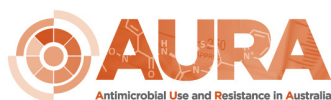


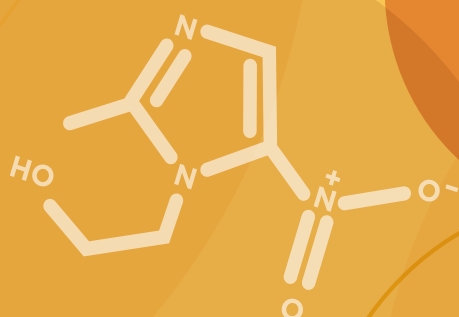
AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE



Antimicrobial prescribing practice in Australian hospitals

Results of the 2017 Hospital
National Antimicrobial
Prescribing Survey

October 2018



HOSPITAL
NAPS National Antimicrobial
Prescribing Survey



NCAS
National Centre for
Antimicrobial Stewardship



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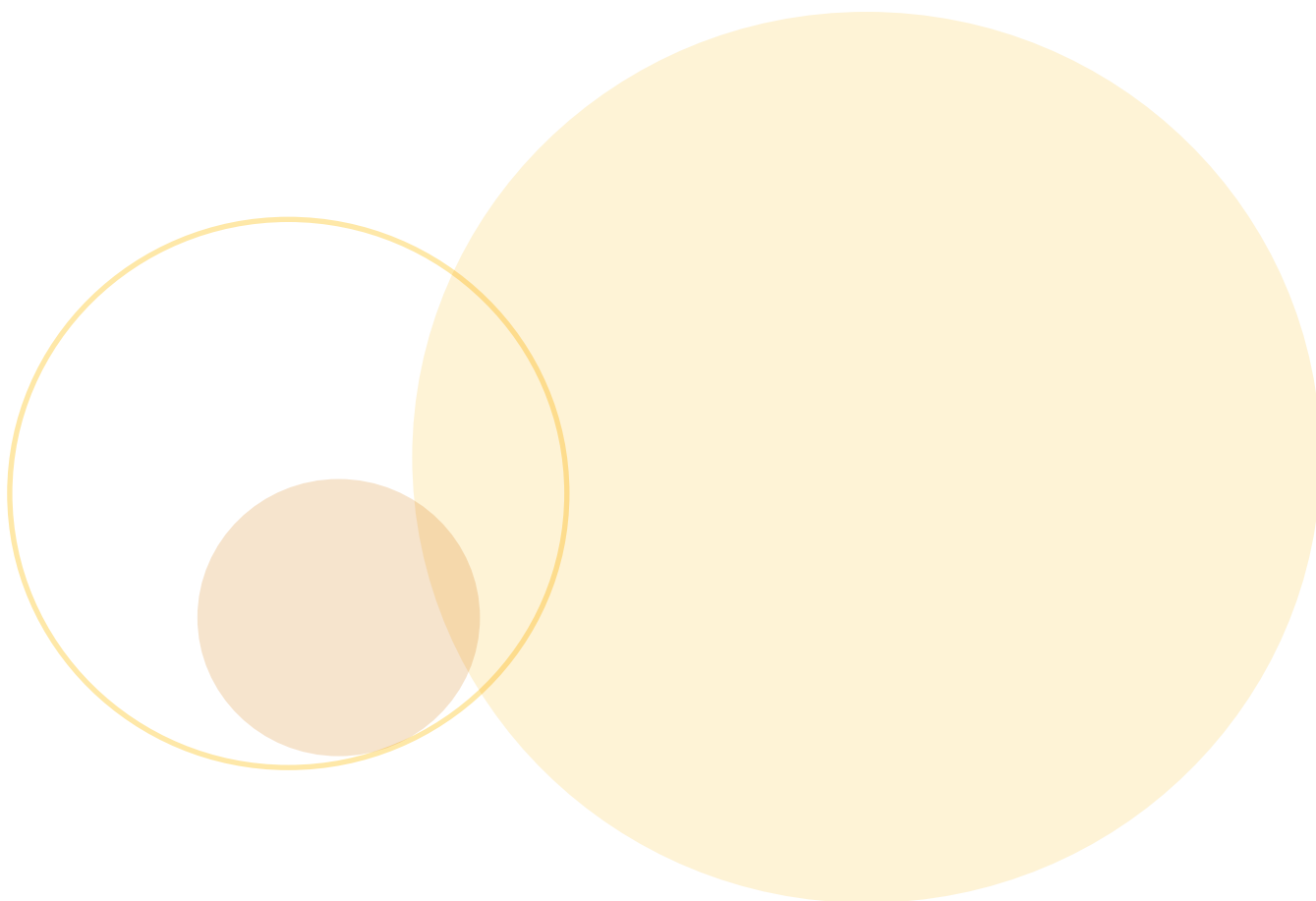
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Summary

The Antimicrobial Use and Resistance in Australia (AURA) Surveillance System, coordinated by the Australian Commission on Safety and Quality in Health Care (the Commission), provides essential information to develop and implement strategies to prevent and contain antimicrobial resistance (AMR) in human health and improve antimicrobial use across the acute and community healthcare settings. AURA also supports the National Safety and Quality Health Service (NSQHS) Standard Preventing and Controlling Healthcare-Associated Infection, and Australia's National Antimicrobial Resistance Strategy (2015–2019). Funding for AURA is provided by the Australian Government Department of Health and state and territory health departments.

The Hospital National Antimicrobial Prescribing Survey (NAPS) is a key component of the AURA Surveillance System. The Hospital NAPS is a collaborative project between the National Centre for Antimicrobial Stewardship and the Guidance Group (Royal Melbourne Hospital).

The 2017 Hospital NAPS provides an overview of antimicrobial prescribing in Australian public and private hospitals. This is the fifth year in which the survey has been conducted, and consistent themes are emerging in relation to the appropriateness of antimicrobial prescribing across the country.

This report presents analyses of 26,277 prescriptions submitted to the Hospital NAPS database by 314 hospitals (228 public and 86 private) during 2017, and analyses of trends from 2013 to 2017.

Key findings of the Hospital NAPS from 2013 to 2017:

- The changes in key indicators of appropriateness of antimicrobial prescribing monitored using the Hospital NAPS from 2013 to 2017 are as follows:
 - o Improvement in documentation of indication from 70.9% to 77.7%
 - o Improvement in documentation of review or stop date from 35.5% to 40.5%
 - o Improvement in the proportion of surgical prophylaxis given for greater than 24 hours from 41.8% to 30.5%
 - o A decline in compliance with *Therapeutic Guidelines: Antibiotic* or local guidelines from 72.2% to 67.3%
 - o A static rate of overall appropriateness of prescribing, of approximately 76% each year
- The five most commonly prescribed antimicrobials in Australian hospitals participating in NAPS in 2017 were: cefazolin, ceftriaxone, amoxicillin–clavulanic acid, metronidazole and doxycycline
- The antimicrobials with the highest rates of inappropriate prescribing in Australian hospitals participating in NAPS in 2017 were: cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone
- The five most common indications for prescribing antimicrobials in Australian hospitals that contributed to NAPS in 2017 were: surgical prophylaxis, community-acquired pneumonia, medical prophylaxis, urinary tract infection and sepsis
- The highest proportions of prescriptions assessed as inappropriate in Australian hospitals participating in NAPS in 2017 were for: surgical prophylaxis, infective exacerbation of chronic obstructive pulmonary disease, traumatic injuries and various types of pneumonia
- Key markers for prescribing appropriateness improved in hospitals that were repeat participants in the NAPS Hospitals from 2013 to 2017.

Implications

The findings indicate encouraging trends from 2013 to 2017 in a number of the key indicators of appropriateness of antimicrobial prescribing that are monitored by the Hospital NAPS, as well as ongoing issues that have implications for patient safety.

Hospital NAPS analyses have identified the following priority areas for targeted quality improvement initiatives for antimicrobial prescribing:

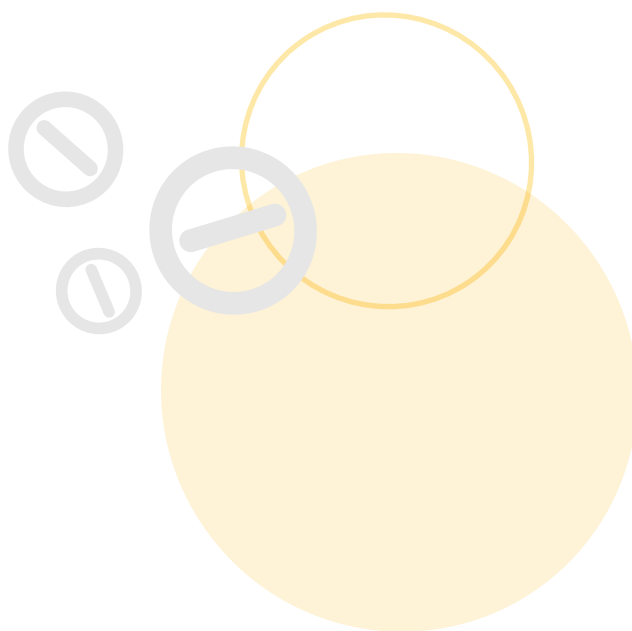
- Documentation of indication
- Documentation of review or stop date
- Compliance with guidelines
- Appropriateness of prescribing, particularly inappropriate broad spectrum antimicrobial use and duration of therapy
- Improved prescribing, particularly for cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone
- Improved prescribing for indications, particularly surgical prophylaxis, infective exacerbations of chronic obstructive pulmonary disease, traumatic injuries and various types of pneumonia.

To address these priority areas for action, the Commission will:

- Communicate the findings to states and territories and private hospital provider organisations to highlight the priority areas for their antimicrobial stewardship programs
- Encourage public and private health service organisations to routinely review their NAPS results, and implement targeted strategies for departments with the highest rates of inappropriate prescribing, and non-compliance with guidelines
- Promote action 3.16c of the NSQHS Preventing and Controlling Healthcare-Associated Infection Standard, which requires action to improve appropriateness of antimicrobial prescribing

- Collaborate with the Royal Australasian College of Surgeons and other key stake holders to improve prescribing of antimicrobials for surgical prophylaxis
- Work with states and territories and expert clinical groups to develop strategies and guidelines to improve the appropriateness of antimicrobial prescribing for respiratory conditions and traumatic injuries; prescribing of broad spectrum antimicrobials and duration of therapy; and prescribing of cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone.

The Commission will also work with the states and territories and the private sector to promote ongoing monitoring of antimicrobial usage and appropriateness of use in Australian hospitals, as required by the NSQHS Preventing and Controlling Healthcare-Associated Infection Standard.¹ This Standard requires all Australian hospitals to implement an antimicrobial stewardship program.



Introduction

The Antimicrobial Use and Resistance in Australia (AURA) Surveillance System, which is coordinated by the Australian Commission on Safety and Quality in Health Care (the Commission), provides a national platform to inform the development of strategies to prevent and contain antimicrobial resistance (AMR) in human health and improve antimicrobial use across the acute and community healthcare settings. AURA also supports the National Safety and Quality Health Service (NSQHS) Preventing and Controlling Healthcare-Associated Infection Standard; and Australia's National Antimicrobial Resistance Strategy (2015–2019). Funding for AURA is provided by the Australian Government Department of Health and state and territory health departments.

Antimicrobial use is a key factor in the development of AMR. Surveillance of antimicrobial use and appropriateness of prescribing is essential to inform prevention and containment strategies for AMR.

The Commission provides funding for the Hospital National Antimicrobial Prescribing Survey (NAPS) to contribute to AURA. The Hospital NAPS is a collaborative project between the National Centre for Antimicrobial Stewardship (NCAS) and the Guidance Group (Royal Melbourne Hospital). It is a standardised auditing tool that health service organisations may use to assess the quality of their antimicrobial prescribing. It is also able to provide data on the quantity of prescriptions for antimicrobials for specific indications and by specialist admission type.

The Hospital NAPS supports Australian health service organisations, states and territories and private health service provider organisations to develop and conduct antimicrobial stewardship (AMS) programs by:

- Facilitating effective audit and review of antimicrobial use, including compliance with prescribing guidelines and prescribing appropriateness
- Facilitating effective communication regarding antimicrobial use and identifying key targets for interventions
- Supporting workforce education and training

- Supporting the implementation of AMS practices across all hospitals – public, private, major city, regional and remote
- Providing flexible and useful benchmarking within hospitals, across units and wards, and between hospitals and jurisdictions.

Participation in Hospital NAPS assists health service organisations to demonstrate that they are meeting the AMS criterion of the NSQHS Preventing and Controlling Healthcare-Associated Infection Standard. The intention of this Standard is to reduce the risk of patients acquiring preventable healthcare-associated infections, effectively manage infections if they occur, and limit the development of AMR through prudent use of antimicrobials as part of antimicrobial stewardship (AMS). The AMS criterion of this Standard promotes implementation of systems for safe and appropriate antimicrobial prescribing and use of antimicrobials as part of an AMS program, including review of antimicrobial use surveillance data. AMS is a part of the broader system to improve patient safety and quality of care and prevent and manage infections associated with AMR.

