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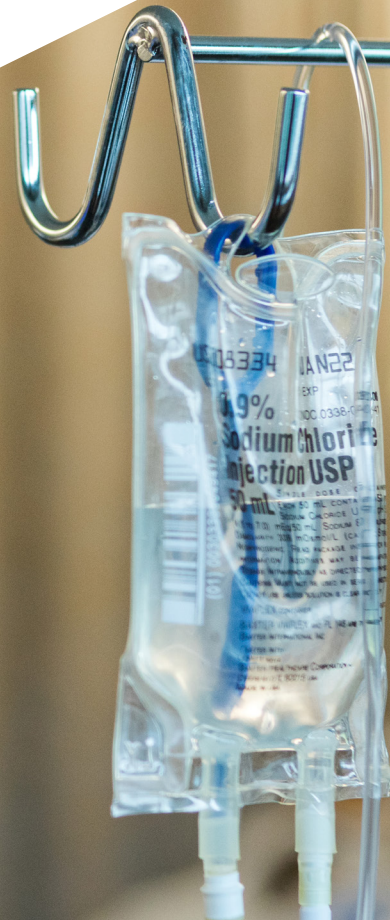
Interim Australian Centre for Disease Control

Antimicrobial prescribing practice in Australian hospitals

Results of the 2023 Hospital National Antimicrobial Prescribing Survey

2023

HOSPITAL NAPS
National Antimicrobial Prescribing Survey

NCAS
National Centre for Antimicrobial Stewardship

Preferred citation

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Preface

This report is best interpreted when read in conjunction with the *National Antimicrobial Prescribing Survey: technical supplement 2023.*[5]

Acknowledgements

Contributing facilities

Abbreviations

Abbreviation	Term
AIHW	Australian Institute of Health and Welfare
AMS	Antimicrobial stewardship
AURA	Antimicrobial Use and Resistance in Australia
EMM	Electronic medication management
GEM	Geriatric evaluation and management
NAPS	National Antimicrobial Prescribing Survey

Summary

The Hospital National Antimicrobial Prescribing Survey (Hospital NAPS) continues to support hospital antimicrobial stewardship (AMS) programs by providing a standardised tool to measure the key quality metrics of antimicrobial prescribing. It is a key contributor to Australia's National Antimicrobial Resistance Strategy[1] and the Antimicrobial Use and Resistance in Australia (AURA) surveillance program.[2]

The Hospital NAPS program continues to be a widely adopted and valued tool to assess the quality of antimicrobial prescribing across Australian hospitals. Its focus on providing meaningful data for action with clear data visualisation for contributing hospitals has led to the continued high participation from Australian hospitals, representing a wide variety of funding types, peer groups and remoteness classifications.

A total of 420 hospitals participated in the 2023 survey – a number which has remained consistent for the last few years. Approximately three-quarters were public hospitals and one-quarter were private hospitals. This participation rate represented 43.5% of all eligible Australian hospitals.

Results of key indicators

- **Documentation of indication** was present for 86.5% of prescriptions. Hospitals with an electronic medication management (EMM) system had substantially higher rates of documentation (92.3%) compared with non-EMM hospitals (79.8%).

- **Documentation of review and stop date** was present for 56.0% of prescriptions. While documentation was better in EMM hospitals (59.1%) compared with non-EMM hospitals (52.4%), this is still well below the expected best-practice target of 95%.

- Of those audited prescriptions that were for **surgical prophylaxis**, 25.9% extended beyond 24 hours.

- There was a continued improvement in the rate of **noncompliance with prescribing guidelines**, with 24.0% of prescriptions deemed as noncompliant. Indications with the highest rates of guideline noncompliance were surgical prophylaxis, non-surgical wound infections, and cystitis.

- Approximately three-quarters of all prescriptions were deemed to be appropriate. As a national aggregate, this metric has had minimal changes over the years. Surgical prophylaxis remains an area with the poorest rates of appropriateness.

Implications for clinical practice

There have been encouraging signs of continued antimicrobial prescribing improvement, in line with the growth and expansion of hospital AMS programs. Nonetheless, the Hospital NAPS highlights several opportunities for quality improvement in the following areas:

- Indication should be documented to ensure that all clinicians treating the patient clearly understand the reasons for the antimicrobial. With increasing adoption of EMM systems in Australian hospitals, this metric is likely to improve over time.

- Review or stop date should be documented, as past results have been well below best target recommendations. This is an important AMS measure to ensure the timely review of antimicrobials prescribed, maximise efficacy and reduce unnecessary treatment.

- Prescribing and guideline compliance should be improved, particularly in the following areas: surgical prophylaxis, management of non-surgical wound infections, and cystitis.

- Despite the existence of clear national guidelines, these data suggest there is still considerable work to be done to support and educate prescribers in making informed and best-practice prescribing choices for indications requiring antimicrobial therapy.

1. Introduction

Australia's National Antimicrobial Resistance Strategy – 2020 and beyond has recommended the adoption of antimicrobial stewardship (AMS) programs, with the aim of enhancing patient healthcare outcomes while reducing the emergence and spread of antimicrobial resistance.[1]

For 11 years, the Hospital National Antimicrobial Prescribing Survey (Hospital NAPS) has continued to support hospital AMS programs, allowing the meaningful measurement, reporting and benchmarking of the quality of antimicrobial prescribing. Hospital NAPS program staff also continue to provide clinical program support and training for participants. Internationally, it remains the only tool to measure appropriateness of antimicrobial prescribing.

