2.4 Kidney infections and urinary tract infections

Why is this important?

Kidney infections and urinary tract infections (UTIs) were the second most common cause of potentially preventable hospitalisations in 2017–18 in Australia.[1] Hospitalisation for UTI often results in the inappropriate use of broad-spectrum antimicrobials, contributing to increased antimicrobial resistance in bacteria.[2]

What did we find?

The rate of hospitalisations for kidney infections and UTIs in 2017–18:

- Varied across states and territories, from 212 per 100,000 people in Tasmania to 559 per 100,000 people in the Northern Territory
- Was higher in remote areas, and increased with socioeconomic disadvantage in inner regional and remote areas
- Was twice as high among Aboriginal and Torres Strait Islander people as among other Australians, nationally (although rates in Tasmania were similar in the two groups).

Between 2014–15 and 2017–18, the rate of hospitalisations for kidney infections and UTIs:

- Decreased in the Australian population as a whole by 1%
- Increased by 3.6% among Aboriginal and Torres Strait Islander people.

What can be done?

The ageing population, and misdiagnosis of asymptomatic bacteriuria as UTI in older people, are likely contributors to the high rates of hospitalisation. Early diagnosis and appropriate antibiotic treatment of UTIs in the community could reduce patient morbidity and the need for hospitalisation. Reducing the misdiagnosis of asymptomatic bacteriuria as UTI could reduce unnecessary hospitalisation of elderly patients, particularly from aged care homes. More accurate diagnosis could also reduce delays in treatment for the true cause of symptoms incorrectly ascribed to UTI.

Implementation of evidence-based guidelines for assessment and treatment of residents of aged care homes with suspected UTI will reduce the inappropriate exposure of these residents to antibiotics, the development of multidrug-resistant organisms and the development of UTIs with antibiotic-resistant organisms (which are more likely to require hospitalisation). Ensuring that people who need a catheter on an ongoing basis or intermittent self-catheterisation have access to community continence services, and are provided with education and resources before discharge, could reduce the incidence of UTIs in this group and the need for readmission.

Kidney infections and urinary tract infections

Context

UTIs are common in the community, accounting for 1.2% of all problems managed in Australian general practice consultations.[3] Kidney infections and UTIs were the second most common cause of potentially preventable hospitalisations in Australia in 2017–18.[4]

Few international rates of hospitalisation for kidney infection and urinary tract infection are available for comparison. Available data suggest kidney infections and UTIs also account for substantial numbers of hospitalisations in other countries. In England, kidney infections and UTIs are the second most common cause of emergency hospital admissions for ambulatory care sensitive conditions.[5] In Ireland, kidney infections and urinary tract infections accounted for 2.6% of all publicly-funded hospital bed days in 2016.[6]

People over 65 years of age had approximately six times the rate of hospitalisation for kidney infections and UTIs, compared to younger people, in Australia in 2017–18.[4] Other countries with ageing populations are also experiencing high numbers of hospitalisations for kidney infections and UTIs among older people; for example, in Ireland people aged 65 years and over accounted for 78% of hospital bed days for kidney infections and UTIs in 2016.[6]

Symptoms of uncomplicated cystitis (infection of the bladder or lower urinary tract) include dysuria, and urinary urgency and frequency.[7] Symptoms of a pyelonephritis (kidney/upper urinary tract infection) include fever, flank pain and costovertebral angle tenderness.[7] Asymptomatic bacteriuria is not considered an infection, and should only be treated in particular circumstances (see 'Asymptomatic bacteriuria' on this page).[7]

Hospital care is required to manage severe kidney infection or UTI with sepsis, persistently high fever, pain, marked physical weakness, or inability to take oral medications or fluid.[8] Hospital care is also warranted when urinary tract obstruction is suspected.[8] Among people hospitalised for UTI, diabetes significantly increases the risk of death.[9]

People with diabetes also have poorer outcomes from pyelonephritis, and have a significantly higher rate of treatment failure than people without diabetes.[10]

UTI with multidrug-resistant organisms is a growing problem, and increases the need for hospital treatment. Inappropriate use of antimicrobials for UTIs adds to the spread of antimicrobial resistance (see page 141).