Since the launch of the web-based Hospital NAPS in 2013, the program has grown and diversified to support the challenges of AMS across Australian public and private hospitals, and aged care settings. The data available from the NAPS delivers insights into the appropriateness of antimicrobial prescribing and has contributed to local, state and territory, and national antimicrobial prescribing strategies to improve the quality of care delivered to patients, residents, and the community.

The surveys have consistently demonstrated that surgical prophylaxis is the most common indication for antimicrobial prescribing, and also has one of the highest percentages of inappropriateness.^{2,3,4,5} A Surgical NAPS module was launched in July 2016, with funding support from the Commission, to investigate prescribing practices for surgical prophylaxis in more detail.⁶

This report focuses on the results of the 2017 Hospital NAPS and analyses of trends from 2013 to 2017.

Methods

Timing

The Hospital NAPS data collection period was from 1 January 2017 to 31 December 2017, following a decision to align the NAPS data collection periods with the calendar year to be more consistent with other antimicrobial usage reports.

For the purposes of this report, and to facilitate data analysis in the future, all historical and current Hospital NAPS data have been re-analysed by calendar year. When comparing the graphs and figures with previous Hospital NAPS reports, there may be some minor differences in the reporting of historical data.

As in previous years, hospitals were encouraged to conduct their Hospital NAPS survey before Antibiotic Awareness Week in November. This was so their results would be available for discussion and education as part of Antibiotic Awareness Week activities in their organisations.

Recruitment

Using the NAPS registration database, approximately 1,400 individuals from 700 hospitals were invited via email to participate in the 2017 Hospital NAPS. Further promotion by the Commission and NCAS occurred throughout the year via their websites, Twitter and the NAPS newsletter.

All hospitals offering overnight stays are able to participate in the Hospital NAPS. Facilities such as same day services, sleep clinics and other private specialty clinics without overnight stay were excluded.

Undertaking the survey

The NAPS is an online web-based survey. Participants who register are granted access to the NAPS portal where they can submit their data. The data collected in the survey can be seen in the Hospital NAPS data collection form (Appendix 1). Participants were advised that both the data collection and assessments of guideline compliance and appropriateness should ideally be performed by multidisciplinary teams.

The auditing team were determined by the participating facility, depending on the staffing resources available, and could consist of any combination of infectious diseases physicians, clinical microbiologists, other interested physicians, pharmacists, infection control practitioners or nurses.

When undertaking the survey, two or more auditors are recommended per site to facilitate discussion about more challenging assessments. Participants were advised that, preferably, auditors should have sound clinical knowledge about antimicrobial prescribing and local prescribing guidelines. If an on-site assessing team was not available, participants were advised that the data should be reviewed by an external assessing team. For example, within the hospital network or at a major centre. The NAPS support team was available to provide additional clinical advice for facilities without infectious diseases expertise.

Data collection methodology

Participants were given the following options to choose from, depending on the nature of their organisation.

Option 1: Hospital-wide point prevalence survey (preferred)

This methodology required all inpatients to be assessed so prevalence of antimicrobial use could be calculated. Data were collected on both the number of inpatients on antimicrobials (numerator) and the total number of inpatients (denominator). This option is recommended to be completed on a single calendar day. However, if this was not possible, wards could be surveyed on separate days provided that all patients were surveyed once only.

Option 2: Repeat point prevalence surveys (for smaller hospitals)

While Option 1 will provide an estimate of antimicrobial prevalence, for smaller hospitals it may not allow sufficient data to be collected to assess prescribing appropriateness. Small hospitals (those with less than 100 acute beds) could conduct repeat point prevalence surveys whereby a whole hospital survey is conducted multiple times, with surveys at least one week apart, until at least thirty antimicrobial prescriptions have been collected. Auditors were advised that all inpatients should be included in the repeat surveys, including those who have been surveyed previously, as the appropriateness of their respective antimicrobial prescriptions may change over time.

Option 3: Random sampling point prevalence survey (for hospitals with ≥ 100 acute beds)

For large hospitals where a whole-hospital point prevalence survey is not able to be undertaken due to resource limitations, data could be collected from a random sample of inpatients provided the following guidelines were adhered to:

- A random sampling method should only be used in hospitals with ≥ 100 acute beds
- The random sampling should include patients from all wards within the hospital
- The proportion of patients sampled must be at least 50% of the inpatient population
- The random sampling is based on inpatients, not antimicrobial prescriptions

Support for auditors

Auditors were able to access the following online resources to promote accurate data collection and prescription assessment, as well as assist with the reporting and feedback process:

- User guide
- Appropriateness definitions
- Case examples
- eLearning module
- Reporting templates to help hospitals communicate survey results locally
- Links to useful AMS-related presentations and posters.

The NAPS support team also provided direct support throughout the data collection period in the form of:

- Webinar training sessions
- Helpdesk support via phone and email
- A remote expert assessment service
- Assistance with the assessment of guideline compliance and prescription appropriateness for hospitals without access to infectious diseases specialists
- Capacity to request an assessment if hospitals felt it would improve the reliability of the audit.

e-Learning module

An online eLearning module was available through the NAPS website throughout the data collection period. This provided information regarding setting up the survey, data collection and assessments of compliance with guidelines and appropriateness. An assessment quiz was also provided at the end of the module requiring participants to answer at least 80% of the questions correctly in order to pass. At least one participant from each hospital was required to successfully pass the quiz in order to finalise their patients' data, however all participants were encouraged to complete the eLearning module prior to data collection.

Analyses

Hospitals that conducted whole-hospital audits including single point prevalence surveys, repeat point prevalent surveys and randomised sample surveys were included in the analyses. To avoid issues with systematic bias, all other Hospital NAPS survey methodologies including directed surveys of selected antimicrobials, indications, specialities or wards, were excluded. The selected survey methodology used does not impact on the data in this report, as each individual prescription is analysed independently of the data collection methodology.

De-identified hospital data are analysed by sector (public or private), state or territory, the Australian Bureau of Statistics (ABS) remoteness classifications⁷ and the Australian Institute of Health and Welfare (AIHW) peer group classifications.⁸ Key performance indicators are analysed and reported for these categories. Five year comparison of Hospital NAPS key performance indicator analyses was performed using the chi² test.

Limitations

The results in this report should be interpreted in the context of the following limitations:

Sampling and selection bias

Participation in the Hospital NAPS is voluntary. The facilities that choose to participate do not represent a randomised sample, hence the results may not be representative of all Australian hospitals.

Comparison with previous surveys

In addition to the 2017 Hospital NAPS results, this report references elements of the 2013–2016 surveys. The ability to directly compare results with those from year to year is limited as a result of changes over time to the inclusion criteria, methodology and distribution of participating hospitals. Modifications have been made to the methodology and data specifications of the Hospital NAPS over time, to help improve the robustness of the data and allow improved auditing and benchmarking.

Patients may be counted multiple times

In regard to facilities that chose Option 2, certain patients may have been counted multiple times if they were still an inpatient on a subsequent audit day. This may artificially inflate the prevalence of some indications that require longer durations of treatment, or the antimicrobials that are used to treat these conditions.

Subjective nature of assessments

Individual auditors at each facility were responsible for assessing antimicrobial prescribing appropriateness and compliance with guidelines, although remote expert assessments were conducted by the NAPS support team on request. These assessments involve some degree of interpretation; the standardised appropriateness definitions used by auditors will help to moderate subjectivity.

Use of alternative audit tools

Depending on local AMS issues, casemix and resources, hospitals may have chosen to use other audit tools, such as the Surgical NAPS or Quality Improvement NAPS. This may have impacted on the number of hospitals that chose to participate in the 2017 Hospital NAPS.

Findings

Participation

Data that met the inclusion criteria were submitted by 314 hospitals (228 public and 86 private) and analysed for this report. There has been a steady increase in the number of Hospital NAPS participants since 2013 (129% increase).

However, 2017 saw a decrease of 3.4% in participating hospitals compared to 2016 (Figure 1). It is noted that a Surgical NAPS commenced in the same time period. Further analysis of the participation in both of these modules can be found later in this section.

Approximately one third of all eligible public (33.5%) and private (29.1%) hospitals participated in the 2017 Hospital NAPS, and all Australian states and territories were represented. Principal referral hospitals had the highest participation rate (93.3%) and contributed 32.6% of all prescriptions.

Details of hospital participation by state and remoteness classification are presented in Table 1.

There was participation from public hospitals across all remoteness classifications; however, contributors were predominantly from hospitals in major cities (56%) and inner regional areas (41.8%). Most private hospitals in Australia are located in major cities, with none being classified as remote or very remote. Participation by private hospitals by remoteness classification ranged from 27.1% to 31.3%. Table 2 shows the corresponding data arranged by peer group.

Figure 1 Number of public and private hospitals that have contributed to Hospital NAPS, 2013–2017

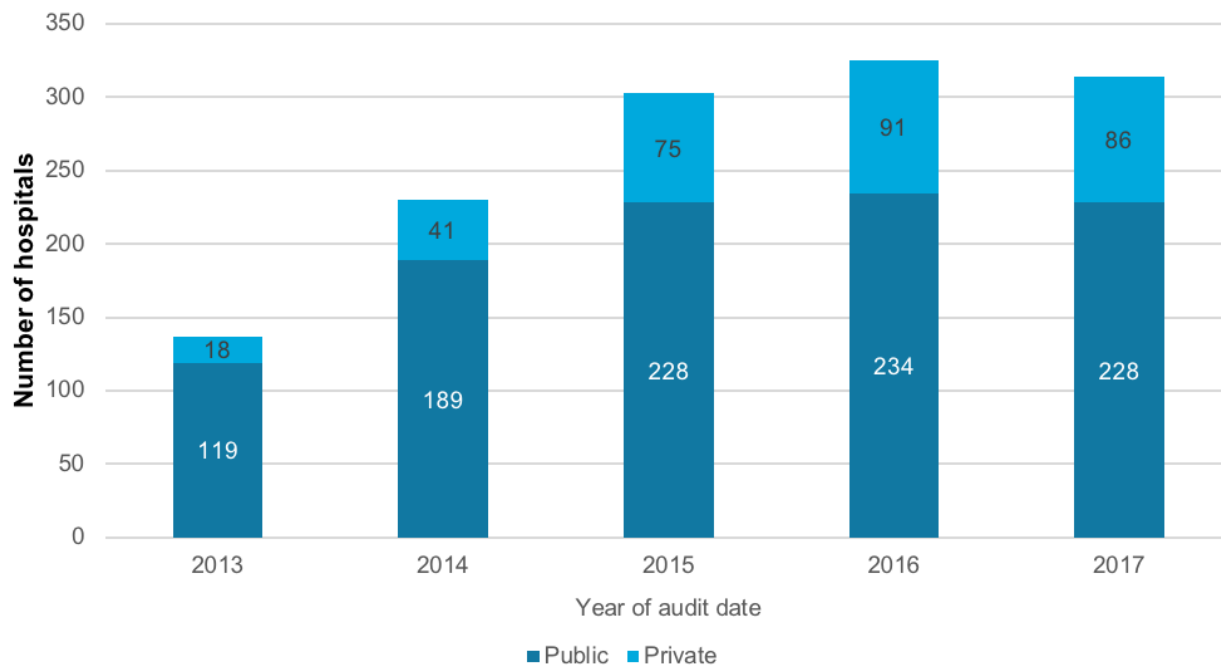


Table 2 Public and private hospitals that contributed to the Hospital NAPS by peer group, 2017

Participating hospitals		Number of participating hospitals (n)	Number of hospitals in reporting group (n)	Percent participation (%)
Public hospital peer group*	Principal referral	28	30	93.3
	Public acute group A hospitals	48	62	77.4
	Public acute group B hospitals	29	45	64.4
	Public acute group C hospitals	58	143	40.6
	Public acute group D hospitals	36	190	18.9
	Other acute specialised hospitals	1	3	33.3
	Children's hospitals	4	7	57.1
	Women's hospitals	4	6	66.7
	Women's and children's hospitals	1	1	100.0
	Mixed subacute and non-acute hospitals	8	25	32.0
	Rehabilitation and GEM† hospitals	4	14	28.6
	Very small hospitals	4	122	3.3
	Psychiatric hospitals	2	22	9.1
	Unpeered hospitals	1	10	10.0
Private hospital peer group§	Private acute group A hospitals	13	22	59.1
	Private acute group B hospitals	23	36	63.9
	Private acute group C hospitals	24	49	49.0
	Private acute group D hospitals	17	69	24.6
	Other acute specialised hospitals	2	15	13.3
	Private rehabilitation hospitals	6	23	26.1
	Private acute psychiatric hospitals	1	29	3.4