Furthermore, participation in the Hospital NAPS assists health service organisations to demonstrate that they meet the AMS action requirements of the National Safety and Quality Health Service Standards and the Antimicrobial Stewardship Clinical Care Standard.[3, 4]

The Australian Government Department of Health, Disability and Ageing provides funding for the Royal Melbourne Hospital Guidance Group and the National Centre for Antimicrobial Stewardship to conduct the Hospital NAPS and contribute data to the AURA surveillance program.[2]

For details on definitions, survey methodology, analyses methodology and considerations for data interpretation, please refer to the *National Antimicrobial Prescribing Survey: technical supplement 2023*.[5]

2. Results

2.1 Participation

The Hospital NAPS remains a voluntary program. Despite this, there has been consistent participation by hospitals across all Australian states and territories, with representation across all Remoteness Areas[7], funding types and peer groups[6] since the program's initiation.

This report analyses the data submitted by 420 hospitals (298 public and 122 private) that met the Hospital NAPS inclusion criteria. Participation has remained steady the last few years, with 414 hospitals (300 public and 114 private) in 2022 and 412 hospitals (296 public, 116 private) in 2021.

Overall, 43.5% of all eligible Australian hospitals participated in the survey, with slightly higher participation from public hospitals (44.0%, 298 of 678) compared with private hospitals (42.4%, 122 of 288). All Australian states and territories were represented (Figure 1).

Figure 1. **Representative participation of hospitals that contributed to the Hospital National Antimicrobial Prescribing Survey by state and territory, 2023***
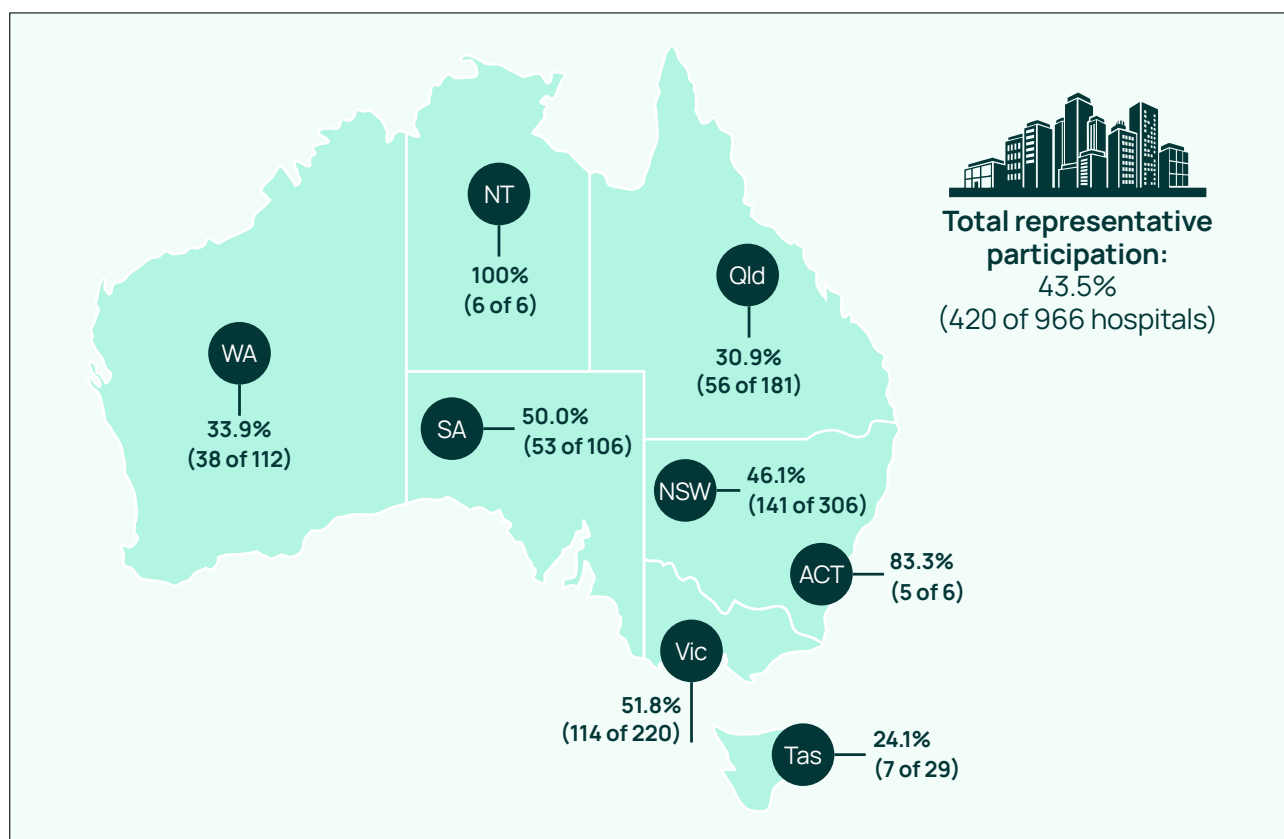
* Total number of hospitals in each state and territory represent all eligible hospitals in the Australian Institute of Health and Welfare reporting groups for public and private, states and territories, and remoteness classifications.[6, 7]

ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic= Victoria; WA = Western Australia.

Data from 24,009 patients were submitted, generating 34,239 prescriptions for analysis. The majority of prescriptions were gathered from Victorian and New South Wales facilities which, together, represented 60.1% of all prescriptions submitted. The majority of auditing was performed in August, September and October, given the benchmark closing was brought forward to 31 October 2023 (previous years had a December close date). The benchmark closing date was brought forward to encourage dissemination of results during World Antimicrobial Resistance Awareness Week in November.