Asymptomatic bacteriuria

The presence of bacteria in an appropriately collected urine specimen from a person without symptoms of UTI is termed asymptomatic bacteriuria.[11] It is common, and most patients with asymptomatic bacteriuria experience no adverse consequences and do not benefit from antimicrobial therapy.[11] Antimicrobials are often prescribed inappropriately for treatment and prophylaxis of asymptomatic bacteriuria in Australian residents of aged care homes (see 'Over-diagnosis of UTI' on page 139).[11]

Treatment for asymptomatic bacteriuria is recommended only in pregnancy and before invasive urological procedures.[11] Pregnant women should be screened and, if necessary, treated for asymptomatic bacteriuria because it may increase the risk of preterm birth, low birthweight and pyelonephritis.[12]

Risk factors for kidney infections and UTIs include:

- Female gender[7]
- Diabetes[13]
- Bladder dysfunction[7]
- Sexual activity[7]
- Use of spermicides
- Urinary catheterisation
- Decline in functional status in elderly institutionalised women.[7]

See page 141 for further discussion of risk factors.

Kidney infections and UTIs among Aboriginal and Torres Strait Islander people

Aboriginal and Torres Strait Islander people, particularly women, have much higher rates of kidney infections and UTIs than other Australians. Screening, treatment and follow-up of these infections among Aboriginal and Torres Strait Islander people is often inadequate.[14] This can have serious consequences, including poorer pregnancy outcomes, acute kidney injury and chronic kidney disease.[15-17]

Severe UTIs are highly prevalent among Aboriginal and Torres Strait Islander people living in remote communities.[18] Recent research in Aboriginal and Torres Strait Islander communities in north Queensland has shown that an extremely high background rate of community-acquired kidney infections and UTIs, and a high prevalence of type 2 diabetes, lead to excess hospitalisation for these infections.[18] UTI was the second most common cause of hospitalisation for infection, and cellulitis was the most common cause, in this study.[18]

UTI can contribute to acute kidney injury, which, if untreated, increases the risk of chronic kidney disease and end-stage renal disease.[15,16] The rate of end-stage renal disease in Aboriginal and Torres Strait Islander people is 7 times as high as that in other Australians.[1] Chronic kidney disease was responsible for 2% of the Aboriginal and Torres Strait Islander burden of disease in 2011.[19]

Factors contributing to poor health, including kidney infections and UTIs, among Aboriginal and Torres Strait Islander people are complex. They include a combination of broad historical, social, cultural and economic factors, as well as biomedical risk factors.[20] For example, traditional active lifestyles and healthy diets of Aboriginal and Torres Strait Islander people have been affected by displacement and colonisation by European settlers.[20]

Kidney infections and UTIs among older people

The rate of hospitalisations for kidney infections and UTIs is about 5 times higher for people over 65 years of age than for younger adults in Australia.[4] Frail, elderly people with functional decline leading to diminished ability to manage their hygiene needs are particularly susceptible to UTIs and the effects of these infections, and minor exacerbations can necessitate hospital admission. However, misdiagnosis of UTI is common in elderly people (see ‘Over-diagnosis of UTI’ on page 139).

About the data

All hospitalisations with a principal diagnoses of urinary tract infection are included.

Data are sourced from the National Hospital Morbidity Database and include admitted patients in both public and private hospitals, as well as Hospital in the Home care.

Rates are based on the number of hospitalisations for kidney infections and/or UTIs per 100,000 people of all ages in 2017–18.

Because a record is included for each hospitalisation for the conditions, rather than for each patient, patients hospitalised for the conditions more than once in the financial year will be counted more than once.

The analysis and maps are based on the usual residential address of the patient and not the location of the hospital.

Rates are age and sex standardised to allow comparisons between populations with different age and sex structures.

Data quality issues – for example, the extent of identification of Aboriginal and Torres Strait Islander status in datasets – could influence the variation seen.

Kidney infections and urinary tract infections

What do the data show?

Magnitude of variation

In 2017–18, there were 76,854 hospitalisations for kidney infections and UTIs, representing 281 hospitalisations per 100,000 people of all ages (the Australian rate).

The number of hospitalisations for kidney infections and UTIs across 326* local areas (Statistical Area Level 3 – SA3) ranged from 141 to 893 per 100,000 people. The rate was **6.3 times as high** in the area with the highest rate compared with the area with the lowest rate. The number of hospitalisations varied across states and territories, from 212 per 100,000 people in Tasmania to 559 in the Northern Territory (Figures 2.27–2.30).