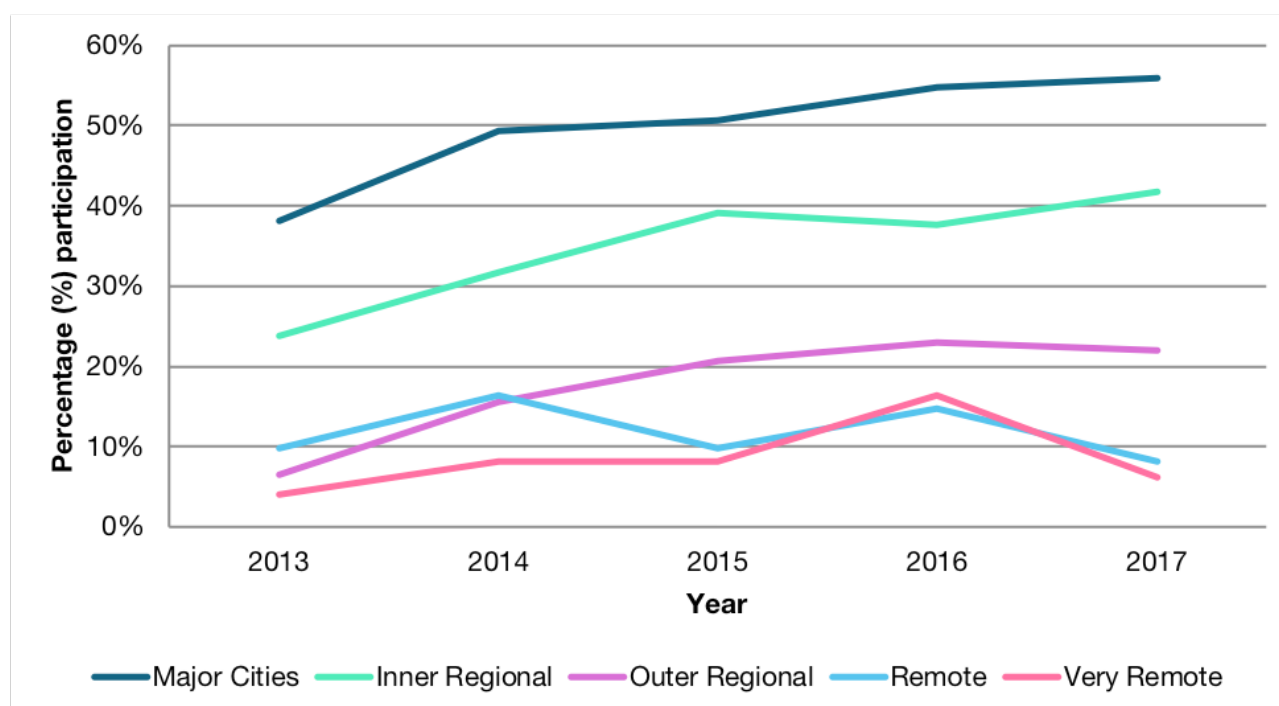
* Excludes early parenting centres, drug and alcohol hospitals, same day hospitals, outpatient hospitals

† GEM – Geriatric Evaluation and Management

§ Excludes ineligible private hospitals



Figure 2 Public hospital participation in Hospital NAPS by remoteness area, 2013-2017



Number of prescriptions

Data from 17,366 patients were submitted as part of the 2017 Hospital NAPS, generating a total of 26,277 prescriptions for analysis. In comparison, 25,661 prescriptions were entered into the database in 2016, which represented the antimicrobial prescribing for 17,040 patients.

Most of the 2017 Hospital NAPS data were submitted from hospitals located in major cities or inner regional areas (80.9%). Principal referral and public acute group A hospitals accounted for approximately one-quarter of the facilities that chose to participate, but together they contributed just over half (53.1%) of the prescriptions submitted.

Nearly 1 in 5 prescriptions entered into the NAPS database were contributed by a private hospital. The full breakdown of the percentage of participating hospitals and numbers of prescriptions according to hospital groupings and key performance indicators are outlined in Tables 3 and 4.

Table 3 Results for key indicators for Hospital NAPS contributors, by state and territory, remoteness area and AIHW peer group, 2017

Key Indicators		Number of hospitals (n)	% of sample	Number of prescriptions (n)	% of prescriptions	Indication documented (%)	Review or stop date documented (%)	Surgical prophylaxis >24hrs* (%)
State or territory	NSW & ACT	116	35.8	10,256	39.1	78.4%	39.7	31.2
	Vic	94	43.7	7,181	27.4	75.9%	40.9	34.2
	Qld & NT	54	28.7	3,858	14.7	81.2%	37.0	29.7
	SA	12	11.4	1,420	5.4	77.0%	54.5	18.3
	WA	31	27.2	3,180	12.1	75.5%	40.3	27.6
	Tas	7	23.3	332	1.3	82.5%	41.0	42.9
Remoteness	Major Cities	159	50.6	18,610	71.0	78.0%	43.0	30.3
	Inner regional	95	30.3	4,904	18.7	77.2%	35.6	28.9
	Outer regional	52	16.6	2,322	8.9	74.4%	32.3	39.3
	Remote	5	1.6	279	1.1	90.0%	31.2	66.7
	Very remote	3	1.0	112	0.4	96.4%	38.4	na
	Principal referral	28	8.9	8,541	32.6	79.4%	37.0	38.6
Public hospital peer group	Public acute group A hospitals	48	15.3	5,368	20.5	83.3%	36.4	41.4
	Public acute group B hospitals	29	9.2	2,027	7.7	76.7%	31.4	41.1
	Public acute group C hospitals	58	18.5	2,748	10.5	77.7%	32.5	20.6
	Public acute group D hospitals	36	11.5	1,014	3.9	78.0%	31.7	50.0
	Other acute specialised hospitals	1	0.3	77	0.3	67.5%	22.1	100.0
	Children's hospitals	4	1.3	549	2.1	84.3%	52.1	37.5
	Women's hospitals	4	1.3	294	1.1	90.5%	64.6	15.8
	Women's and children's hospitals	1	0.3	138	0.5	95.7%	67.4	19.4
	Mixed subacute and non-acute hospitals	8	2.6	243	0.9	67.5%	35.0	0
	Rehabilitation and GEM† hospitals	4	1.3	124	0.5	90.3%	60.5	na
	Very small hospitals§	4	1.3	12	0.1	-	-	-
	Psychiatric hospitals	2	0.6	235	0.9	86.4%	60.4	50.0
Private hospital peer group	Unpeered hospitals	1	0.3	40	0.2	45.0%	37.5	0
	Private acute group A hospitals	13	4.1	1,515	5.8	69.3%	45.4	31.8
	Private acute group B hospitals	23	7.3	1,317	5.0	61.1%	51.3	26.0
	Private acute group C hospitals	24	7.6	1,034	3.9	65.8%	65.9	28.4
	Private acute group D hospitals	17	5.4	642	2.5	69.5%	77.3	20.1
	Other acute specialised hospitals	2	0.6	87	0.3	93.1%	83.9	12.4
Funding type	Private rehabilitation hospitals	6	1.9	205	0.8	80.5%	60.5	88.9
	Private acute psychiatric hospitals§	1	0.3	17	0.1	-	-	-
	Public	228	72.6	21,410	81.6	80.1%	36.8	36.4
	Private	86	27.4	4,817	18.4	67.3%	57.2	26.5
Combined national result		314	100	26,227	100	77.7	40.5	30.5

na - not applicable

* Where surgical prophylaxis was selected as the indication (n = 3,397)

† * GEM – geriatric evaluation and management

§ Results are not displayed if there are fewer than 30 prescriptions

Table 4 Compliance with guidelines and prescription appropriateness in Hospital NAPS contributors, by state and territory, remoteness area and AIHW peer group, 2017

Key Indicators	Compliance with guidelines (%)						Appropriateness (%)		
	Compliant	Non-compliant	Directed therapy	Not available	Not assessable		Appropriate	Inappropriate	Not assessable
State or territory	NSW & ACT	52.9	26.7	11.3	4.6	4.5	70.5	24.9	4.6
	Vic	57.0	23.3	9.5	5.2	5.0	73.1	20.6	6.3
	Qld & NT	51.7	27.3	12.8	2.9	5.4	71.0	23.4	5.6
	SA	61.2	22.0	9.2	4.0	3.6	75.8	19.5	4.8
	WA	56.0	23.3	9.9	7.1	3.7	74.4	21.8	3.8
	Tas	55.2	27.3	7.7	3.2	6.7	72.5	21.2	6.3
Remoteness	Major Cities	54.4	23.6	11.7	5.7	4.6	72.8	22.0	5.2
	Inner regional	56.8	28.9	7.2	2.6	4.5	71.0	23.8	5.2
	Outer regional	54.7	27.2	10.1	2.7	5.3	70.6	23.7	5.7
	Remote	59.3	26.8	6.6	3.5	3.8	72.5	24.5	3.0
	Very remote	54.3	34.7	6.5	1.7	2.7	65.8	31.0	3.2
	Principal referral	54.2	20.4	18.0	4.0	3.4	76.6	19.4	4.0
Public hospital peer group	Public acute group A hospitals	50.8	30.0	13.0	3.2	2.9	71.8	24.9	3.3
	Public acute group B hospitals	54.5	27.9	10.3	3.1	4.3	73.6	21.8	4.6
	Public acute group C hospitals	56.8	30.3	7.1	1.9	4.0	71.4	23.7	4.9
	Public acute group D hospitals	44.9	40.9	8.8	2.9	2.6	61.7	34.2	4.0
	Other acute specialised hospitals	84.4	10.4	0.0	1.3	3.9	85.7	9.1	5.2
	Children's hospitals	69.8	10.6	9.5	6.7	3.5	85.4	11.7	2.9
	Women's hospitals	85.4	6.8	1.0	6.8	0.0	91.2	7.5	1.4
	Women's and children's hospitals	69.6	5.8	10.9	13.0	0.7	83.3	13.0	3.6
	Mixed subacute and non-acute hospitals	52.7	15.2	17.3	8.6	6.2	72.0	19.3	8.6
	Rehabilitation and GEM* hospitals	53.2	9.7	25.0	5.7	6.5	79.0	11.3	9.7
	Very small hospitals†	-	-	-	-	-	-	-	-
	Psychiatric hospitals	48.1	26.8	5.5	4.7	14.9	60.4	22.1	17.5
Private hospital peer group	Unpeered hospitals	22.5	27.5	27.5	15.0	7.5	65.0	30.0	5.0
	Private acute group A hospitals	45.4	32.5	12.0	2.5	7.7	65.8	24.7	9.5
	Private acute group B hospitals	56.0	29.8	7.4	1.9	4.9	67.7	26.4	6.0
	Private acute group C hospitals	59.3	32.0	4.4	0.7	3.7	69.2	26.4	4.5
	Private acute group D hospitals	57.6	32.7	4.8	1.4	3.4	67.6	24.5	7.9
	Other acute specialised hospitals	82.8	12.6	2.3	0.0	2.3	87.4	10.3	2.3
Funding type	Private rehabilitation hospitals	33.7	22.9	31.2	2.4	9.8	74.2	15.6	10.2
	Private acute psychiatric hospitals†	-	-	-	-	-	-	-	-
	Public	54.2	25.2	13.5	3.6	3.5	74.0	21.8	4.2
Combined national result	Private	53.2	30.9	8.7	1.8	5.5	68.1	24.8	7.1
		54.0	26.2	12.6	3.3	3.9	72.9	22.4	4.7

* GEM – geriatric evaluation and management

† Results are not displayed if there are fewer than 30 prescriptions

Key performance indicators: 2017

Documentation of indication

The overall rate for documentation of indication in hospitals was 77.7% in 2017 (Table 3). In private hospitals, the documentation rate was lower than in public facilities. The rates were 67.3% and 80.1% respectively. These rates are below the best-practice target of 95% as they have been in previous years. However, the specialised hospitals, such as rehabilitation and geriatric evaluation and management (GEM) hospitals and women's and children's hospitals, are close to achieving this target.

Documentation of review or stop date

In 2015, documentation of a review or stop date was introduced in the NAPS as a quality indicator. As there was no published best-practice target for review or stop date documentation, the decision was made to apply a target of 95% in line with the other NAPS key quality indicators. In 2017, 40.5% of all audited antimicrobial prescriptions submitted for the Hospital NAPS had a documented review or stop date (Table 3). Private hospitals ($n = 86$) performed better than public hospitals ($n = 228$) for this indicator, with a documentation rate of 57.2% compared with 36.8%. Women's and children's hospitals performed well for this indicator.

Surgical prophylaxis greater than 24 hours

The rate of surgical prophylaxis that is prescribed for longer than 24 hours varies widely between hospital peer groups (Table 3). In 2017, on average, 30.5% of antimicrobial prophylaxis prescriptions extended 24 hours beyond the time of surgery, with hospitals reporting rates that ranged from 0% to 100%. For this key performance indicator, private hospitals performed better than public facilities. Only 26.5% of surgical prophylaxis extended beyond 24 hours in private hospital contributors, compared to 36.4% in public hospitals. This may be a reflection of the difference in case-mix between public and private hospitals. Private hospitals are more likely to treat patients electively, whereas public hospitals care for a higher percentage of patients requiring unplanned or complex surgeries.

In women's hospitals only 15.8% of surgical prophylaxis extended beyond 24 hours. Of the states and territories, South Australia had the lowest rate of surgical prophylaxis extending beyond 24 hours at 18.3%.