2.2 Key indicators

Results of the key indicators are summarised below (Table 1). The vast majority of antimicrobial prescriptions had an indication documented in the patient medical history. This measure has continued to improve, from 71.9% in 2015 to 86.5% in 2023.

Indication documentation was higher in public hospitals (89.7%) compared with private hospitals (73.2%) and amongst hospitals with an electronic medication management (EMM) system (92.3%) compared with those without an EMM system (79.8%). This is not surprising given that most EMM systems require indication as a mandatory field before the antimicrobial prescription can be confirmed.

Table 1. Hospital National Antimicrobial Prescribing Survey key indicators, for assessable prescriptions, 2023

Key indicator	Result
Indication documented Best-practice target ›95%	86.5%
Review or stop date documented Best-practice target ›95%	56.0%
Surgical prophylaxis ›24 hours*	25.9%
Compliance with guidelines^	70.2%
Appropriate#	77.9%

Note: Refer to *National Antimicrobial Prescribing Survey: technical supplement 2023* for definitions.[5]
* Where surgical prophylaxis was selected as the indication (n=4,122).
^ Prescriptions for which compliance was assessable (n=27,624). 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=32,686). Excludes prescriptions deemed to be 'not assessable'.

For a full breakdown of Hospital NAPS key indicators by funding type, state and territory, peer group and remoteness classification, refer to the Appendix, tables 1A and 1B.

Documentation of review or stop date

Encouragingly, the documentation of antimicrobial review or stop date has continued to improve over the years since this measure was initially introduced (29.7%, 2015) to 56.0% in 2023. Private hospitals performed better than public hospitals (59.9% compared with 55.1%). Hospitals with EMM systems performed better than non-EMM hospitals (59.1% compared with 52.4%); however, these results are still well below the expected best-practice target of above 95%.

Surgical prophylaxis greater than 24 hours

The point prevalence nature of the Hospital NAPS methodology limits the meaningful interpretation of surgical prophylaxis results.[5] This is because post-operative antimicrobial prophylaxis is not required in the majority of procedures and hence these patients do not meet the inclusion criteria for Hospital NAPS.

Nonetheless, of those audited prescriptions that were for surgical prophylaxis, 25.9% extended beyond 24 hours. This remains a major concern, as post-procedural prophylaxis is rarely required and should be less than 24 hours when prescribed.[8]

The Surgical National Antimicrobial Prescribing Survey (Surgical NAPS) has a more accurate methodology for capturing surgical antimicrobial prophylaxis data. Further in-depth analyses of the types and durations of post-operative surgical prophylaxis procedures can be found in the 2023 Surgical NAPS report.[9]

Compliance with guidelines

The rate of noncompliance with prescribing guidelines for the last few years has continued to decline (Figure 2) - slightly better in public hospitals compared with private hospitals (22.9% compared with 28.9%). Overall, nearly a quarter of prescriptions were noncompliant with guidelines despite existence of national guidelines, highlighting the need for further interventions to promote guideline concordance (Appendix, Table 1B).

Figure 2.   Noncompliance with guidelines for all prescriptions in the Hospital National Antimicrobial Prescribing Survey, 2015-2023*
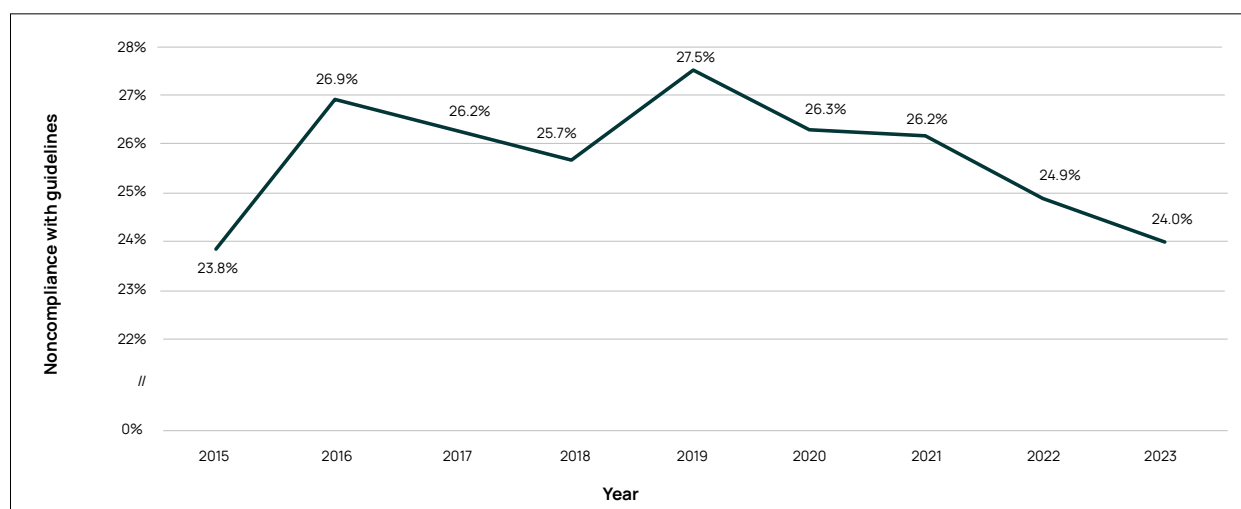
* There may be small differences in results compared with the previously published National Antimicrobial Prescribing Survey reports. This is because participants are free to amend their data at any time and the historical data are reanalysed each year.
Please note axis is broken.