After the highest and lowest 10% of results were excluded and 261 SA3s remained, the number of hospitalisations per 100,000 people was 2.3 times as high in the area with the highest rate compared with the area with the lowest rate.

Analysis by remoteness and socioeconomic status

Rates of hospitalisations for kidney infections and UTIs were substantially higher in remote areas than in other areas. Hospitalisation rates also increased with socioeconomic disadvantage in inner regional and remote areas (Figure 2.31).

Analysis by Aboriginal and Torres Strait Islander status

The rate for Aboriginal and Torres Strait Islander people (581 per 100,000 people) was 2.1 times as high as the rate for other Australians (274 per 100,000 people) (Figure 2.25). However, rates in Tasmania were similar in the two groups.

Figure 2.25: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by state and territory of patient residence, by Aboriginal and Torres Strait Islander status, 2017–18†

The data for Figure 2.25, and the data and graphs for Analysis by PHN are available at safetyandquality.gov.au/atlas

* There are 340 SA3s. For this item, data were suppressed for 14 SA3s due to a small number of hospitalisations and/or population in an area.

Notes:

Some SA3 rates are more volatile than others. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.

† Data for ACT (Aboriginal and Torres Strait Islander people) have been suppressed. Data by Aboriginal and Torres Strait Islander status should be interpreted with caution as hospitalisations for Aboriginal and Torres Strait Islander patients are under-enumerated, with variation among states and territories.

Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.

For further detail about the methods used, please refer to the Technical Supplement.

Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Trends over time

Between 2014–15 and 2017–18, the rate of hospitalisations for kidney infections and UTIs per 100,000 people decreased by 1% in the population as a whole (Figure 2.32).

Since June 2017, emergency department–only episodes in New South Wales have not been counted as hospitalisations, and this will affect the time trends described above.

For Aboriginal and Torres Strait Islander people, the rate of hospitalisations for kidney infections and UTIs per 100,000 people nationally increased by 3.6% between 2014–15 and 2017–18 (Figure 2.33).

Interpretation

Potential reasons for the variation include geographical differences in

- Demographic and consumer factors
  - clustering of populations with a high risk of UTIs, such as residents of aged care homes[21], people with type 2 diabetes and people with socioeconomic disadvantage
  - populations with poor diabetes control
  - access to medicines, including affordability
  - incidence of infection with multidrug-resistant extended-spectrum β-lactamase-producing bacteria
  - rates of urological procedures, such as stent insertion
- Clinician factors
  - diagnostic error, leading to over- or under-diagnosis
  - adherence to evidence-based guidelines, including choice of antimicrobial and length of treatment
- Health system factors
  - use of emergency department short-stay units, where a patient stay is counted as a hospitalisation rather than an emergency department–only visit
  - implementation of hospital avoidance schemes
  - access to primary care, including availability, acceptability and affordability
  - access to community services
  - access to information about self-management at an appropriate health literacy level and in languages other than English
  - access to, and availability of, culturally appropriate health care for Aboriginal and Torres Strait Islander people
  - antimicrobial stewardship interventions.

Kidney infections and urinary tract infections

Variations between areas may not directly reflect the practices of the clinicians who are based in these areas. Area boundaries reflect where people live rather than where they obtain their health care. Patients who live in metropolitan, regional and rural areas may all travel outside their local areas to receive care.

Access to primary care is likely to affect hospitalisation rates for kidney infections and UTIs. Barriers to access include distance, lack of transport, cost, and a lack of health services that provide culturally appropriate care for Aboriginal and Torres Strait Islander people, and people from other culturally and linguistically diverse backgrounds.

Low health literacy is also a barrier to seeking care and managing treatment effectively. Inability of people with cognitive impairment, such as some residents of aged care homes, to communicate symptoms may contribute to delays in obtaining care.

Addressing variation

UTI treatment with broad-spectrum antimicrobial agents contributes to bacterial resistance, making the management of subsequent UTIs more difficult.[2] Antimicrobials remain the recommended treatment for UTIs, but including other prevention measures could reduce the incidence of UTIs, the use of antimicrobials and the development of resistance.[2] Prevention should follow this order:

- Counselling about reducing modifiable risk factors (see below)
- Non-antimicrobial measures
- Antimicrobial prophylaxis.[2]

Identification and management of risk factors such as vaginal infections, use of spermicides and atrophic vaginitis due to oestrogen deficiency could reduce the rate of UTIs and the need for antimicrobials.[2] Increasing access to health care for people with anatomical abnormalities of the urinary tract could also reduce the rate of UTIs among this group of patients.