Non-compliance with guidelines

Table 4 shows that 26.2% of all prescriptions were assessed as being non-compliant with either the *Therapeutic Guidelines*⁹ or locally endorsed guidelines. Public hospitals had a lower rate of non-compliance than private hospitals, 25.2% and 30.9% respectively. Hospitals located in major cities had the lowest rate of non-compliance with guidelines (23.6%). In 2017, hospitals in regional and remote locations had rates of non-compliance with guidelines ranging from 26.8% to 34.7%. There were also differences based on hospital peer group. Specialist hospitals (for example, women's and children's hospitals) tended to have lower rates of non-compliance with guidelines compared to general hospitals. As has been noted in previous years, there was wide variation among peer groups in 2017, with non-compliance with guidelines ranging from 5.8% to 40.9%.

Inappropriateness

Overall, 22.4% of prescriptions were assessed as inappropriate (Table 4). Whilst private hospitals reported a slightly higher rate of inappropriate prescribing (24.8%) compared to public hospitals (21.8%), the difference between these rates has been steadily reducing since 2015. Rates of inappropriateness vary considerably between peer groups.

Specialist hospitals (for example women's and children's hospitals) had a lower percentage of inappropriate prescribing compared with general hospitals in 2017.

Table 5 shows a breakdown of the most common reasons for prescriptions being assessed as inappropriate. The documentation of these fields is optional, and analysis of 2017 Hospital NAPS data has shown that they are not specified for a significant percentage of prescriptions. From 2019, the documentation of these fields will become mandatory for the Hospital NAPS to improve the quality of the data collected.

The most common reasons for prescriptions being assessed as inappropriate include spectrum too broad (21.9%), incorrect dose or frequency (20.1%), and antimicrobial not required (17.5%). Between 2015 and 2016, the proportion of prescriptions assessed as having an incorrect duration rose from 17.8% to 20.3%. In 2017, this figure dropped to 16.5%.

Very few prescriptions, of those that were assessed (*n* = 26,227), were identified as having a microbiology mismatch (1.5%) or allergy mismatch (0.5%). The targets for these rates are 0%. These low rates of mismatch are impressive and have improved over time.

Table 5 Reasons for a prescription being assessed as inappropriate, Hospital NAPS contributors, 2017

Reason	Yes (%)	No (%)	Not specified (%)
Spectrum too broad	21.9%	46.3%	31.8%
Incorrect dose or frequency	20.1%	50.9%	29.0%
Antimicrobial not required	17.5%	49.8%	32.7%
Incorrect duration	16.5%	51.0%	32.5%
Spectrum too narrow	6.6%	58.8%	34.6%
Incorrect route	5.2%	60.6%	34.3%

n = 5,864

Comparison of Hospital NAPS and Surgical NAPS participation

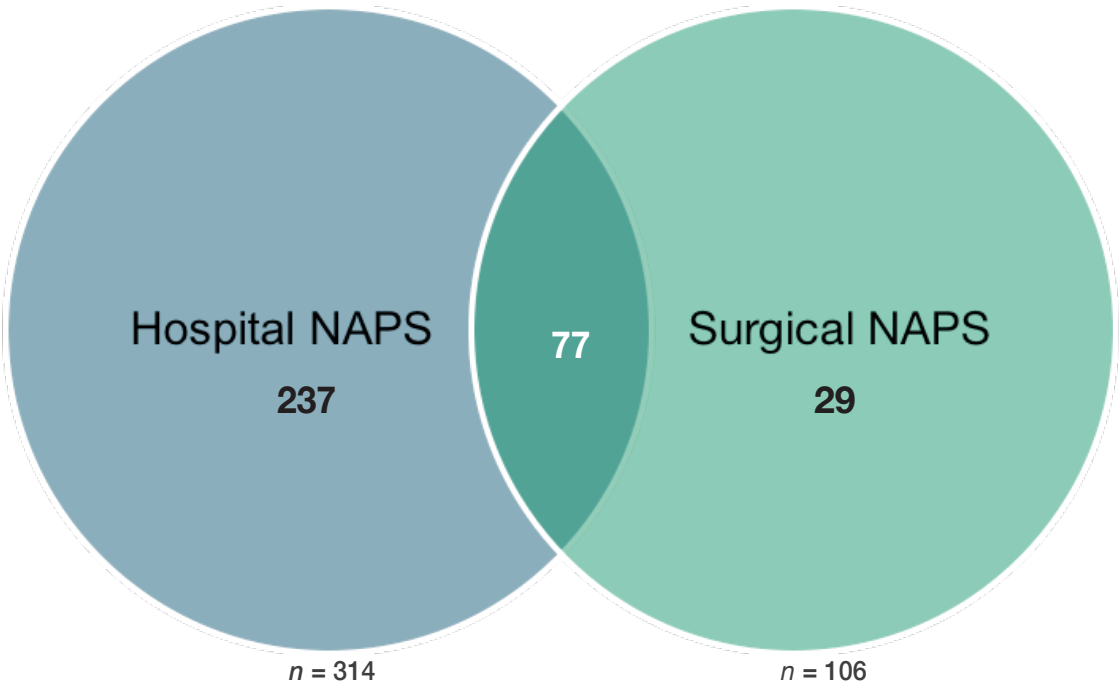
Data collected as part of the Hospital NAPS have consistently shown that antimicrobial prescribing for surgical episodes has poor rates of guideline compliance and appropriateness. The Surgical NAPS was introduced in 2016 to allow clinicians to examine these prescriptions in more depth and target this area in future quality improvement activities, supported by detailed audit data.

Participation in the NAPS is voluntary, with hospitals choosing to participate according to local requirements.

Hospitals may choose not to participate every year or to alternate between the different types of surveys available.

An analysis of Surgical NAPS data is not included in this report, however participation in that survey is shown in Figure 3 and Figure 4.

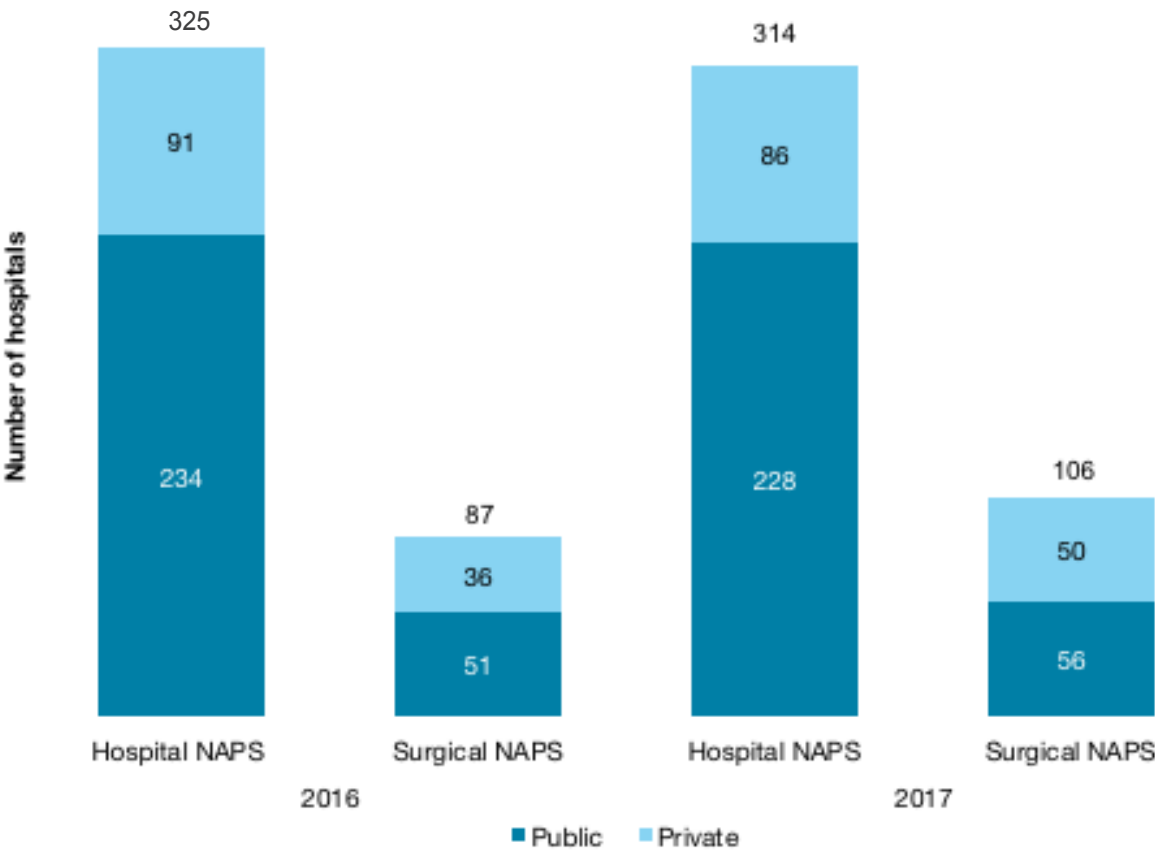
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Figure 3 Number of hospitals participating in the Hospital NAPS and Surgical NAPS by survey type, 2017



To examine the impact of the introduction of the Surgical NAPS on Hospital NAPS participation, further analysis was undertaken. The increase in Surgical NAPS participation does not appear to have had a major impact on Hospital NAPS participation rates.

Hospital NAPS participation decreased slightly between 2016 and 2017 in both public (2.6%) and private sectors (5.5%). Participation in Surgical NAPS increased between 2016 and 2017 in both public (9.8%) and private (38.9%) sectors, this increase was more pronounced in the private sector (Figure 4).

Figure 4 Total public and private hospital participation in the Hospital NAPS and/or the Surgical NAPS, 2016-2017



Note: sites that completed both types of survey have been counted twice
 For 2016 $n = 412$ and for 2017 $n = 420$.

Five year comparison of Hospital NAPS key performance indicators

In previous Hospital NAPS reports, the ability to compare data across years has been limited as the type and numbers of hospitals that participate vary from year to year. Over the course of five years, more than 100,000 prescriptions have been captured for the Hospital NAPS database, and it is now possible to perform more in-depth analyses. Tables 6 and 7 summarise the Hospital NAPS key performance indicators over this period.

Documentation of the antimicrobial indication in the medical notes has continued to improve, particularly from 2015 onwards. In 2016 the documentation rate was 75.6% and it was 77.7% in 2017. As more health service organisations adopt electronic medical records it is anticipated this will continue to improve. Electronic medication management (EMM) improves the legibility of prescription orders. Some EMM sites have configured their system with a mandatory indication field.

These developments have improved analysis of antimicrobial prescriptions by assessors. The percentage of prescriptions with a review or stop date documented has also continued to trend upwards, from 35.5% in 2015 to 40.5% in 2017 (Table 7).

The percentage of surgical antibiotic prophylaxis prescriptions prescribed for greater than 24 hours has decreased over time. The best practice target is less than 5%. In the 2017 Hospital NAPS the rate was 30.5%, which is a slight decrease from 31.1% in 2016 (Table 7). There was an improvement in this aspect of prescribing in private hospitals, from 29.5% in 2016 to 26.5% in 2017. There was a reduction in this aspect of appropriateness of prescribing in public hospitals over the same period, from 33.3% of facilities reporting surgical prophylaxis greater than 24 hours in 2016 to 36.4% in 2017.

In 2017, 26.2% of prescriptions were reported as being non-compliant with either local guidelines or the *Therapeutic Guidelines*. While this is a slight improvement compared to the 2016 rate of 27.3%, there has been no improvement in this indicator over time (Table 6).

Prescriptions that are compliant with guidelines or directed therapy can still be assessed as inappropriate, because standard clinical guidelines may not meet the treatment needs of certain patient subgroups. Common clinical scenarios could include a prescription that follows guidelines, but has not taken into account a patient's documented medical or travel history. Another scenario may be a prescription that is directed therapy, as it is informed by a microbiology result, but the prescriber could have chosen a narrower spectrum antimicrobial. Equally, a prescriber may sometimes for valid reasons, select a treatment for a patient that is not guideline compliant but still clinically justifiable, and this would be assessed as appropriate.

Appropriateness of prescribing overall has also remained fairly consistent over the 5 years of the Hospital NAPS, at approximately 72% (Table 6).