Appropriateness

Definitions of appropriateness are summarised in the *National Antimicrobial Prescribing Survey: technical supplement 2023*.[5] The percentage of prescriptions deemed to be appropriate in 2023 was 74.4%, for all prescriptions. Despite minor fluctuations, this metric has remained largely unchanged over many years (Figure 3). Appropriateness was generally higher amongst public hospitals compared with private hospitals (75.8% compared with 68.6%).

Figure 3.   Appropriateness for all prescriptions in the Hospital National Antimicrobial Prescribing Survey, 2015-2023*
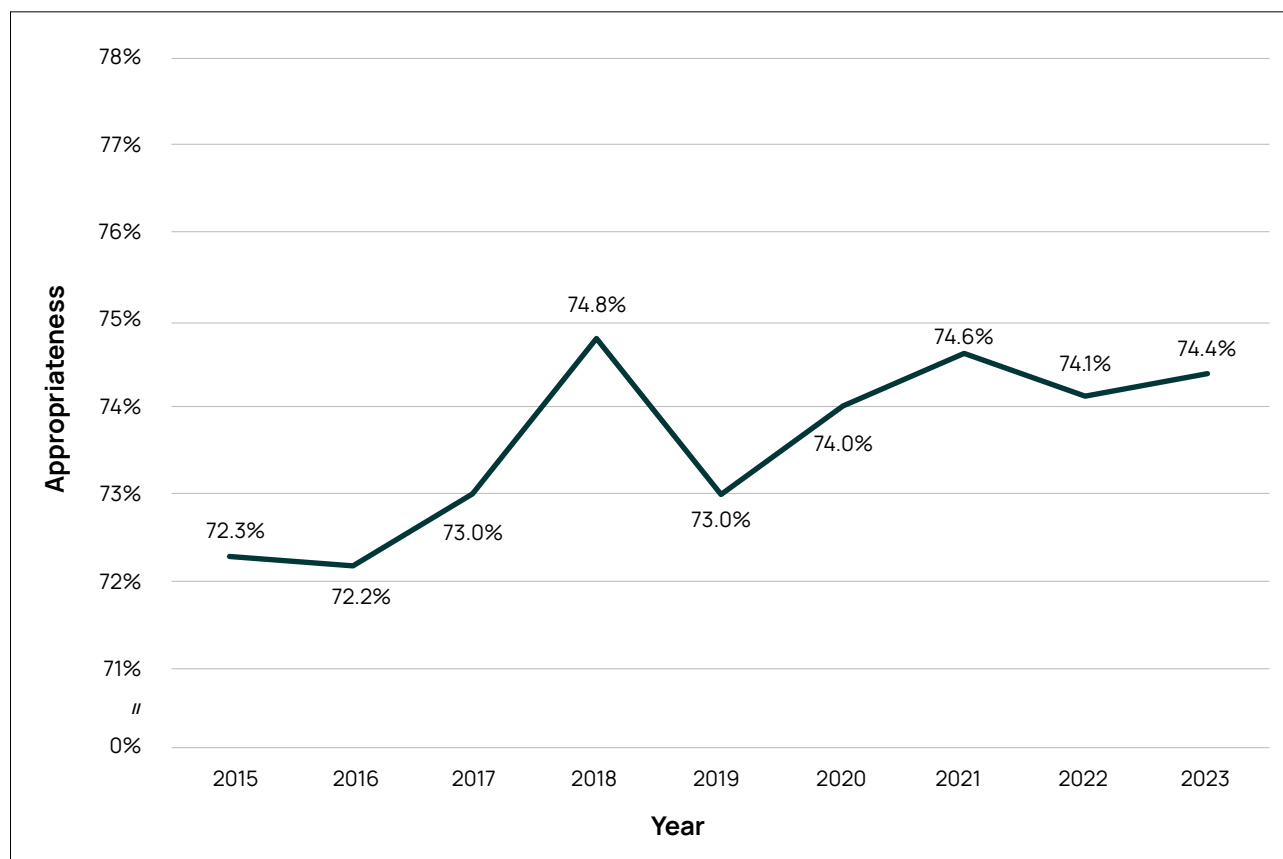
* There may be small differences in results compared with the previously published National Antimicrobial Prescribing Survey reports. This is because participants are free to amend their data at any time and the historical data are reanalysed each year.
Please note axis is broken.

Reasons for inappropriateness

The percentage of prescriptions deemed to be inappropriate in 2023 was 21.0% (the remaining 4.6% of prescriptions were not assessable). Nearly one-quarter of inappropriate prescriptions (21.6%) were for conditions that do not require any antimicrobial therapy. The remaining reasons for inappropriateness (Table 2) were primarily due to the antimicrobial spectrum being too broad, incorrect dose or frequency, and incorrect duration.

Table 2. Reasons for inappropriateness for all prescriptions assessed as being inappropriate* in the Hospital National Antimicrobial Prescribing Survey, 2023

Reason for inappropriateness		Number of prescriptions*
Microbiology mismatch		468 (6.5%)
Allergy mismatch		79 (1.1%)
Indication does *not* require any antimicrobials		1,561 (21.6%)
Indication *does* require antimicrobials	Spectrum too broad	1,895 (26.3%)
	Incorrect dose/frequency	1,604 (22.2%)
	Incorrect duration	1,548 (21.5%)
	Spectrum too narrow	601 (8.3%)
	Incorrect route	419 (5.8%)

*Each prescription is assessed against each quality indicator and thus can be represented in more than one category. There was a total of 7,215 inappropriate prescriptions (comprising of 8,175 reasons for inappropriateness).