Over-diagnosis of UTI

Although elderly people are at higher risk of UTIs, over-diagnosis of UTIs is also common in this group.[22] Our ageing population, and misdiagnosis of asymptomatic bacteriuria as UTI in older people, are likely contributors to the high rates of hospitalisation reported in this chapter. An incorrect diagnosis of UTI in an elderly person has several negative consequences, including not identifying or treating the actual cause of their symptoms and increasing the risk of subsequent infection with antimicrobial-resistant organisms after treatment with an unnecessary antimicrobial. Difficulties in accurate diagnosis of UTIs in older people include:

- High rates of asymptomatic bacteriuria, which can lead to a positive urine dipstick result and misinterpretation as a UTI
- Lack of a fast, accurate test that distinguishes asymptomatic bacteriuria from active infection
- Comorbidities, such as cognitive impairment, that impede assessment.[23]

Review of patient notes in a United Kingdom (UK) hospital study found that 43% of patients over 75 years of age who were given a diagnosis of UTI did not meet diagnostic criteria.[22] Of the patients incorrectly diagnosed with UTI, 37% had asymptomatic bacteruria.[22] Guidelines recommend against treating asymptomatic bacteruria, except in pregnancy and before some urological procedures.[12] Asymptomatic bacteriuria affects approximately 19% of women and 9% of men over 80 years of age[24], and can lead to a positive urine dipstick result in the absence of a UTI. A positive urinalysis result is not a reliable method for identifying UTI in elderly emergency department patients.[25]

Time pressure in hospital emergency departments may contribute to over-diagnosis of UTIs in elderly people. UK emergency department staff interviewed for a qualitative study said that quickly diagnosing UTI by urine testing was a method of securing hospital admission.[26] One staff member commented that she needed 'to find a cause to admit somebody to hospital when we think they are not right to go home, we've only got so much time to make the decision … so that's what I'm going to come up with'.[26]