Table 6 Hospital NAPS compliance with guidelines and prescription appropriateness, 2013-2017

Key indicator		Percentage of total prescriptions (%)				
		2013	2014	2015	2016	2017
Compliance with guidelines	Compliant with <i>Therapeutic Guidelines</i> or local guidelines	59.7	56.2	55.9	51.5	54.0
	Non compliant	23.0	24.3	23.3	27.3	26.2
	Directed therapy	na	10.4	12.4	12.8	12.6
	No guideline available	11.0	4.6	3.8	4.0	3.3
	Not assessable	6.3	4.5	4.7	4.4	3.9
Appropriateness	Appropriate (optimal and adequate)	70.8	72.3	73.2	72.1	72.9
	Inappropriate (suboptimal and inadequate)	22.9	23.0	21.9	22.6	22.4
	Not assessable	6.3	4.7	5.0	5.3	4.7

na = not applicable as that indicator was introduced in 2014

Table 7 Hospital NAPS key indicators, 2013-2017

Key Indicator	Percentage of total prescriptions (%)				
	2013	2014	2015	2016	2017
Indication documented in medical notes (best practice >95%)	70.9	74.0	72.5	75.6	77.7
Review or stop date documented (best practice >95%)	na	na	35.5	38.1	40.5
Surgical prophylaxis given for >24 hours (best practice <5%)*	41.8	35.9	27.4	31.1	30.5
Compliant with <i>Therapeutic Guidelines</i> or local guidelines†	72.2	73.7	70.6	65.4	67.3
Appropriate (optimal and adequate)§	75.6	75.9	77.0	76.1	76.5

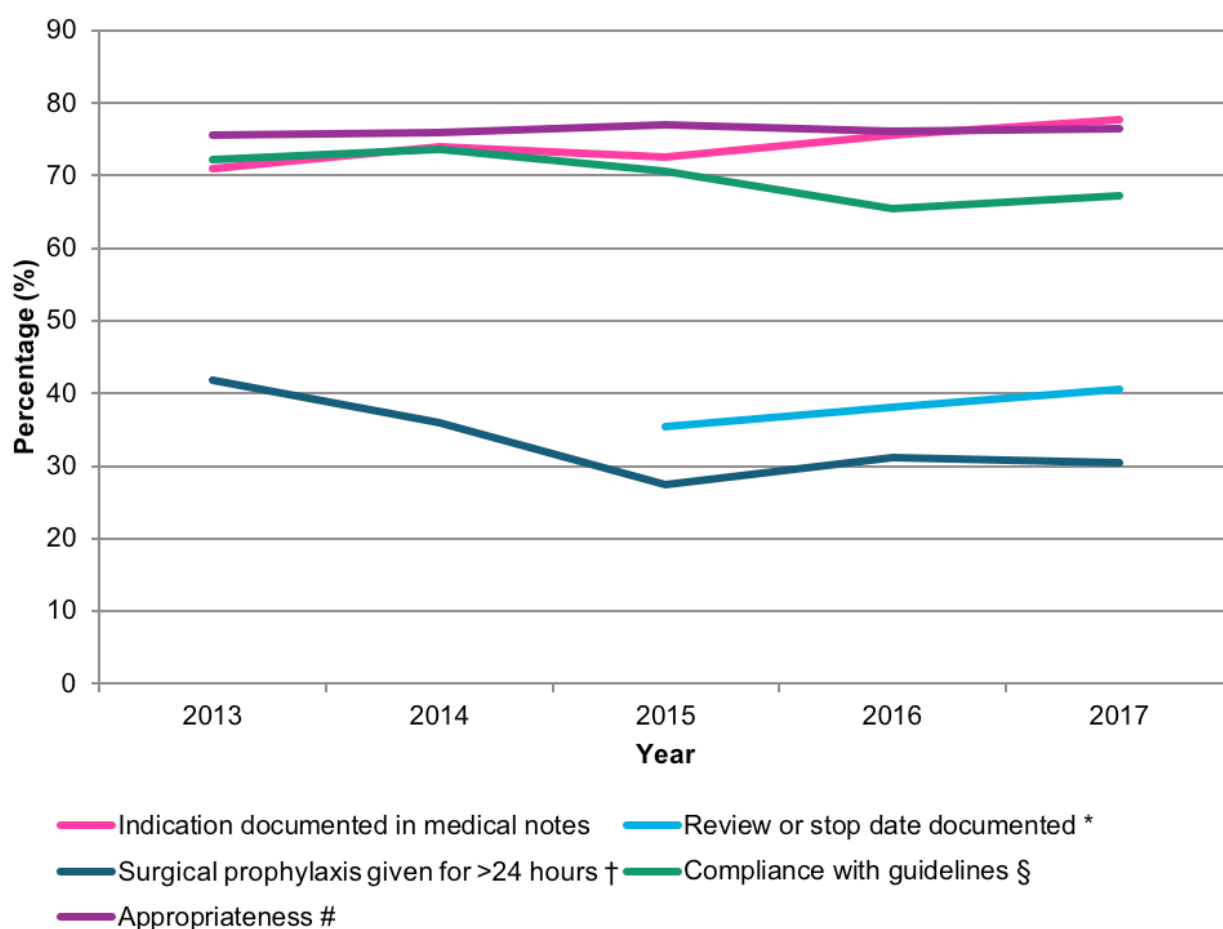
na - not applicable as these indicators were introduced in 2015

* Where surgical prophylaxis was selected as the indication ($n = 3,397$)

† Prescriptions for which compliance was assessable (21,034 prescriptions in 2017). Excludes prescriptions for which guidelines were not available, as well as prescriptions that were 'directed therapy' or 'not assessable'.

§ Prescriptions for which appropriateness was assessable (24,987 prescriptions in 2017). Excludes prescriptions deemed to be 'not assessable'.

Figure 5 Hospital NAPS key indicators by percentage, 2013–2017



* Collection of data on documentation of review and stop date commenced in 2015.

† Where surgical prophylaxis was selected as the indication ($n = 3,397$)

§ Prescriptions for which compliance was assessable (21,034 prescriptions in 2017), excludes prescriptions for which guidelines were not available, as well as prescriptions that were 'directed therapy' or 'not assessable'.

Prescriptions for which appropriateness was assessable ($n=24,987$ prescriptions in 2017), excludes prescriptions deemed to be 'not assessable'.

There are several factors that could be influencing the results and trends seen in Tables 7 and 8; these warrant further investigation. For example, the Hospital NAPS is a voluntary survey and it is possible that hospitals may not participate every year. Within each data collection period, there will also be facilities that are participating for the first time whose results may be poorer than sites that have participated over many years or have a more established AMS program. To limit the impact of these types of variables, two further analyses were performed which examine the impact of the NAPS in assisting hospitals to improve the quality of their antimicrobial prescribing over time.

It is important to consider these findings in the broader context of the development of AMS initiatives such as the NSQHS Standards and state and territory quality improvement strategies.

For hospitals that have undertaken the NAPS at least twice over the five years from 2013 to 2017 ($n = 361$), the analyses in Tables 8 and 9 show the percentage change in key indicators between subsequent years of participation. Significant improvements (determined by $p < 0.05$) in the reporting of quality markers, such as documentation of indication (1.43%) or duration of surgical prophylaxis greater than 24 hours (- 4.03%), are shown (Table 9).

Fewer prescriptions were reported as not assessable (- 0.52%), and there was a decrease in auditors reporting that no guidelines were available to assist with assessment (- 1.45%) (Table 8). The number of prescriptions assessed as appropriate rose by 0.83% over the period (Table 8), despite 0.61% fewer prescriptions being deemed to be compliant with guidelines (Table 9).

This is perhaps explained by the increase in directed therapy (2.37%), as treatment of conditions based on directed therapy usually has a higher rate of appropriateness as it is informed by microbiology results (Table 8).

Table 8 Percentage change in compliance with guidelines and prescription appropriateness for facilities that contributed at least twice to the Hospital NAPS between 2013 and 2017

Key indicator		Percentage change between subsequent years		
		Estimated change (95%CI)	p value	Direction of change
Compliance with guidelines	Compliant with <i>Therapeutic Guidelines</i> or local guidelines	-0.75 (-1.24, -0.27)	0.002*	↓
	Non compliant	0.36 (-0.06, 0.79)	0.093	↑
	Directed therapy	2.37 (2.06, 2.68)	<0.001*	↑
	No guideline available	-1.45 (-1.66, -1.24)	<0.001*	↓
	Not assessable	-0.52 (-0.73, -0.32)	<0.001*	↓
Appropriateness	Appropriate (optimal and adequate)	0.83 (0.39, 1.27)	<0.001*	↑
	Inappropriate (suboptimal and inadequate)	-0.43 (-0.84, -0.02)	0.040*	↓
	Not assessable	-0.40 (-0.62, -0.19)	<0.001*	↓

* Chi² p<0.05

Table 9 Percentage change in key indicators for facilities that contributed at least twice to the Hospital NAPS between 2013 and 2017

Key indicator	Percentage change between subsequent years		
	Estimated change (95%CI)	p value	Direction of change
Indication documented in medical notes (best practice >95%)	1.43 (1.01, 1.86)	0.001*	↑
Surgical prophylaxis given for >24 hours (best practice <5%)†	-4.03 (-5.33, -2.72)	<0.001*	↓
Compliant with <i>Therapeutic Guidelines</i> or local guidelines§	-0.61 (-1.12, -0.10)	0.019*	↓
Appropriate (optimal and adequate)#	0.55 (0.12, 0.98)	0.012*	↑

* Chi² p<0.05

† Where surgical prophylaxis was selected as the indication

§ Prescriptions for which compliance was assessable. Excludes prescriptions for which guidelines were not available, as well as prescriptions that were 'directed therapy' or 'not assessable'.

Prescriptions for which appropriateness was assessable. Excludes prescriptions deemed to be 'not assessable'

A similar analysis was also undertaken for hospitals that participated in both the 2016 and 2017 Hospital NAPS ($n = 257$), to determine if improvements were demonstrated in association with consistent years of participation (Tables 10 and 11). It is important to consider these findings in the broader context of the development of AMS initiatives such as the NSQHS Standards and state and territory quality improvement strategies.

Significant improvements were reported for documentation of indication (2.27%) and documentation of a stop or review date (2.53%) (Table 11).

An improvement was reported in the number of prescriptions with guidelines available in 2017 compared with 2016, and fewer prescriptions were considered not assessable. The number of prescriptions that were considered compliant with guidelines increased by 1.33% (Table 11), and there was a 0.69% increase in appropriateness from 2016 to 2017 (Table 10). These findings may indicate the benefits of enabling audit and feedback processes over time.

Table 10 Percentage change in compliance with guidelines and prescription appropriateness for facilities that participated in both the 2016 and 2017 Hospital NAPS

Key indicator		Percentage change between 2016 and 2017		
		Estimated change (95%CI)	p value	Direction of change
Compliance with guidelines	Compliant with <i>Therapeutic Guidelines</i> or local guidelines	1.87 (1.01, 2.74)	<0.001*	↑
	Non compliant	-0.65 (-1.42, -0.11)	0.095	↓
	Directed therapy	-0.05 (-0.63, 0.53)	0.878	↓
	No guideline available	-0.68 (-1.01, -0.36)	<0.001*	↓
	Not assessable	-0.49 (-0.84, -0.14)	0.005*	↓
Appropriateness	Appropriate (optimal and adequate)	0.69 (-0.09, 1.46)	0.082	↑
	Inappropriate (suboptimal and inadequate)	-0.14 (-0.87, 0.58)	0.701	↓
	Not assessable	-0.54 (-0.92, -0.16)	0.005*	↓

* Chi² $p < 0.05$

Table 11 Percentage change in key indicators for facilities that participated in both the 2016 and 2017 Hospital NAPS

Key indicator	Percentage change between 2016 and 2017		
	Estimated change (95%CI)	p value	Direction of change
Indication documented in medical notes (best practice >95%)	2.27 (1.53, 3.00)	<0.001*	↑
Review or stop date documented (best practice >95%)	2.53 (1.68, 3.37)	<0.001*	↑
Surgical prophylaxis given for >24 hours (best practice <5%)†	0.47 (-1.71, 2.64)	0.688	↑
Compliant with <i>Therapeutic Guidelines</i> or local guidelines§	1.33 (0.42, 2.25)	0.004*	↑
Appropriate (optimal and adequate)#	0.29 (-0.47, 1.04)	0.460	↑

* Chi² $p < 0.05$

† Where surgical prophylaxis was selected as the indication

§ Prescriptions for which compliance was assessable. Excludes prescriptions for which guidelines were not available, as well as prescriptions that were 'directed therapy' or 'not assessable'.

Prescriptions for which appropriateness was assessable. Excludes prescriptions deemed to be 'not assessable'

Most commonly prescribed antimicrobials

Australia experienced a number of antimicrobial drug shortages throughout 2017. These shortages impacted on the ability of clinicians to prescribe in accordance with guideline recommendations.¹⁰ As a result, the 20 most commonly prescribed antimicrobials (Figure 6) show considerable variation from previous years.