2.3 Most commonly prescribed antimicrobials

The 10 most commonly prescribed antimicrobials and their corresponding appropriateness assessment are summarised in Figure 4. Of these antimicrobials, cefazolin, ceftriaxone, amoxicillin—clavulanic acid, cefalexin and piperacillin—tazobactam also had amongst the highest rates of inappropriateness. This distribution of antimicrobials has remained relatively consistent with previous Hospital NAPS results.

Figure 4. The 10 most commonly prescribed antimicrobials and associated appropriateness assessment, Hospital National Antimicrobial Prescribing Survey, 2023
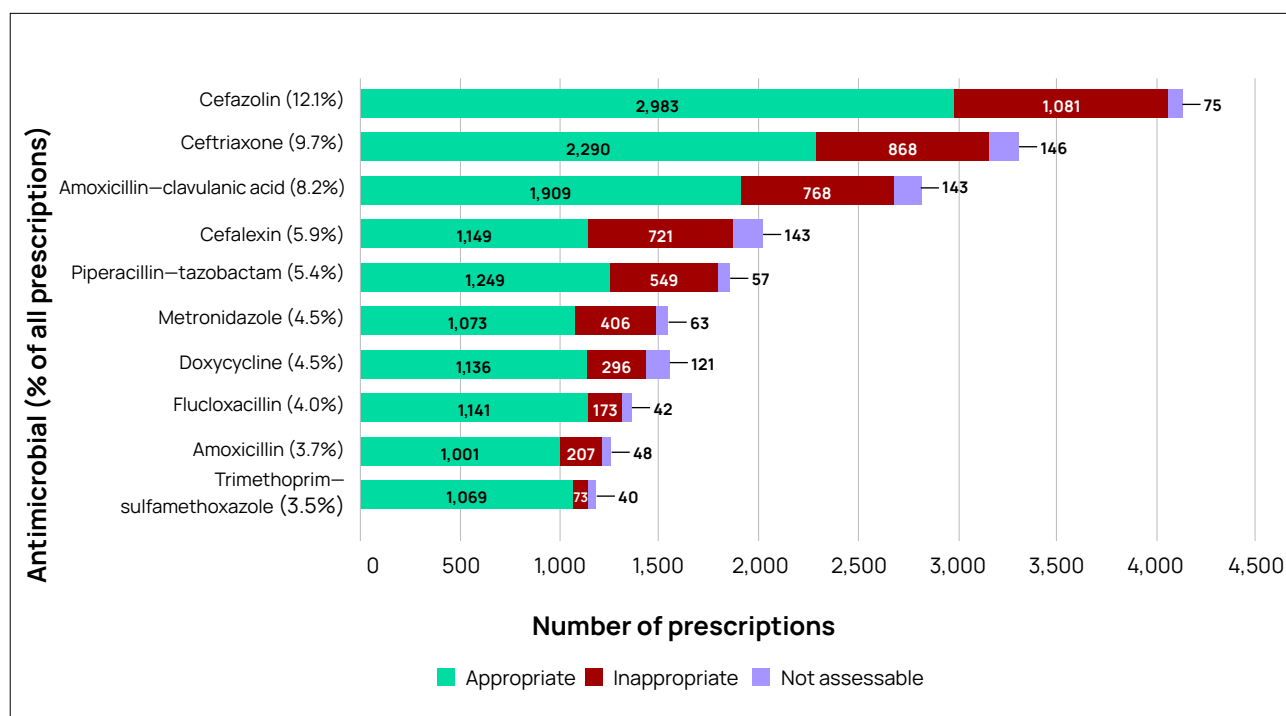
2.4. Most common indications for antimicrobial prescribing and appropriateness

Figure 5 shows the 10 most common indications for antimicrobial prescribing in Australian hospitals. The indication with the most inappropriate prescribing continues to be surgical prophylaxis, despite availability of nationally endorsed guidelines and a substantial revision to the antimicrobial recommendations in the *Therapeutic guidelines: antibiotic*[8] in 2018.