Reducing over-diagnosis in elderly people

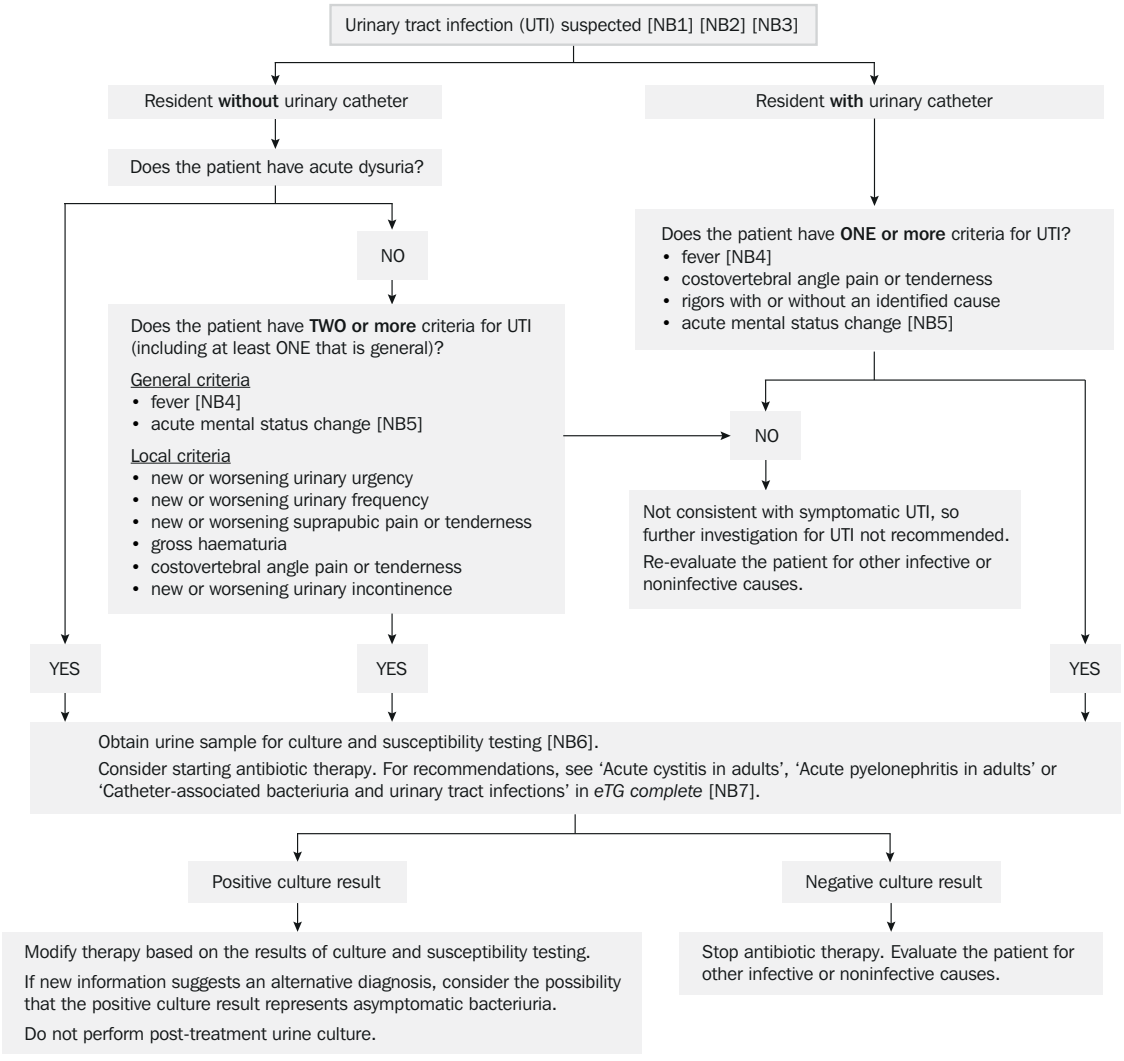
Strategies to reduce over-diagnosis of UTIs in elderly people include selective use of urine testing in emergency departments, and only after considering the probability of UTI based on history and examination.[23] Ensuring midstream clean-catch urine collection, or using an in/out catheter if necessary, will increase the accuracy of urine tests, as will removal of a long-term indwelling catheter and insertion of a fresh catheter before collecting urine samples.[23] Following Australian guidelines on assessment and treatment of residents of aged care homes with suspected UTI could also increase diagnostic accuracy in this group (see Figure 2.26 on page 140).[11,23]

Kidney infections and urinary tract infections

Figure 2.26: Flowchart on assessment and treatment of aged-care facility residents with suspected urinary tract infection[12]

Therapeutic Guidelines

Assessment and treatment of aged-care facility residents with suspected urinary tract infection



NB1: Do not investigate or treat cloudy or malodorous urine in aged-care facility residents who do not have other signs or symptoms of UTI.
NB2: Consider whether an alternative diagnosis is likely. Consider both infective (e.g. pneumonia) and non-infective (e.g. medication-related adverse events) causes.
NB3: Establish whether an advance care plan is in place as it may influence assessment and management (e.g. whether investigations are performed or antibiotics are given).
NB4: Fever is defined as a temperature higher than 38°C or an increase of more than 1.5°C above baseline temperature.
NB5: Acute mental status changes include new change in level of consciousness, periods of altered perception, disorganised speech and lethargy.
NB6: If the resident has an indwelling urinary catheter, see *eTG complete* for a guide to collecting urine samples in patients with indwelling urinary catheters.
NB7: The duration of therapy does not need to be modified for this patient group and should always be stated on the prescription.

Reproduced with permission from Urinary tract infection in aged-care facility residents [published 2019 Apr]. In: eTG complete [digital]. Melbourne: Therapeutic Guidelines Limited; 2020. tgldcdp.tg.org.au/searchAction?appendedInputButtons=Urinary%20tract%20infection%20in%20aged-care%20facility%20residents

Healthcare-associated UTIs

UTIs are a common healthcare-associated infection. Many are associated with indwelling urinary catheters.[27] Note that a UTI acquired during a hospital admission for another reason would not be counted in the data presented in this chapter, but a readmission to manage the UTI would be counted. In Australia in 2017–18, there were 5,362 unplanned readmissions for UTI within 28 days of discharge from a public hospital (excluding Western Australia).[28] This figure includes unplanned readmissions after initial admission for any reason, and includes readmissions to the same hospital only.