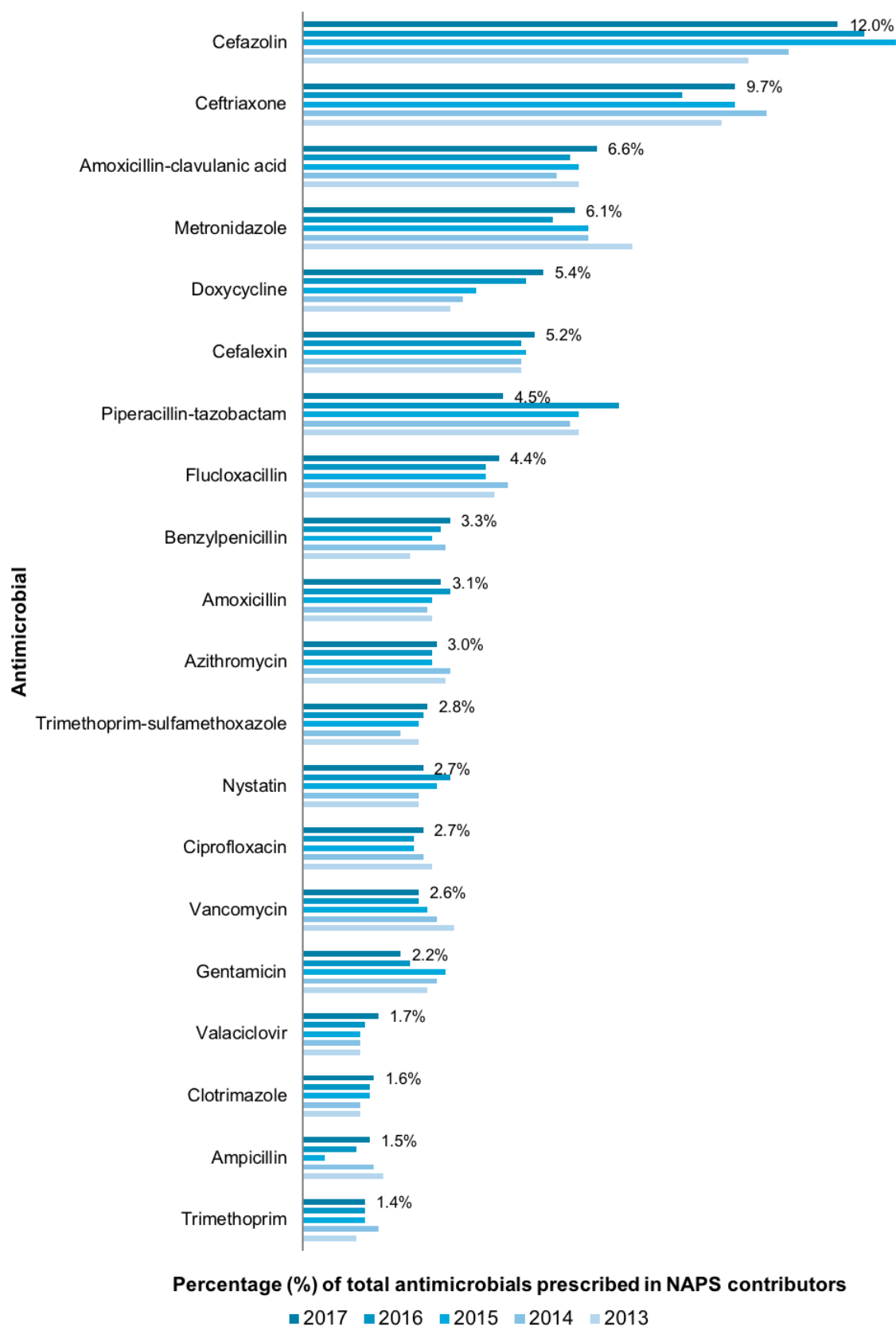
The fall in piperacillin–tazobactam use from 7.1% in 2016 to 4.5% of total antimicrobials prescribed in NAPS contributors in 2017, is consistent with the prolonged supply issue with this medication. Prescribers appear to have increased their use of ceftriaxone, metronidazole (oral and parenteral) and amoxicillin–clavulanic acid (oral and parenteral) in response to the limited availability of piperacillin–tazobactam. A small increase in ciprofloxacin use may also have accompanied the change, or alternatively could have been triggered by the ongoing norfloxacin shortage.

The piperacillin–tazobactam shortage placed pressure on the supply of alternative antibiotics with broad-spectrum Gram-negative coverage, such as gentamicin and cefepime, and subsequently led to stock shortages of these medications. However, fluctuations in the usage of these agents were not captured by the Hospital NAPS. Meropenem, a broad spectrum antimicrobial, has moved out of the top 20 antimicrobials prescribed in 2017, which is encouraging.

It is noted that the rate of prescribing of vancomycin in 2017 remained the same as for 2016 (2.6%), despite a prolonged period of unavailability. Resultant increases in teicoplanin, daptomycin or linezolid usage were not observed through the 2017 Hospital NAPS.

Cefazolin use declined for the second year in a row, and was 12.0% in 2017. The use of doxycycline continued to increase, and was 5.4%. Doxycycline is frequently recommended as a first-line antibiotic in the *Therapeutic Guidelines*, so this trend is encouraging. The use of many other first-line narrow spectrum antibiotics remained stable.

Figure 6 The 20 most commonly prescribed antimicrobials in Hospital NAPS contributors, by percentage, 2013–2017



Appropriateness for the most commonly prescribed antimicrobials

Figure 7 shows the appropriateness for the 20 most commonly prescribed antimicrobials in 2017. The antimicrobials that are commonly prescribed for medical prophylaxis (antimicrobials given to prevent infection when patients are immunosuppressed – for example, those undergoing transplantation), such as valaciclovir, trimethoprim–sulfamethoxazole and nystatin, are usually given in accordance with guidelines or protocols. High rates of appropriateness in prescribing have been consistently reported for these medications in the Hospital NAPS over time.

The narrow spectrum antimicrobials tended to have high rates of appropriate use, including flucloxacillin (84.3%), benzylpenicillin (83.9%), trimethoprim (79.6%) and doxycycline (74.1%).

In 2017, there were very high rates of appropriateness of prescribing for vancomycin and the broad-spectrum agent meropenem (84.8% and 83.1% respectively).

In line with the 2016 Hospital NAPS report, the antimicrobials with the highest rates of inappropriate prescribing were cefalexin (43.3%), amoxicillin–clavulanic acid (29.4%), cefazolin (28.9%) and ceftriaxone (28.1%). This information highlights the importance of AMS programs focusing on the use of these agents, in addition to antimicrobials that have traditionally been highly restricted.

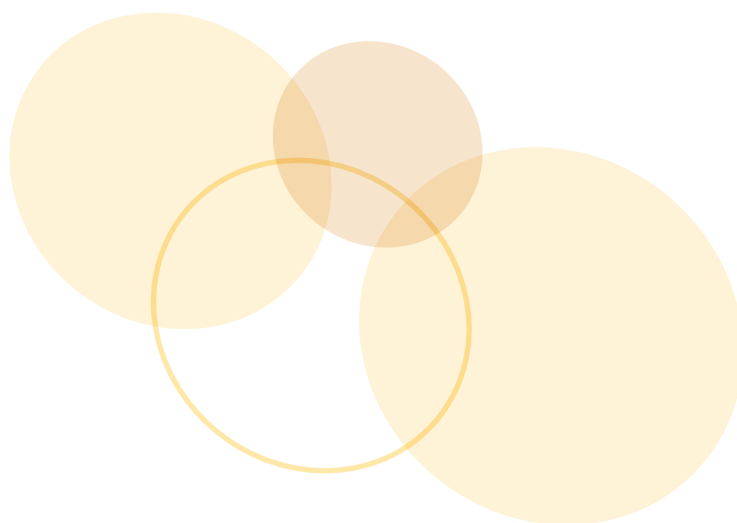
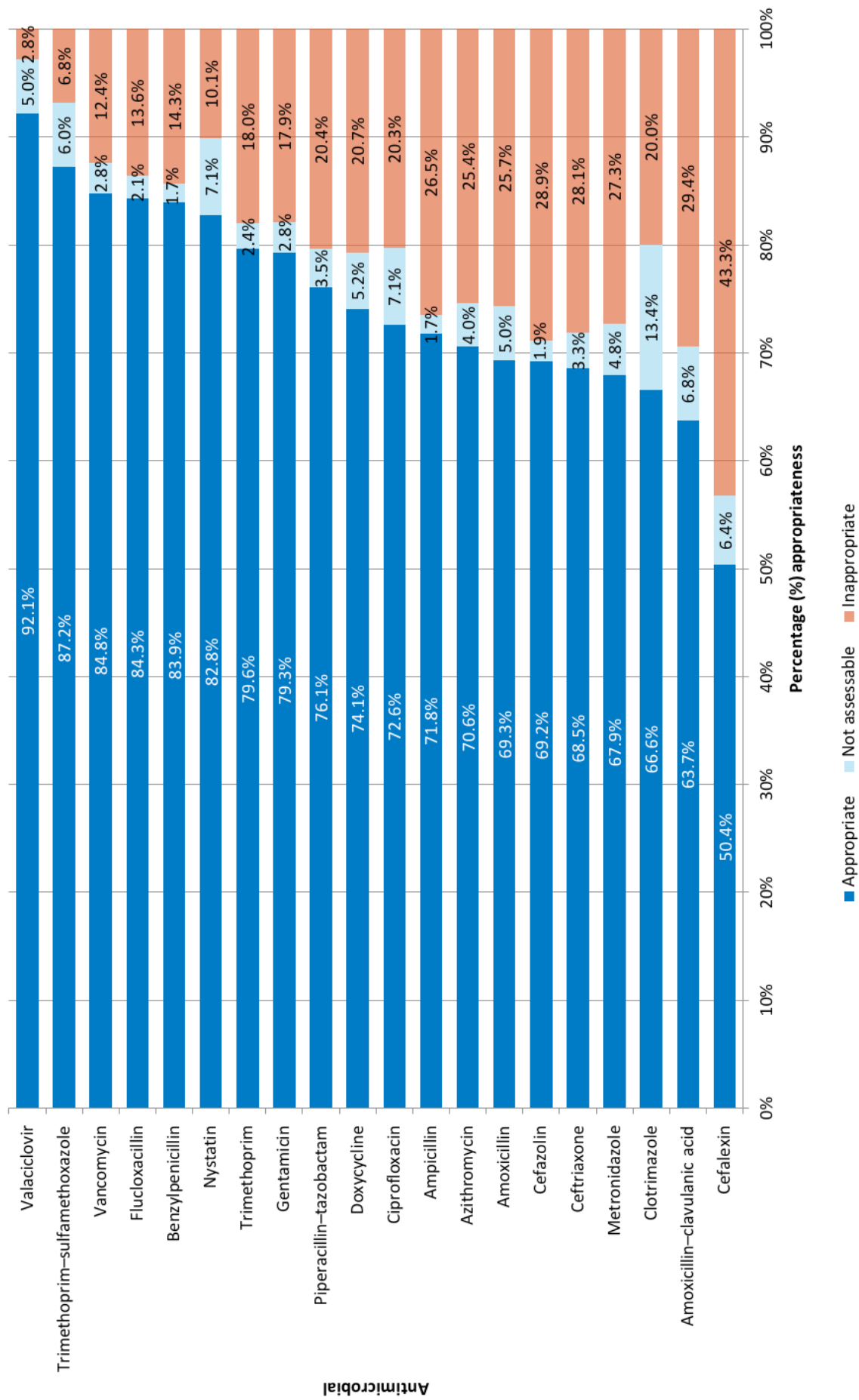


Figure 7 Appropriateness for the most commonly prescribed antimicrobials in Hospital NAPS contributor hospitals, 2017

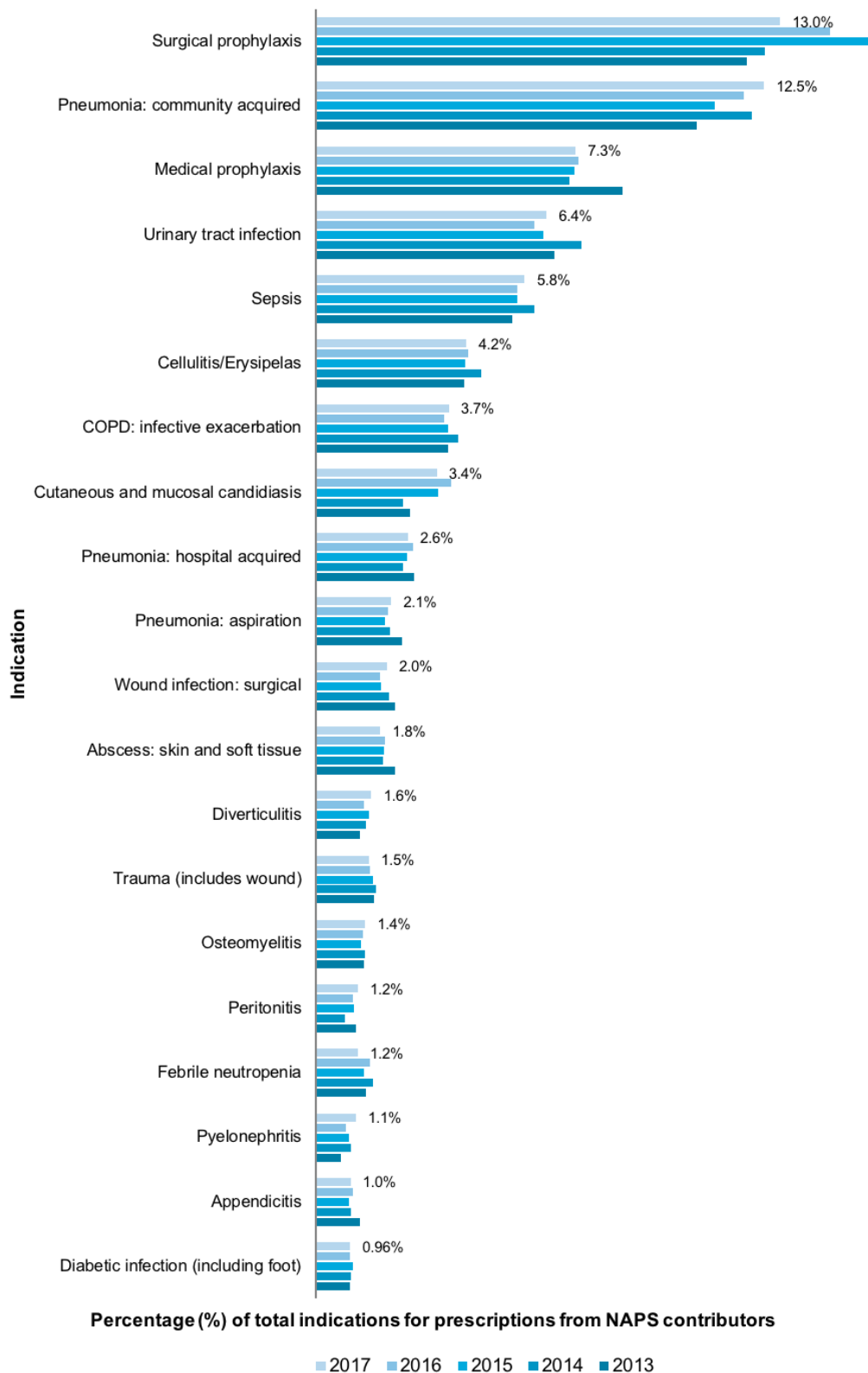


Most common indications for antimicrobial prescribing

The most common indications for antimicrobial use have been remarkably consistent across the five years that the Hospital NAPS has been conducted (Figure 8), whereas the most commonly prescribed antimicrobials have fluctuated (Figure 6). This demonstrates that the choice of antimicrobials for treatment of infective presentations is changing over time, possibly in response to either medication shortages or changes in local guideline recommendations. Other factors, such as the development of AMS initiatives (for example, the NSQHS Standards and state and territory quality improvement strategies) may have also influenced this.