Figure 5. The 10 most common indications for antimicrobial prescribing and their associated appropriateness assessment, Hospital National Antimicrobial Prescribing Survey, 2023
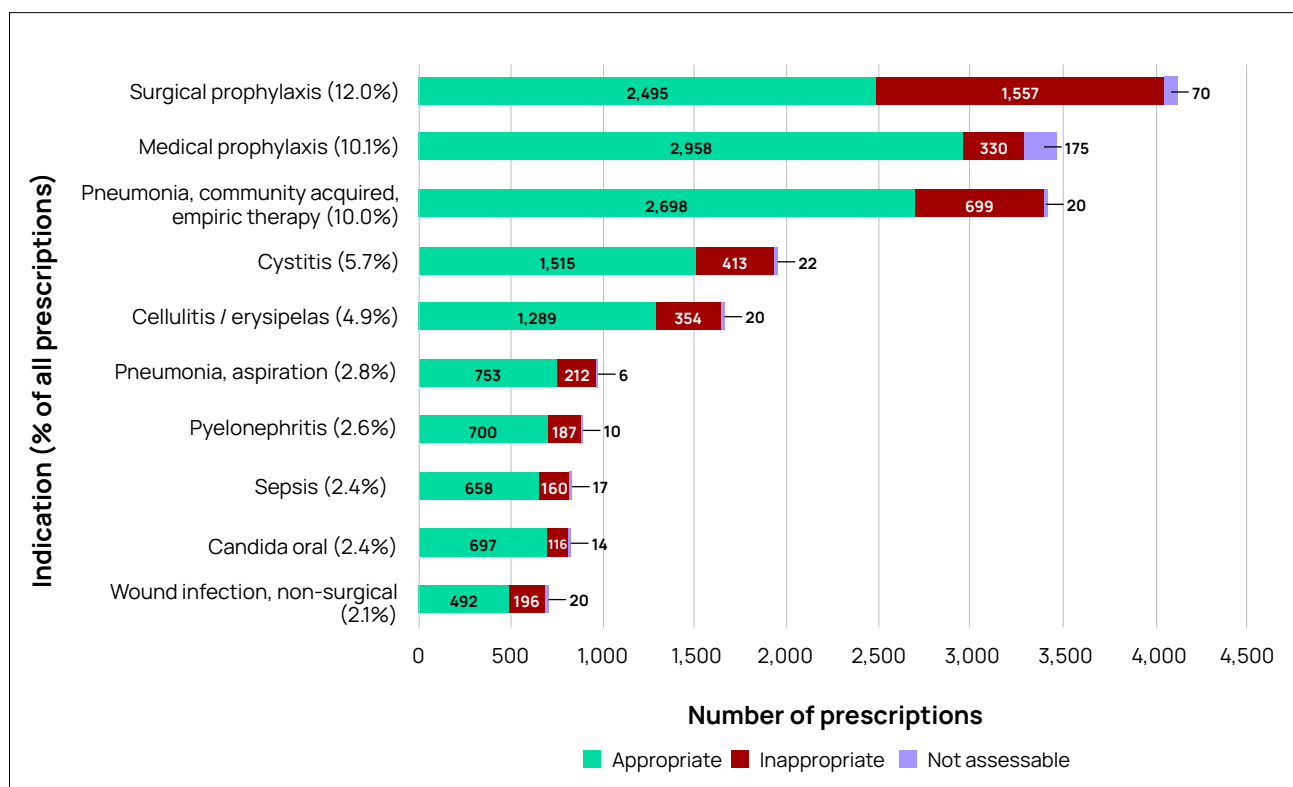
Compliance with guidelines

Indications with the highest rates of guideline noncompliance were surgical prophylaxis, wound (non-surgical) infections and cystitis (Figure 6). Unsurprisingly, these indications are also associated with high rates of inappropriateness (Figure 5). Considerable work from a multi-level approach needs to be done to support and educate prescribers who are prescribing in these clinical areas.

Figure 6. **Compliance with guidelines^ for the 10 indications* most commonly requiring antimicrobials in Hospital National Antimicrobial Prescribing Survey contributors, 2023**
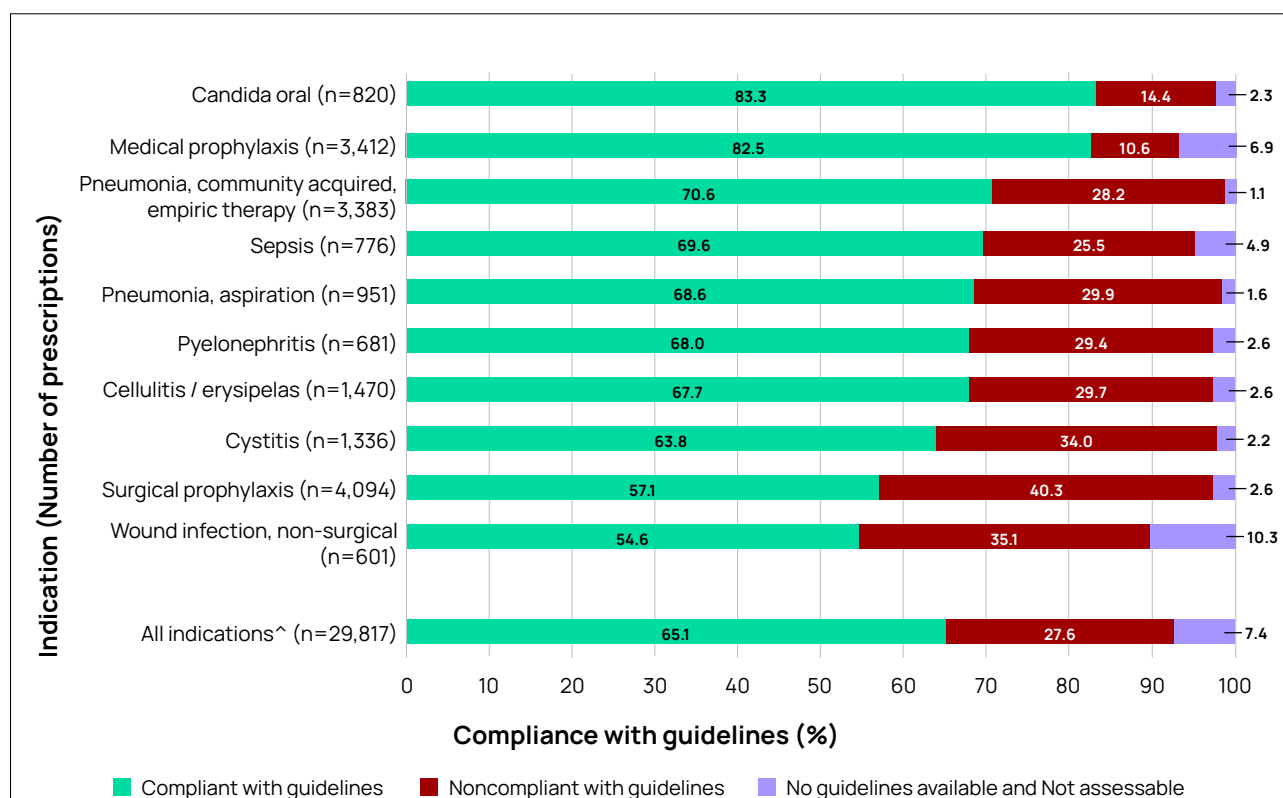
^ Excludes prescriptions marked as 'Directed therapy' (n=4,422).

