazole from a prn prescription may lead to inappropriate duration of therapy, and unnecessary use of antifungals either topically or systemically may contribute to the development of resistance. Of particular concern is *Candida auris*, a multidrug-resistant fungus that has rarely been reported in Australia to date, but has become prominent in aged care settings in other countries.[16]

Cefalexin prescriptions for prophylaxis comprised 5.2% of all prescriptions in the 2019 survey, which is an improvement compared with 2018, when the proportion was almost 9%. However, there are narrower spectrum antimicrobials recommended as first line treatments to minimise the risk of development of antimicrobial resistance.

The patterns of prescribing of broad-spectrum antimicrobials such as cefalexin and amoxicillin–clavulanic acid identified by the AC NAPS suggest opportunities to promote improved concordance with evidence-based guidelines, particularly in relation to pneumonia and urinary tract infections. Appropriate use of narrow-spectrum antimicrobials would likely reduce adverse effects such as candidiasis and diarrhoea, and may have flow-on benefits of reducing antimicrobial use for those conditions.

Prescribing antimicrobials for ‘other – skin, soft tissue or mucocutaneous’ infections likely represents a heterogeneous group of superficial infections. Exploring the conditions contributing to this large proportion of antimicrobial prescribing in the AC NAPS cohort may inform prescribing guidelines for aged care; and focus preventive strategies for these infections, which are likely facility-associated, such as hydration, hygiene and pressure care.

As in previous years, the majority of prescriptions for prophylaxis were for urinary tract conditions including asymptomatic bacteriuria; prophylaxis is not indicated for asymptomatic bacteriuria. The relative risks and benefits of prolonged antimicrobial prophylaxis in the elderly are not well studied. In addition to the risk of development of AMR, risks of antimicrobial side effects are high, and include diarrhoea and mucocutaneous candidiasis.

Whilst participating services are encouraged to provide AC NAPS data to prescribers and other relevant clinicians and to management, it is not known whether these feedback loops have been established. Reporting on risks to clinicians, governance and leadership groups, residents and their families is essential to foster improvement in performance relating to antimicrobial use and the safety of care provided to residents.

The following actions may contribute to improving resident safety and ensuring a solid foundation for AMS and infection prevention and control in residential aged care services:

- Regular review of prescribing patterns in collaboration with medical and nursing staff, particularly regarding prescriptions for antimicrobial prophylaxis, including compliance with Australian prescribing guidelines in relation to recommended duration and choice of antimicrobials
- Ensuring that analyses of AC NAPS data for each residential aged care service are shared with administrators, governance groups, and clinicians such as general practitioners, pharmacists and nurses, and used to develop targeted improvement strategies
- Feedback mechanisms on issues identified by analyses of AC NAPS data for clinicians, governance and leadership groups, residents and their families
- Use of medication charts that are consistent with the Commission's National Residential Medication Chart to improve documentation
- Policies that require default fixed-length courses of treatment and mandatory review dates, particularly for prn prescriptions[14]
- Consideration of the need for external expert support for aged care staff in relation to antimicrobial use, and diagnosis, prevention and control of infections
- Implementation of policies and procedures consistent with the Australian Guidelines for the Prevention and Control of Infection in Health Care
- Infection prevention and control and AMS education for nurses, prescribers and family members of residents to raise awareness and skill levels in relation to recommended practice[15]
- Education for non-nursing staff who provide care to residents on the importance of infection prevention and control and basic personal and hygiene care
- Targeted quality improvement programs that can be implemented incrementally, with appropriate support and monitoring.

Appendix 1: Facility form

AGED CARE NAPS National Antimicrobial Prescribing Survey

Facility Form

GUIDANCE | NCAS | VICNISS

Facility name

Survey date / /

Aged care provider group name

RAC number

1. Facility Data

Infection Prevention and Control (IPC)

A multidisciplinary team or committee is established that oversees an IPC program.	❒ yes	❒ no
A person is employed to lead and coordinate the IPC program.	❒ yes	❒ no
The appointed IC Coordinator has dedicated time for completing assigned tasks.	❒ yes	❒ no
The ACH has IPC policies and procedures that detail requirements for standard and transmission based precautions.	❒ yes	❒ no

Antimicrobial stewardship (AMS)

A person is employed to lead and coordinate the AMS program.	❒ yes	❒ no
The ACH has IPC policies and procedures that detail requirements for AMS.	❒ yes	❒ no
Staff that prescribe are easily able to access onsite the following national prescribing guidelines:		
• Therapeutic Guidelines: Antibiotic	❒ yes	❒ no
• Australian Medicines Handbook: Aged Care Companion	❒ yes	❒ no

2. Demographic Data

Enter the total number on the survey day.