Surgical prophylaxis remains the most common reason for a patient to receive an antimicrobial prescription during their hospital stay; the rate reduced to 13.0% in 2017 after peaking at 15.6% in 2015. Conversely, the rate of prescribing for community-acquired pneumonia has gradually increased over time, and reached 12.5% in the 2017 survey. The other indications for which antimicrobials are commonly prescribed have remained relatively static since 2013.

Figure 8 The 20 most common indications for prescribing antimicrobials in Hospital NAPS contributors, 2013–2017



COPD = chronic obstructive pulmonary disease

Appropriateness of prescribing for the 20 most common indications

Of the 20 most common indications for prescribing antimicrobials in 2017, the conditions for which the highest proportions of prescriptions were assessed as inappropriate were: surgical prophylaxis (40.3%); infective exacerbation of chronic obstructive pulmonary disease (COPD) (37.8%); and trauma (29.3%) (Figure 9). In contrast, conditions with well-accepted and highly-protocolised treatment guidelines continued to have the highest rates of appropriate prescribing. These include: medical prophylaxis (88.2%); appendicitis (87.0%); peritonitis (86.6%); osteomyelitis (86.5%); and sepsis (86.4%).

Infective exacerbation of COPD remains a persistent issue for inappropriate prescribing in Australia and abroad. The AIHW reports that there were 86,000 hospitalisations for COPD in 2016–2017 which highlights how common this illness is. The *Therapeutic Guidelines: Antibiotic* recommends that antibiotics may not be required for many exacerbations.

Appropriateness for aspiration pneumonia reduced from 80.7% in 2016 to 72.1% in 2017. This suggests optimising respiratory prescribing is a priority area for improvement action.

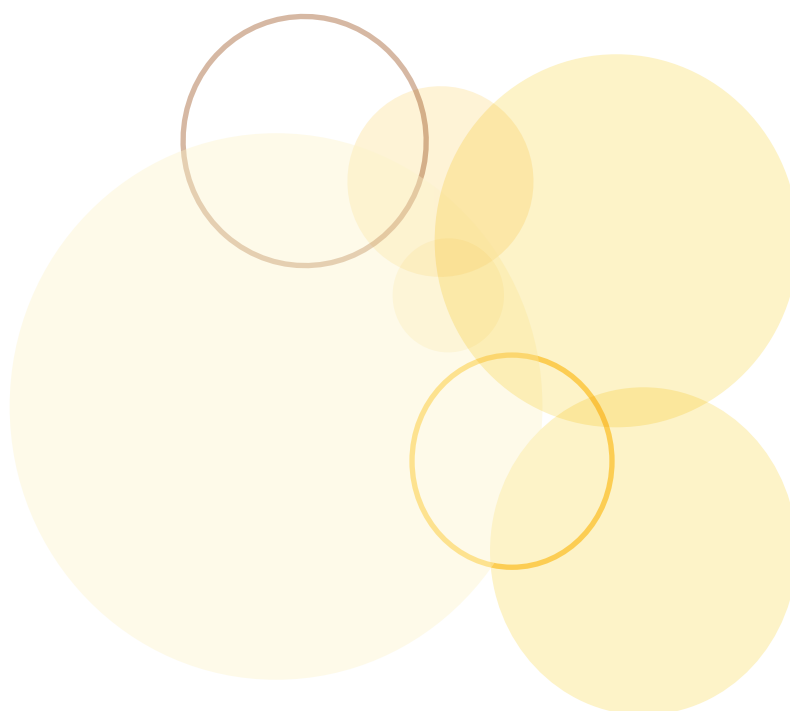
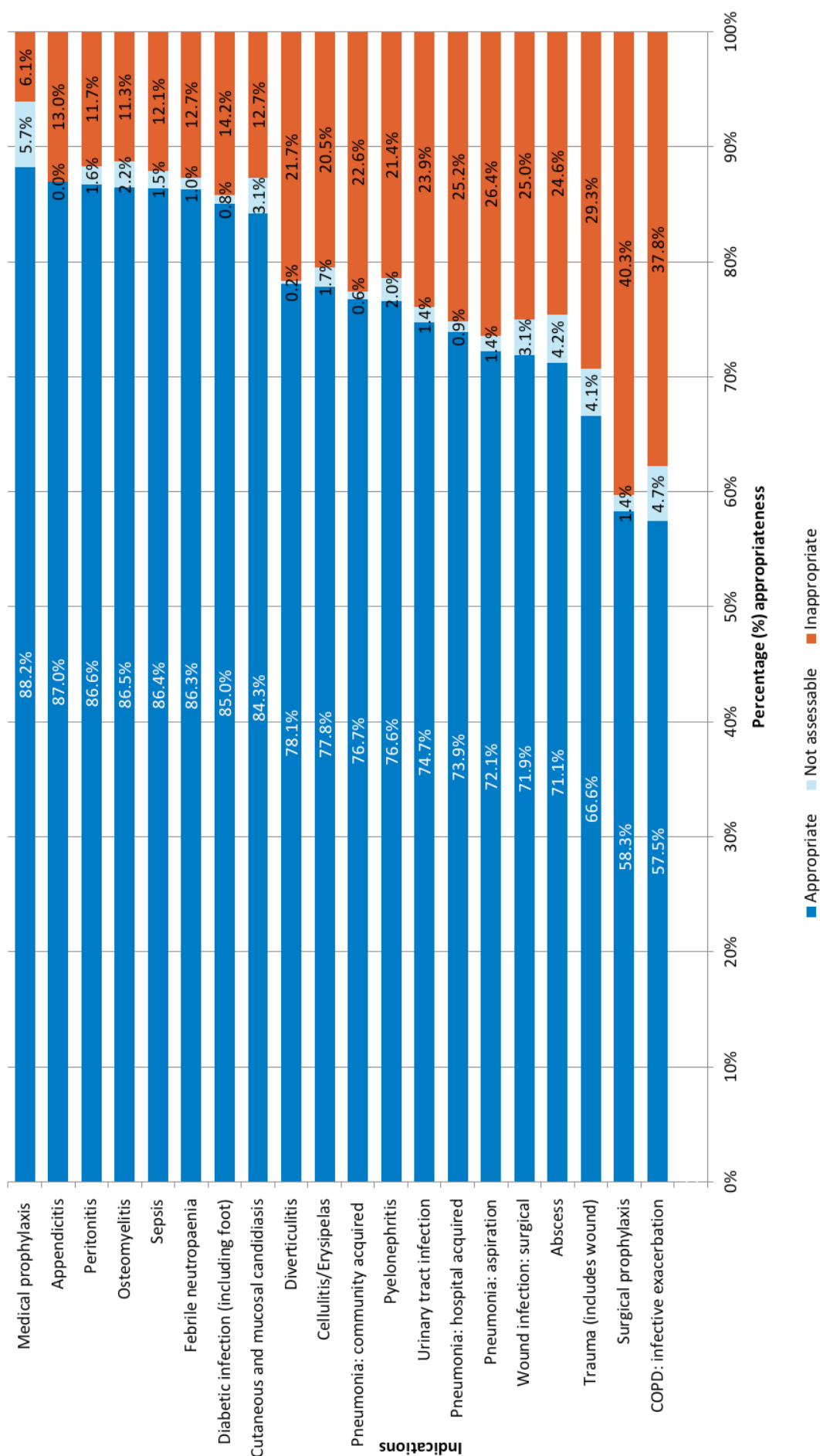


Figure 9 Appropriateness of prescribing for the 20 most common indications in Hospital NAPS contributors, 2017



COPD = chronic obstructive pulmonary disease

Compliance with guidelines for the 20 most common indications

Figure 10 shows the percentage of prescriptions assessed as compliant with guidelines for the 20 indications most commonly requiring antimicrobial therapy in 2017. Prescriptions can be assessed as inappropriate despite being compliant with guidelines or directed therapy. Common clinical scenarios for this can be a prescription that follows guidelines but doesn't consider a documented medical or travel history that the assessor has seen. Another scenario may be a prescription that is directed therapy, as it is informed by a microbiology result but the prescriber could have chosen a narrower spectrum antimicrobial and so it is inappropriate.

Indications with a high degree of appropriateness often also had a high degree of guideline compliance, such as medical prophylaxis (83.8%); febrile neutropenia (77.5%); and cutaneous and mucosal candidiasis (73.9%).

Certain indications with low levels of guideline compliance, but high levels of directed therapy, also tended to be assessed as appropriate overall. These included osteomyelitis, sepsis, and urinary tract infection. Indications with high levels of guideline non-compliance were similar to those with high levels of inappropriateness: infective exacerbation of COPD (49.6%), surgical prophylaxis (45.2%), and cholecystitis (36.8%).

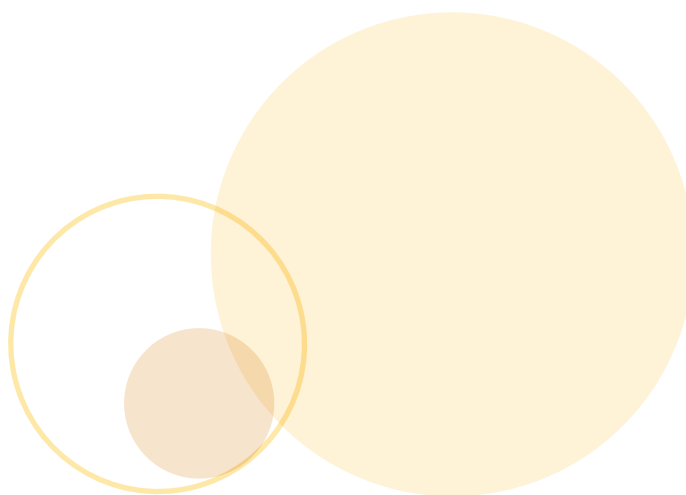
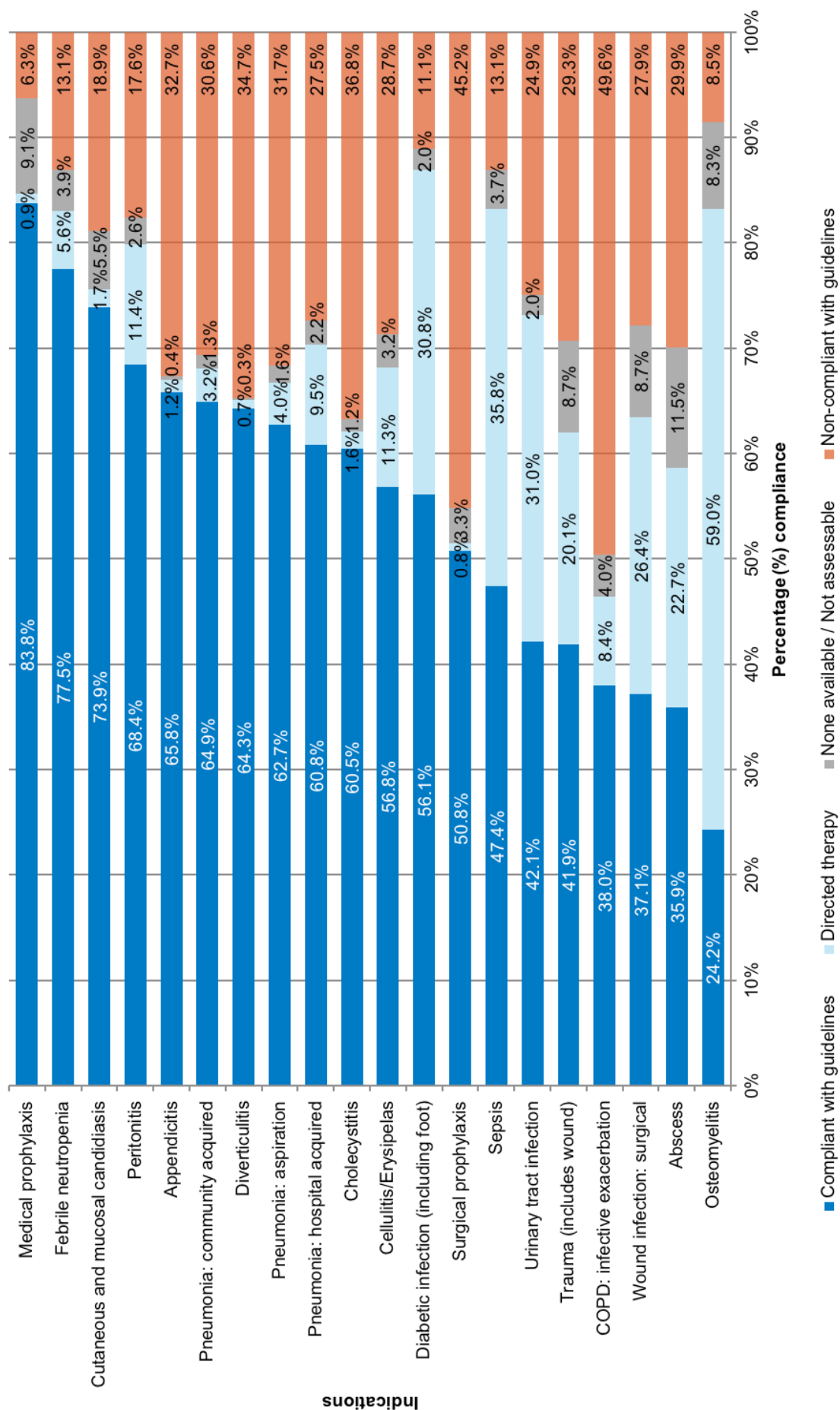