* Excludes prescriptions where the indication for prescribing was unknown (n=995).

3. Conclusion

Overall, the Hospital NAPS has consistently demonstrated strong uptake from hospitals from around Australia. Encouragingly, there have been notable improvements in documentation of indication and review and stop dates. Additionally, rates of noncompliance with guidelines and inappropriateness have continued to decline over recent years. Despite this, the Hospital NAPS reveals some key areas requiring improvement, such as antimicrobial use in surgical prophylaxis, managing non-surgical wound infections, and cystitis.

Rectifying these issues will require purposeful, large-scale interventions to improve the quality of prescribing. Further in-depth analysis of the Hospital NAPS dataset, and education of target areas for practice improvement, will be incorporated into upcoming clinical circulars[10] for specific clinical conditions.

Appendix

Table 1A. Results of key indicators in Hospital National Antimicrobial Prescribing Survey contributors, by state and territory, Remoteness Area,^ AIHW peer group^^ and funding type, 2023

		Number of participating hospitals (n)	Percentage of participating hospitals (%)	Number of prescriptions (n)	Percentage of prescriptions (%)	Indication documented (%)	Review or stop date documented (%)	Surgical prophylaxis >24 hours (%)*
State or territory	ACT	5	1.2	655	1.9	92.4	51.6	40.9
	NSW	141	33.6	11,573	33.8	89.7	48.0	32.9
	NT	6	1.4	759	2.2	98.2	81.0	47.4
	Qld	56	13.3	4,845	14.2	84.7	36.1	24.5
	SA	53	12.6	3,213	9.4	81.7	49.0	15.4
	Tas	7	1.7	456	1.3	71.7	15.1	22.1
	Vic	114	27.1	9,004	26.3	85.3	44.1	23.3
	WA	38	9.0	3,734	10.9	84.7	36.3	18.0
Remoteness Area	Major Cities	195	46.4	22,767	66.5	86.3	58.3	27.0
	Inner Regional	116	27.6	6,025	17.6	89.1	52.5	20.8
	Outer Regional	86	20.5	4,466	13.0	82.5	49.6	22.7
	Remote	17	4.0	694	2.0	92.2	51.3	n/a
	Very Remote	6	1.4	287	0.8	95.5	58.2	n/a
Public hospital peer group	Principal referral	28	6.7	9,827	28.7	91.2	54.2	41.5
	Public Acute Group A hospitals	56	13.3	6,983	20.4	90.8	57.9	28.8
	Public Acute Group B hospitals	36	8.6	2,194	6.4	87.1	47.1	30.0
	Public Acute Group C hospitals	81	19.3	4,970	14.5	84.4	50.4	14.2
	Public Acute Group D hospitals	54	12.9	1,576	4.6	91.3	52.4	n/a
	Other acute specialised hospitals	1	0.2	135	0.4	88.1	77.0	n/a
	Children's hospitals	3	0.7	434	1.3	93.1	68.4	n/a
	Women's and children's hospitals	1	0.2	113	0.3	98.2	39.8	n/a
	Women's hospitals	4	1.0	248	0.7	95.2	83.5	12.5
	Mixed subacute and non-acute hospitals	8	1.9	270	0.8	92.6	87.0	n/a
	Rehabilitation and GEM hospitals	7	1.7	238	0.7	89.5	62.6	n/a
	Very small hospitals	16	3.8	277	0.8	91.3	52.7	n/a
	Psychiatric hospitals	2	0.5	333	1.0	98.5	88.0	n/a
	Unpeered	1	0.2	48	0.1	81.3	58.3	n/a

Table 1A. Continued

		Number of participating hospitals (n)	Percentage of participating hospitals (%)	Number of prescriptions (n)	Percentage of prescriptions (%)	Indication documented (%)	Review or stop date documented (%)	Surgical prophylaxis >24 hours (%)*
Private hospital peer group	Private Acute Group A hospitals	18	4.3	2,042	6.0	73.0	47.5	26.9
	Private Acute Group B hospitals	29	6.9	1,703	5.0	71.6	63.2	23.2
	Private Acute Group C hospitals	36	8.6	1,355	4.0	70.1	62.2	21.7
	Private Acute Group D hospitals	19	4.5	811	2.4	74.0	70.4	16.8
	Other acute specialised hospitals	2	0.5	233	0.7	82.8	83.3	8.7
	Private rehabilitation hospitals	14	3.3	366	1.1	79.2	60.9	n/a
	Private acute psychiatric hospitals	3	0.7	77	0.2	83.1	68.8	n/a
	Women's hospitals	1	0.2	16	0.05	n/a	n/a	n/a
Funding type	Public	298	71.0	27,646	80.7	89.7	55.1	21.8
	Private	122	29.0	6,593	19.3	73.2	59.9	32.1
Combined national result		**420**	**100.0**	**34,239**	**100.0**	**86.5**	**56.0**	**25.9**

^ Remoteness category as per the Australian Bureau of Statistics.[7]

^^ Australian Institute of Health and Welfare peer groups.[6]

* Where surgical prophylaxis was selected as the indication (n=4,122).

ACT = Australian Capital Territory; AIHW = Australian Institute of Health and Welfare; GEM = geriatric evaluation and management; n/a = not applicable, as there are fewer than 30 prescriptions; NSW = New South Wales;

NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia.