You may wish to use the Worksheet on the following page to help identify these residents.

	Total
No. of residents present (or onsite)	
No. of residents aged > 85 years	
No. of male residents	
No. of residents admitted to hospital in previous 30 days	
No. of residents transferred to hospital with a suspected or confirmed infection	
No. of residents with a urinary catheter present on the survey day	

AC NAPS ACH Form v1 2019

Worksheet (optional)

	Bed	Name or ID number	>85yrs	Male	Admitted to hospital in previous 30 days	Transferred to hospital with an infection	Current urinary IDC	Prescribed an antimicrobial	Signs and/or symptoms of infection
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
17.									
18.									
19.									
20.									
21.									
22.									
23.									
24.									
Total									

Appendix 2: Antimicrobial and infection form

AGED CARE NAPS National Antimicrobial Prescribing Survey

Antimicrobial and Infection Form

GUIDANCE | NCAS | VICNISS HEALTHCARE ASSOCIATED INFECTION SURVEILLANCE

Does the resident have an antimicrobial prescription? ❒ yes; ***complete sections 1, 2, 3 & if the antimicrobial start date is known and <6 months section 4***

Does the resident have signs or symptoms of infection **on the survey day**? ❒ yes; ***complete sections 1, 5a and 5b***

1. Demographics	Identification number	Date of birth or age	Gender	Admitted to hospital within the last 30 days
		/ /	M / F / O	Yes / No

2. Antimicrobials

Start date*	Started at this facility	Still prescribed today	Antimicrobial	Dose	Route	Freq	*PRN*	*If PRN, administered on the survey day or in the 6 days prior*	Indication documented by prescriber	Specify documented or presumed indication	Was this for prophylaxis?	Review/stop date documented
/ /												
/ /												
/ /												
/ /												

3. Adverse drug reactions to antimicrobials

❒ nil known ❒ not documented

❒ yes, specify;
Antimicrobial(s) _____
_____
_____

Allergic reactions			Side effects (eg: nausea, vomiting diarrhea)	Unknown reaction
Anaphylaxis / angioedema	Rash / urticaria	Other		
❒	❒	❒	❒	❒
❒	❒	❒	❒	❒
❒	❒	❒	❒	❒

4. Microbiology

complete for specimens collected on the antimicrobial start date or in the 6 days prior

❒ none collected ❒ sputum
❒ skin / wound swab ❒ respiratory swab
❒ urine ❒ other

5a. Constitutional criteria; *completed for all residents with any signs and/or symptoms of a suspected or confirmed infection on the survey day or in the 2 days prior*

❒ No constitutional criteria identified

Fever
❒ Single oral temperature >37.8°C
❒ Repeated oral temperature >37.2°C, or rectal temperature >37.5°C
❒ Single temperature > 1.1°C over baseline from any site
❒ Chills or rigors

As according to full blood examination results
❒ White blood cells elevated *(WBC, leucocytes, etc.)*
❒ Left shift documented

Change in mental status from baseline
(confusion, forgetfulness, etc.)
❒ Acute onset *(hours to a few days)*
❒ Fluctuating course
❒ Inattention
❒ Disorganised thinking or altered level of consciousness

Acute functional decline from baseline:
(hours to a few days)
❒ Bed mobility
❒ Transfer
❒ Locomotion within facility
❒ Dressing
❒ Toilet use
❒ Personal hygiene
❒ Eating

AC NAPS Antimicrobial and Infection Form FINAL

1. Demographics	Identification number	Date of birth or age / /

5b. System criteria; *multiple system criteria are possible, complete for all residents with any signs and / or symptoms of a suspected or confirmed infection on the* ***survey day*** *or in the* ***2 days prior***