Figure 10 Compliance with guidelines for the 20 indications most commonly requiring antimicrobials in Hospital NAPS contributors, 2017



COPD = chronic obstructive pulmonary disease

Discussion

The 2017 Hospital NAPS marks the fifth year of the survey and demonstrates that the collaboration between the Commission and the NCAS has resulted in a sustainable program that supports the ongoing challenges of AMS in Australian hospitals.

NAPS is a valuable tool for health service organisations to monitor the performance of their AMS programs, as it contributes to demonstrating that a health service organisation is meeting the requirements of the NSQHS Standards. However, participation by public hospitals has been relatively static since 2015, as has the total number of participating hospitals. At the same time, the number of prescriptions for which data are submitted to NAPS has increased each year.

Participation in the NAPS is voluntary, and hospitals may choose not to participate every year or to alternate between the different available NAPS surveys. Analyses of 2016 and 2017 Hospital NAPS participation data by NCAS indicate that the static size of the Hospital NAPS cohort has been complemented by the uptake of the Surgical NAPS since it was introduced in 2016. Surgical NAPS is an audit tool that may be more useful for some health service organisations. Surgical NAPS is an audit tool that allows clinicians to examine surgical prophylaxis prescribing in more depth. Surgical NAPS participation increased between 2016 and 2017; this increase does not appear to have had a major impact on Hospital NAPS participation rates.

The high level of participation by principal referral hospitals, public acute group A and B hospitals, private acute group A and B hospitals and specialist women's hospitals provides valuable findings in relation to appropriateness of antimicrobial prescribing in those settings. As approximately one third of all eligible public and private hospitals participated in the 2017 Hospital NAPS, and the participation rates vary between the states and territories, there are opportunities for increasing participation. The Commission continues to work with the public and private sectors to increase participation.

Analyses of Hospital NAPS data collected from 2013 to 2017 showed improvements over that period for a number of key quality indicators for antimicrobial prescribing. These include increases in the rate of documentation of indication for prescribing antimicrobials in participating hospitals, and in the rate of documentation of an antimicrobial review or stop date. In 2017, in response to these improvements in the quality of documentation, fewer prescriptions were deemed to be not assessable.

There has also been an improvement in the rate of prescribing of antimicrobials for surgical prophylaxis for longer than 24 hours, and a downward trend from 2013 to 2017 toward the target for this indicator of less than 5%. However, in 2017, almost one third of antimicrobial prescriptions for surgical prophylaxis were continued beyond 24 hours of therapy.

The number of prescriptions assessed as compliant with guidelines, and as appropriate, remained relatively unchanged from 2013 to 2017. The most common reasons for inappropriate prescribing in hospitals that contributed to NAPS in 2017 were: spectrum too broad; wrong dose or frequency; and, antimicrobials not required.

To further investigate the reasons why appropriateness of prescribing and compliance with guidelines have remained static since 2013, in contrast to other key indicators, NCAS performed analyses for the subgroups of facilities that had either participated in the Hospital NAPS on more than one occasion in the last five years or participated in the Hospital NAPS in both 2016 and 2017.

These analyses revealed that key markers for prescribing appropriateness improved in hospitals that were repeat participants in the Hospital NAPS. These findings suggest that regular auditing of antimicrobial prescribing does result in improved appropriateness of prescribing and compliance with guidelines.

While these results are encouraging, the survey has also highlighted the ongoing need for improved prescribing for selected antimicrobials, particularly cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone. This may be challenging where there are periods of extended antimicrobial drug shortages.

The Commission is planning targeted action with regard to the use of antimicrobials in prolonged post-operative surgical prophylaxis. Targeted strategies will also be considered in relation to the treatment of infective exacerbations of COPD, cholecystitis, and traumatic injuries. These conditions had poor rates of prescribing appropriateness and guideline compliance. The 2017 Hospital NAPS analyses have identified the following priority areas for targeted quality improvement initiatives for antimicrobial prescribing:

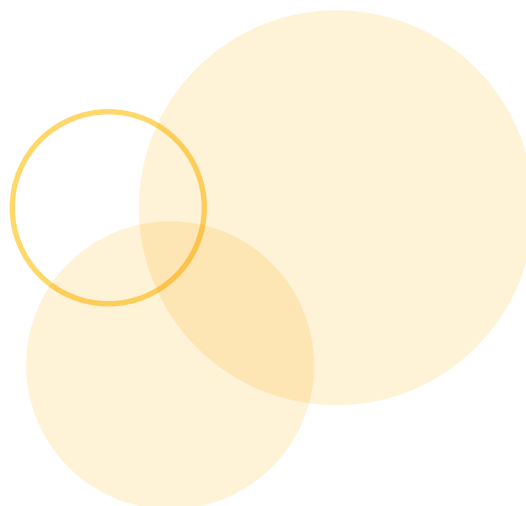
- Documentation of indication
- Documentation of review or stop date
- Compliance with guidelines
- Appropriateness of prescribing, particularly inappropriate broad spectrum antimicrobial use and duration of therapy
- Improved prescribing, particularly for cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone
- Improved prescribing for indications, particularly surgical prophylaxis, infective exacerbations of chronic obstructive pulmonary disease, traumatic injuries and various types of pneumonia.

To address these priority areas for action, the Commission will:

- Communicate the findings to states and territories and private hospital provider organisations to highlight the priority areas for their antimicrobial stewardship programs
- Encourage public and private health service organisations to routinely review their NAPS results, and implement targeted strategies for departments with the highest rates of inappropriate prescribing, and non-compliance with guidelines

- Promote action 3.16c of the NSQHS Preventing and Controlling Healthcare-Associated Infection Standard, which requires action to improve appropriateness of antimicrobial prescribing
- Collaborate with the Royal Australasian College of Surgeons and other key stake holders to improve prescribing of antimicrobials for surgical prophylaxis
- Work with states and territories and expert clinical groups to develop strategies and guidelines to improve the appropriateness of antimicrobial prescribing for respiratory conditions and traumatic injuries; prescribing of broad spectrum antimicrobials and duration of therapy; and prescribing of cefalexin, amoxicillin–clavulanic acid, cefazolin and ceftriaxone.

The Commission will also work with the states and territories and the private sector to promote ongoing monitoring of antimicrobial usage and appropriateness of use in Australian hospitals, as required by the NSQHS Preventing and Controlling Healthcare-Associated Infection Standard.¹ This Standard requires all Australian hospitals to implement an antimicrobial stewardship program.



HOSPITAL
NAPS National Antimicrobial
Prescribing Survey

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Appendix 2: Hospital NAPS data definitions of appropriateness

If endorsed guidelines are <u>present</u>		If endorsed guidelines are <u>absent</u>	
Appropriate	1 Optimal ¹	Antimicrobial prescription follows either the Therapeutic Guidelines ² or endorsed local guidelines <i>optimally</i> , including antimicrobial choice, dosage, route and duration ³	The antimicrobial prescription has been reviewed and endorsed by an infectious diseases clinician or a clinical microbiologist OR The prescribed antimicrobial will cover the likely causative or cultured pathogens and there is not a narrower spectrum or more appropriate antimicrobial choice, dosage, route or duration ³ available
	2 Adequate	Antimicrobial prescription does not optimally follow the Therapeutic Guidelines ² or endorsed local guidelines, including antimicrobial choice, dosage, route or duration ³ , however, is a reasonable alternative choice for the likely causative or cultured pathogens OR For surgical prophylaxis, as above and duration ³ is less than 24 hours	Antimicrobial prescription including antimicrobial choice, dosage, route and duration ³ is not the most optimal, however, is a reasonable alternative choice for the likely causative or cultured pathogens OR For surgical prophylaxis, as above and duration ³ is less than 24 hours
Inappropriate	3 Suboptimal	There may be a mild or non-life-threatening allergy mismatch OR Antimicrobial prescription including antimicrobial choice, dosage, route and duration ³ , is an unreasonable choice for the likely causative or cultured pathogens, including: <ul style="list-style-type: none"> spectrum excessively broad, unnecessary overlap in spectrum of activity, dosage excessively high or duration excessively long failure to appropriately de-escalate with microbiological results 	Antimicrobial prescription including antimicrobial choice, dosage, route or duration ³ is an unreasonable choice for the likely causative or cultured pathogens
	4 Inadequate	Antimicrobial prescription including antimicrobial choice, dosage, route or duration ³ is unlikely to treat the likely causative or cultured pathogens OR The documented or presumed indication does not require any antimicrobial treatment OR There may be a severe or possibly life-threatening allergy mismatch, or the potential risk of toxicity due to drug interaction OR For surgical prophylaxis, the duration ³ is greater than 24 hours (except where local guidelines endorse this)	Antimicrobial prescription including antimicrobial choice, dosage, route or duration ³ is unlikely to treat the likely causative or cultured pathogens OR The documented or presumed indication does not require any antimicrobial treatment OR There may be a severe or possibly life-threatening allergy mismatch, or the potential risk of toxicity due to drug interaction OR For surgical prophylaxis, the duration ³ is greater than 24 hours (except where local guidelines endorse this)
5 Not assessable		The indication is not documented and unable to be determined from the notes OR The notes are not comprehensive enough to assess appropriateness OR The patient is too complex, due to multiple co-morbidities, allergies or microbiology results, etc.	

¹ Taking into account acceptable changes due to the patient's weight or renal function, if this information is available

² Antibiotic Expert Group. Therapeutic Guidelines: Antibiotic. Version 15 (2014), or online version

³ Duration should only be assessed if the guidelines state a recommended duration and the antimicrobial has already been dispensed for longer than this, or if there is a clear planned 'end date' documented

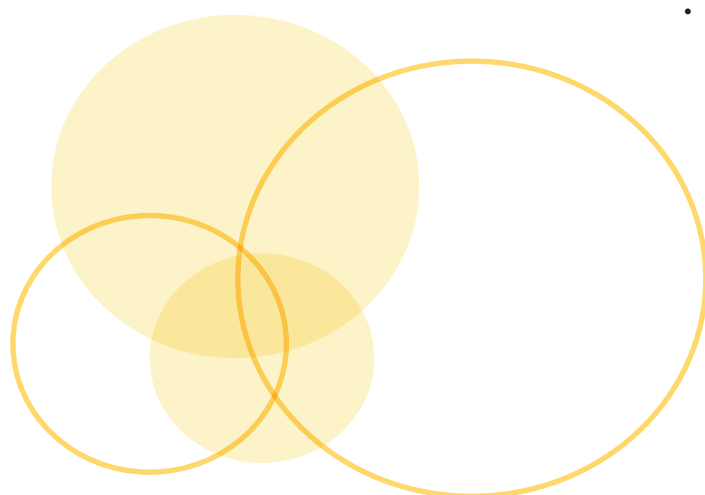
Appendix 3: Tables and figures

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- Table 11: Percentage change in key indicators for facilities that participated in both the 2016 and 2017 Hospital NAPS



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