Approximately 1.7% of patients who were hospitalised for more than two days acquired a UTI, according to a study of eight Australian hospitals.[27] The estimated extra length of stay due to these healthcare-associated UTIs was four days.[27]

Contributing factors that must be considered include whether indwelling urethral catheterisation is necessary, duration of the indwelling catheter, and how the catheter is inserted.[7] Intermittent clean catheterisation should be considered in many people in both inpatient and outpatient settings to prevent catheter-associated UTIs. Reducing the proportion of patients with an indwelling catheter will reduce the incidence of UTIs and the likelihood of re-presentation to hospital with that UTI because of diagnostic failure or inadequate treatment before discharge.

Impact of antimicrobial-resistant bacteria

Increasing incidence of multidrug-resistant extended-spectrum β-lactamase-producing bacteria in Australia will contribute to increasing rates of hospitalisation for UTIs that do not respond to initial treatment, and longer hospital stays due to more complex treatment. Australian guidelines have been updated in light of growing antibiotic resistance.[12]

If possible, the susceptibility of organisms recently identified in patient samples should guide antimicrobial choice.[12] Trimethoprim continues to be recommended as empirical oral antimicrobial therapy for acute cystitis, but not for non-severe pyelonephritis because it is a more serious infection with a higher risk of adverse outcomes with treatment failure.[12] Amoxicillin–clavulanic acid has an unnecessarily broad spectrum of activity for empirical therapy of cystitis (that is, treatment before the responsible organism is known), and increases the risk of selecting for antimicrobial-resistant organisms.[12,29]

People with renal failure may be less likely to receive targeted antimicrobial agents because of concerns about renal function, and may receive antimicrobials that have less reliable effectiveness (for example, cefalexin, ceftriaxone). For patients in remote areas with renal failure, delays in receiving microbiology study results may add to the barriers to receiving effective treatment.

Risk factors for UTIs with multidrug-resistant bacteria include recent overseas travel, previous exposure to antimicrobials and living in an aged care home.[30] Urine culture before starting treatment is advisable for patients with any of these risk factors to guide antimicrobial choice.[30]

Kidney infections and urinary tract infections

Reducing UTIs among Aboriginal and Torres Strait Islander people

Developing culturally appropriate and accessible information in partnership with Aboriginal and Torres Strait Islander communities could reduce the impact of UTIs in these groups.[31] This should include information emphasising the importance of prompt medical attention for symptoms of UTI to minimise the risk of acute kidney injury and subsequent chronic kidney disease.[31]

Improving access to culturally safe care may increase the early detection and treatment of UTIs in Aboriginal and Torres Strait Islander people. Strengthening the capacity of the Aboriginal Community Controlled Health Service sector and improving the cultural safety of mainstream services are both important elements. Improving access for Aboriginal and Torres Strait Islander mothers to culturally safe models of maternity care may improve detection and treatment of UTIs in pregnancy in this group.[32] See page 60 for examples of successful strategies for improving antenatal care for Aboriginal and Torres Strait Islander mothers.

Reducing risk factors for diabetes could reduce the rate of UTIs among Aboriginal and Torres Strait Islander people, as diabetes increases the risk of UTI. Diabetes prevalence is strongly related to social disadvantage among Aboriginal and Torres Strait Islander people, and the underlying social determinants of health need to be considered to address the increasing rate of diabetes.[33] The logistical and financial barriers to accessing health care for Aboriginal and Torres Strait Islander people living in remote areas also need to be addressed.