Urinary tract

❒ Facility associated
❒ Non-facility associated

❒ Acute pain on urination
❒ Acute pain, swelling or tenderness of the testes, epididymis or prostate
❒ Back pain or tenderness (new onset)
❒ Blood in urine
❒ Frequency (new or marked increase)
❒ Incontinence (new or marked increase)
❒ Low blood pressure with no alternate site of infection (new onset)
❒ Pus discharging from the urethra or around a catheter
❒ Suprapubic pain (new onset)
❒ Urgency (new or marked increase)
❒ Urinary retention

❒ **Other** signs +/or symptoms not listed above

Urinary catheter
❒ none
❒ intermittent *(in and out)*
❒ indwelling
❒ suprapubic
❒ external
❒ nephrostomy tube

Urine dipstick
❒ not performed ❒ performed; *date* / /
Nitrite
❒ negative ❒ positive ❒ not recorded
Leucocyte esterase
❒ negative ❒ 1+ ❒ 2+ ❒ 3+ ❒ not recorded

Urine specimen
❒ not collected ❒ collected: *date* / /
❒ final report attached

Respiratory tract

❒ Facility associated
❒ Non-facility associated

❒ Chest wall pain
❒ Chest X-ray (recent, normal)
❒ Chest X-ray showing pneumonia or new infiltrate (recent)
❒ Cough (new or increased)
❒ Headache or eye pain (new)
❒ Hoarseness
❒ Loss of appetite
❒ Lung abnormalities (new or increased)
❒ Malaise
❒ Myalgia or muscle pain
❒ Oxygen saturation < 94% on room air or a reduction of > 3% from baseline
❒ Pain on swallowing
❒ Respiratory rate ≥ 25 breaths per minute
❒ Runny nose or sneezing
❒ Sore throat
❒ Sputum (new or increased)
❒ Stuffy nose
❒ Swollen or tender neck glands

❒ **Other** signs +/or symptoms not listed above

Sputum specimen
❒ not collected ❒ collected: *date* / /
❒ final report attached

Respiratory virus test
❒ not collected ❒ collected: *date* / /
❒ final report attached

Skin or soft tissue

❒ Facility associated
❒ Non-facility associated

❒ Heat
❒ Pus present at wound, skin or soft tissue site
❒ Redness
❒ Serous discharge
❒ Swelling
❒ Tenderness or pain

Rash
❒ rash or lesions characteristic of a fungal skin infection
❒ maculopapular rash and/or itching rash
❒ vesicular rash

Doctor or laboratory confirmation for
❒ fungal skin infection
❒ herpes simplex or zoster
❒ scabies

❒ Linkage to laboratory confirmed case of scabies

❒ **Other** signs +/or symptoms not listed above

Swab
❒ not collected ❒ collected: *date* / /
❒ final report attached

Other infection(s) not listed

❒ Facility associated
❒ Non-facility associated

Comments and clinical notes

Oral

❒ Facility associated
❒ Non-facility associated

❒ Doctor or dental provider confirmation
❒ Presence of raised white patches or plaques in mouth

❒ **Other** signs +/or symptoms not listed above

Eye

❒ Facility associated
❒ Non-facility associated

❒ Itching or pain > 24 hours
❒ New or increased conjunctival redness
❒ Pus from one/both eyes present for >24 hrs

❒ **Other** signs +/or symptoms not listed above

Appendix 3: Additional data on infections and antimicrobials

Table A1: Facilities by state, remoteness area classification and provider type, AC NAPS contributors, 2019

Category		Residents audited	Participating facilities		Facilities in reporting group	Participating facilities in the reporting group
		No.	No.	%	No.	%
State and Territory	ACT	672	6	1.1	25	24.0
	NSW	7,114	119	21.0	943	12.6
	NT	84	1	0.2	13	7.7
	QLD	4,971	78	13.7	503	15.5
	SA	4,942	62	10.9	275	22.5
	TAS	1,494	24	4.2	75	32.0
	VIC	8,120	195	34.3	779	25.0
	WA	4,950	83	14.6	283	29.3
Remoteness	Major Cities	19,205	249	43.8	1,696	14.7
	Inner Regional	9,163	175	30.8	680	25.7
	Outer Regional	3,599	119	21.0	404	29.5
	Remote	272	17	3.0	74	23.0
	Very Remote	108	8	1.4	42	19.0
Provider Type	Not for Profit	22,626	312	54.9	1,562	20.0
	Private	4,132	49	8.6	920	5.3
	Government	5,589	207	36.4	414	50.0
Total		**32,347**	**568**	**100.0**	**2,896**	**19.6**

Source: 1. Facility form and 2. Aged Care service list: 30 June 2019 AIHW GEN Aged Care Data.
See Figures 1 and 2 for graphical presentation.
Transition Care, Innovative Pool, National Aboriginal and Torres Strait Island and Short term restorative care services are excluded.