Table 1B. Compliance with guidelines and prescription appropriateness in Hospital National Antimicrobial Prescribing Survey contributors, by state and territory, Remoteness Area,^ AIHW peer group^^ and funding type, 2023

		% Compliance with guidelines						% Appropriateness		
		Therapeutic Guideline§ compliant	Local Guideline compliant	Noncompliant	Directed therapy	Not available	Not assessable	Appropriate	Inappropriate	Not assessable
State or territory	ACT	41.2	10.5	28.5	17.4	1.8	0.5	73.4	25.8	0.8
	NSW	47.3	7.0	26.5	14.6	1.6	3.1	73.1	23.4	3.4
	NT	44.0	20.2	11.3	24.0	0.3	0.3	84.5	15.0	0.5
	Qld	46.7	7.4	25.2	13.6	3.2	3.9	72.5	23.0	4.6
	SA	50.7	9.4	22.2	11.9	2.4	3.4	79.8	16.3	3.9
	Tas	50.2	7.9	22.6	10.3	2.6	6.4	72.8	19.7	7.5
	Vic	51.1	8.7	21.2	9.5	2.9	6.7	73.8	18.9	7.3
	WA	42.6	13.6	25.2	13.2	2.9	2.4	75.8	21.3	2.9
Remoteness Area	Major Cities	45.1	10.6	23.9	14.3	2.8	3.4	74.9	21.2	3.9
	Inner Regional	53.4	5.2	26.1	9.9	1.6	3.8	73.9	21.8	4.3
	Outer Regional	54.3	3.4	22.0	10.1	1.8	8.3	71.9	19.3	8.8
	Remote	45.2	13.3	27.5	11.7	0.7	1.6	74.9	23.1	2.0
	Very Remote	58.2	14.3	15.3	11.5	0.0	0.7	79.4	19.5	1.0
Public hospital peer group	Principal referral	40.3	13.1	22.6	18.1	3.2	2.7	76.1	21.0	2.9
	Public Acute Group A hospitals	47.1	8.1	25.2	13.9	2.9	2.7	74.6	22.2	3.2
	Public Acute Group B hospitals	46.4	6.9	27.3	11.9	2.9	4.6	72.2	22.8	5.0
	Public Acute Group C hospitals	58.1	5.3	20.0	7.9	1.0	7.8	75.7	16.2	8.1
	Public Acute Group D hospitals	56.5	2.5	28.2	10.0	0.9	2.0	71.8	25.3	2.9
	Other acute specialised hospitals	68.9	6.7	12.6	6.7	4.4	0.7	90.4	8.9	0.7
	Children's hospitals	13.6	55.5	9.2	13.4	5.3	3.0	87.3	10.4	2.3
	Women's and children's hospitals	36.3	24.8	14.2	12.4	10.6	1.8	81.4	15.9	2.7
	Women's hospitals	41.9	43.5	7.3	4.4	2.8	0.0	91.1	8.5	0.4
	Mixed subacute and non-acute hospitals	55.9	4.8	15.2	16.3	3.3	4.4	84.8	9.3	5.9
	Rehabilitation and GEM hospitals	52.9	7.1	18.1	15.1	3.8	2.9	80.3	16.4	3.4
	Very small hospitals	57.0	2.9	26.7	9.4	0.4	3.6	75.8	19.9	4.3
	Psychiatric hospitals	58.3	1.5	11.4	26.4	1.2	1.2	90.4	7.8	1.8
	Unpeered	54.2	2.1	29.2	10.4	4.2	0.0	75.0	25.0	0.0

Table 1B. Continued

		% Compliance with guidelines						% Appropriateness		
		Therapeutic Guideline[8] compliant	Local Guideline compliant	Noncompliant	Directed therapy	Not available	Not assessable	Appropriate	Inappropriate	Not assessable
Private hospital peer group	Private Acute Group A hospitals	45.3	4.9	31.5	11.2	1.6	5.4	67.4	26.3	6.3
	Private Acute Group B hospitals	53.1	4.8	26.4	9.6	1.6	4.5	71.4	23.5	5.1
	Private Acute Group C hospitals	48.9	4.1	33.3	5.5	1.4	6.7	61.5	30.3	8.1
	Private Acute Group D hospitals	54.7	2.1	29.8	5.4	1.2	6.7	65.5	26.4	8.1
	Other acute specialised hospitals	80.7	7.2	10.3	0.0	0.0	1.8	88.3	9.9	1.8
	Private rehabilitation hospitals	55.2	0.8	22.7	16.1	0.5	4.6	79.2	13.9	6.8
	Private acute psychiatric hospitals	80.5	0.0	15.6	0.0	1.3	2.6	84.4	11.7	3.9
	Women's hospitals	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Mixed subacute and non-acute hospitals	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Funding type	Public	47.0	9.9	22.9	13.9	2.6	3.7	75.8	20.1	4.1
	Private	51.4	4.1	28.9	8.6	1.4	5.4	68.6	25.0	6.5
Combined national result		**47.9**	**8.8**	**24.0**	**12.9**	**2.4**	**4.0**	**74.4**	**21.1**	**4.5**

^ Remoteness category as per the Australian Bureau of Statistics.[7]

^^ Australian Institute of Health and Welfare peer groups.[6]

ACT = Australian Capital Territory; AIHW = Australian Institute of Health and Welfare; GEM = geriatric evaluation and management; n/a = not applicable, as there were fewer than 30 prescriptions; NSW = New South Wales;

NT = Northern Territory; Qld = Queensland; SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia.

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