Table A2: Participating facilities from the reporting group by state and territory and provider type, AC NAPS contributors, 2016–2018

Category		2016			2017			2018		
		No. of PF	No. of Facilities in RG	% of PF in the RG	No. of PF	No. of Facilities in RG	% of PF in the RG	No. of PF	No. of Facilities in RG	% of PF in the RG
State and Territory	**ACT**	0	26	0.0	0	26	0.0	4	26	15.4
	NSW	28	935	3.0	33	944	3.5	49	946	5.2
	NT	0	13	0.0	0	13	0.0	2	13	15.4
	QLD	27	477	5.7	19	479	4.0	47	490	9.6
	SA	7	279	2.5	8	272	2.9	36	272	13.2
	TAS	10	78	12.8	3	78	3.8	3	76	3.9
	VIC	153	761	20.1	161	767	21.0	184	771	23.9
	WA	13	276	4.7	20	271	7.4	28	278	10.1
Provider Type	**Government**	152	423	35.9	165	420	39.3	197	416	47.4
	Not for Profit	71	1,560	4.6	69	1,552	4.4	137	1,552	8.8
	Private	15	862	1.7	10	878	1.1	19	904	2.1
Total		**238**	**2,845**	**8.4**	**244**	**2,850**	**8.6**	**353**	**2,872**	**12.3**

Source: 1. Facility form and 2. Aged Care service list: 30 June 2016, 2017 and 2018 AIHW GEN Aged Care Data.
See Figures 1 and 2 for graphical presentation.
PF = Participating facilities; RG = Reporting group Transition Care, Innovative Pool, National Aboriginal and Torres Strait Island and Short term restorative care services are excluded.

Table A3: Number and characteristics of all residents on the survey day, AC NAPS contributors, 2017–2019

Measurement	2017		2018		2019	
	No.	%	No.	%	No.	%
Present on survey day	10,727	-	18,245	-	32,347	-
Aged >85 years	6,207	57.9	10,787	59.1	19,005	58.8
Male	3,646	34.0	5,963	32.7	10,397	32.1
Admitted to hospital in previous 30 days	465	4.3	797	4.4	1,529	4.7
Indwelling urinary catheter present	404	3.8	696	3.8	943	2.9

Source: Facility form

Table A4: Prevalence of suspected infections and antimicrobial use, AC NAPS contributors, 2016–2019

On Survey Day	2016		2017		2018		2019	
	No.	%	No.	%	No.	%	No.	%
Residents prescribed at least one antimicrobial	892	7.7	792	7.4	1,425	7.8	2,643	8.2
Residents prescribed at least one antimicrobial excluding topical antimicrobials	668	5.8	571	5.3	996	5.5	1,768	5.5
Residents prescribed at least one antimicrobial excluding prn orders not administered in the last 7 days	892	7.7	792	7.4	1,302	7.1	2,340	7.2
Residents with signs and/or symptoms of at least one suspected infection	393	3.4	350	3.3	588	3.2	1,017	3.1
Number of residents present	11,560	-	10,727	-	18,245	-	32,347	-

Source: 1. Facility form and 2: Antimicrobial and Infection form
See Figure 3 for graphical presentation

Table A5: Prevalence of suspected infections and antimicrobial use for facilities that have participated annually, AC NAPS contributors, 2017-2019

On Survey Day	2017			2018			2019		
	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI
Residents prescribed at least one antimicrobial	513	7.9	7.2–8.6	615	9.4	8.7–10.1	516	8	7.4–8.7
Residents with signs and/or symptoms of at least one suspected infection	211	3.2	2.8–3.7	216	3.3	2.9–3.8	166	2.6	2.2–3
Number of residents present	6,502	-	-	6,534	-	-	6,436	-	-

Source: 1. Facility form and 2: Antimicrobial and Infection form
See Figure 4 for graphical presentation

Table A6: Most commonly prescribed antimicrobials, AC NAPS contributors, 2016–2019*

Antimicrobial	2016 (*n* = 1,388)		2017 (*n* = 1,207)		2018 (*n* = 1,946)		2019 (*n* = 3,735)	
	No.	%	No.	%	No.	%	No.	%
Cefalexin	315	22.7	246	20.4	418	21.5	790	21.2
Clotrimazole (T)	147	10.6	154	12.8	253	13.0	654	17.5
Amoxicillin–clavulanic acid	121	8.7	107	8.9	149	7.7	274	7.3
Trimethoprim	97	7.0	91	7.5	128	6.6	236	6.3
Doxycycline	78	5.6	85	7.0	125	6.4	227	6.1
Amoxicillin	91	6.6	92	7.6	131	6.7	208	5.6
Chloramphenicol (T)	86	6.2	78	6.5	131	6.7	198	5.3
Hexamine Hippurate	15	1.1	15	1.2	50	2.6	130	3.5
Mupirocin (T)	8	0.6	11	0.9	33	1.7	85	2.3
Roxithromycin	53	3.8	35	2.9	35	1.8	73	2.0
Flucloxacillin	41	3.0	31	2.6	62	3.2	71	1.9
Ciprofloxacin	34	2.4	31	2.6	49	2.5	69	1.8
Nystatin (O or T)	19	1.4	14	1.2	20	1.0	63	1.7
Miconazole (T)	17	1.2	18	1.5	42	2.2	62	1.7
Clindamycin	19	1.4	17	1.4	26	1.3	58	1.6
Nitrofurantoin	24	1.7	26	2.2	18	0.9	58	1.6
Kenacomb® (T)	23	1.7	19	1.6	44	2.3	54	1.4
Oseltamivir	9	0.6	1	0.1	1	0.1	47	1.3
Trimethoprim–Sulfamethoxazole	23	1.7	18	1.5	23	1.2	45	1.2
Metronidazole	19	1.4	8	0.7	22	1.1	38	1.0

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 5 for graphical presentation
Only top 20 antimicrobials prescribed listed.
Denominator = number of all antimicrobials prescribed
**Kenacomb ® contains triamcinolone, neomycin, nystatin and gramicidin

Table A7: Key quality indicators for all participating facilities, AC NAPS contributors, 2016–2019

Indicator	2016		2017		2018		2019	
	No.	%	No.	%	No.	%	No.	%
Indication for Prescribing an Antimicrobial								
Documented	1,169	84.2	1,017	84.3	1,625	83.5	2,820	75.5
Not Documented	219	15.8	190	15.7	321	16.5	915	24.5
Review or Stop Date								
Documented	858	61.8	754	62.5	1,136	58.4	2,415	64.7
Not Documented	530	38.2	453	37.5	810	41.6	1,320	35.3
Total	**1,388**	-	**1,207**	-	**1,946**	-	**3,735**	-

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 6 for graphical presentation

Table A8: Key quality indicators for facilities that have participated annually, AC NAPS contributors, 2017-2019.

Indicator	2017			2018			2019		
	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI
Indication for Prescribing an Antimicrobial									
Documented	666	83.7	80.9–86.2	728	82.9	80.3–85.3	601	76.4	73.2–79.3
Not Documented	130	16.3	13.8–19.1	150	17.1	14.7–19.7	186	23.6	20.7–26.8
Review or Stop Date									
Documented	499	62.7	59.2–66.1	494	56.3	52.9–59.6	476	60.5	57–63.9
Not Documented	297	37.3	33.9–40.8	384	43.7	40.4–47.1	311	39.5	36.1–43
Total	**796**	-	-	**878**	-	-	**787**	-	-

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 7 for graphical presentation

Table A9: Most common indications for antimicrobial prescriptions, AC NAPS contributors, 2016–2019

Indication	2016 (*n* = 1,333)		2017 (*n* = 1,161)		2018 (*n* = 1,866)		2019 (*n* = 3,548)	
	No.	%	No.	%	No.	%	No.	%
Cystitis	241	18.1	213	18.3	294	15.8	680	19.2
Other - Skin, Soft Tissue or Mucosal	151	11.3	109	9.4	261	14.0	469	13.2
Pneumonia	237	17.8	207	17.8	277	14.8	452	12.7
Tinea	11	0.8	53	4.6	48	2.6	251	7.1
Wound Infection: Non-Surgical	90	6.8	78	6.7	116	6.2	218	6.1
Cellulitis	90	6.8	69	5.9	133	7.1	170	4.8
Conjunctivitis	60	4.5	57	4.9	82	4.4	139	3.9
Other - Respiratory Tract	19	1.4	16	1.4	46	2.5	98	2.8
Asymptomatic Bacteriuria	46	3.5	24	2.1	33	1.8	82	2.3
Oral Candidiasis	9	0.7	14	1.2	17	0.9	72	2.0
Other - Urinary Tract	26	2.0	18	1.6	64	3.4	67	1.9
Catheter-associated UTI	32	2.4	29	2.5	46	2.5	60	1.7
Genital Candidiasis	9	0.7	11	0.9	20	1.1	59	1.7
Influenza	12	0.9	10	0.9	1	0.1	52	1.5
Infective Exacerbation of COPD	22	1.7	26	2.2	24	1.3	50	1.4
Other - Eye	16	1.2	18	1.6	35	1.9	45	1.3
Ulcers	21	1.6	18	1.6	34	1.8	43	1.2
Bronchitis	36	2.7	29	2.5	28	1.5	36	1.0
Wound Infection: Surgical	14	1.1	10	0.9	16	0.9	32	0.9
Common Cold	27	2.0	14	1.2	22	1.2	21	0.6

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 8 for graphical presentation
Only top 20 indications for antimicrobial prescriptions listed.
Unknown indications for commencing an antimicrobial are excluded
UTI = Urinary Tract Infection COPD = Chronic Obstructive Pulmonary Disease

Table A10: Most common prophylactic indications for antimicrobial prescriptions, AC NAPS contributors, 2016–2019

Indication	2016 (*n* = 167)		2017 (*n* = 202)		2018 (*n* = 317)		2019 (*n* = 694)	
	No.	%	No.	%	No.	%	No.	%
Cystitis	45	26.9	44	21.8	84	26.5	232	33.4
Other - Skin, Soft Tissue or Mucosal	24	14.4	12	5.9	31	9.8	74	10.7
Other - Urinary Tract	10	6.0	8	4.0	37	11.7	41	5.9
Asymptomatic Bacteriuria	17	10.2	13	6.4	19	6.0	31	4.5
Tinea	0	0.0	6	3.0	1	0.3	26	3.7
Other - Medical Prophylaxis	8	4.8	16	7.9	19	6.0	22	3.2
Other - Eye	5	3.0	6	3.0	10	3.2	21	3.0
Pneumonia	4	2.4	22	10.9	13	4.1	20	2.9
Catheter-associated UTI	3	1.8	8	4.0	10	3.2	19	2.7
Wound Infection: Non-Surgical	3	1.8	6	3.0	9	2.8	17	2.4

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 9 for graphical presentation
Only top ten prophylactic indications for antimicrobial prescriptions listed.
Unknown indications for commencing an antimicrobial excluded
UTI = Urinary tract infection

Table A11: Comparison of therapeutic and prophylactic antimicrobial prescriptions for common indications, AC NAPS contributors, 2019

Indication	Therapeutic		Prophylactic		Total
	No.	%	No.	%	
Cystitis	448	65.9	232	34.1	680
Other - Skin, Soft Tissue or Mucosal	395	84.2	74	15.8	469
Pneumonia	432	95.6	20	4.4	452
Tinea	225	89.6	26	10.4	251
Wound Infection: Non-Surgical	201	92.2	17	7.8	218
Cellulitis	159	93.5	11	6.5	170
Conjunctivitis	130	93.5	9	6.5	139
Other - Respiratory Tract	83	84.7	15	15.3	98
Asymptomatic Bacteriuria	51	62.2	31	37.8	82
Oral Candidiasis	69	95.8	3	4.2	72

Source: Antimicrobial and infection form Section 2 Method 1 and 2 data
See Figure 10 for graphical presentation
Only top 10 indications for antimicrobial prescription listed.
Unknown indications for commencing an antimicrobial excluded

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