Preventing recurrent UTIs

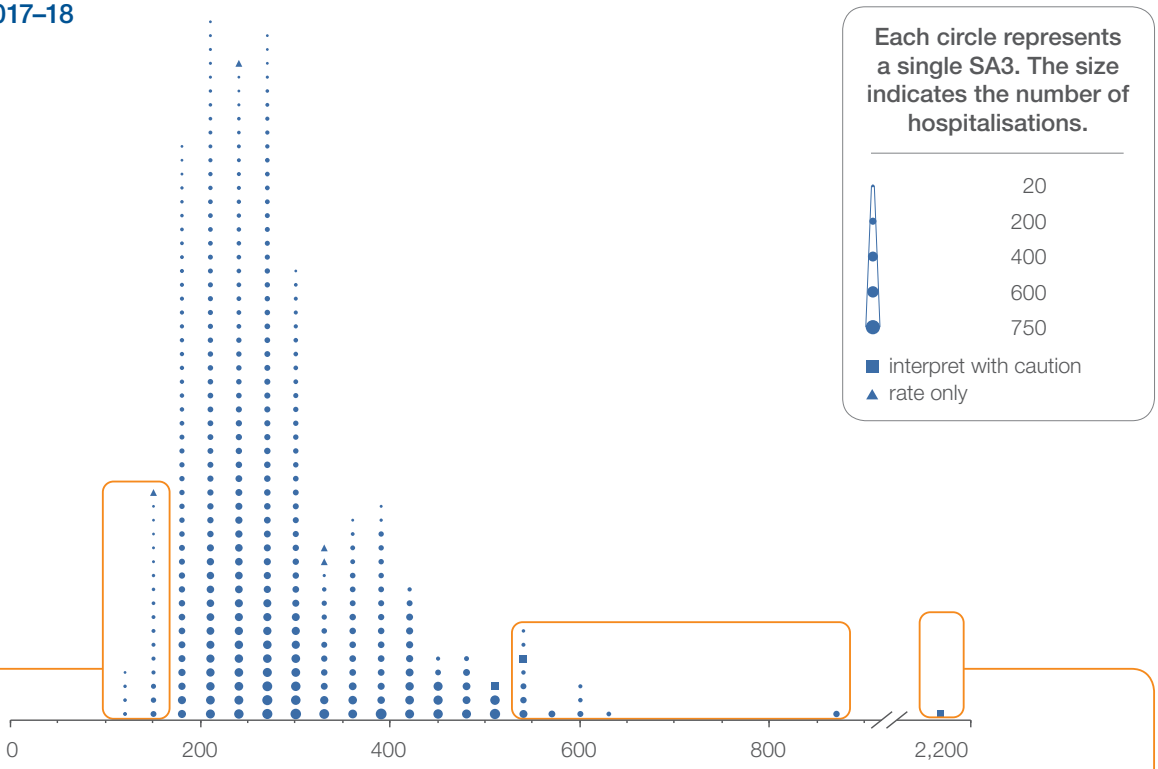
Recurrent UTIs account for a substantial number of infections, and prophylaxis may be appropriate for certain groups of patients after evaluation for contributing factors.[12] Patient-initiated treatment with antimicrobials at the onset of symptoms may also be appropriate for women who have frequent symptomatic UTIs, and this approach reduces overall antimicrobial use compared with prophylaxis.[12]

On discharging older patients from hospital with a diagnosis of UTI, communication to general practitioners emphasising recommendations to reduce the risk of recurrent UTIs may reduce the need for future hospitalisations.[23] In postmenopausal women, vaginal oestrogen may reduce recurrences of UTIs. Increasing water intake may reduce recurrences in premenopausal women.[12]

The evidence for cranberry products to prevent UTIs is conflicting. A meta-analysis published in 2017 concluded that cranberry products significantly reduce the risk of UTIs.[34] Another meta-analysis published in 2012 reported a non-significant trend to fewer UTIs; this review also commented that the high withdrawal rate in trials suggests that use of cranberry products may not be an acceptable intervention for some patients.[35] There is not enough high-quality evidence to determine whether probiotics are effective for preventing UTIs.[36]

Rates by local area

Figure 2.27: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



Lowest rate areas

SA3	State	Rate	Hospitalisations
Norwood - Payneham - St Peters	SA	141	77
Pennant Hills - Epping	NSW	142	86
Burnside	SA	148	100
Adelaide City	SA	148	38
Huon - Bruny Island	Tas	152	38
Manningham - West	Vic	158	224
Esperance	WA	158	n.p.
Port Stephens	NSW	161	165
Glenelg - Southern Grampians	Vic	164	74
Macedon Ranges	Vic	165	55
Hobart Inner	Tas	166	104
Augusta - Margaret River - Busselton	WA	168	102
Great Lakes	NSW	169	88
Kiama - Shellharbour	NSW	170	185
Queanbeyan	NSW	171	99
Hawkesbury	NSW	171	40
Heathcote - Castlemaine - Kyneton	Vic	175	109
Armidale	NSW	175	79
Taree - Gloucester	NSW	176	110
Sorell - Dodges Ferry	Tas	178	35
Dural - Wisemans Ferry	NSW	179	56

Highest rate areas

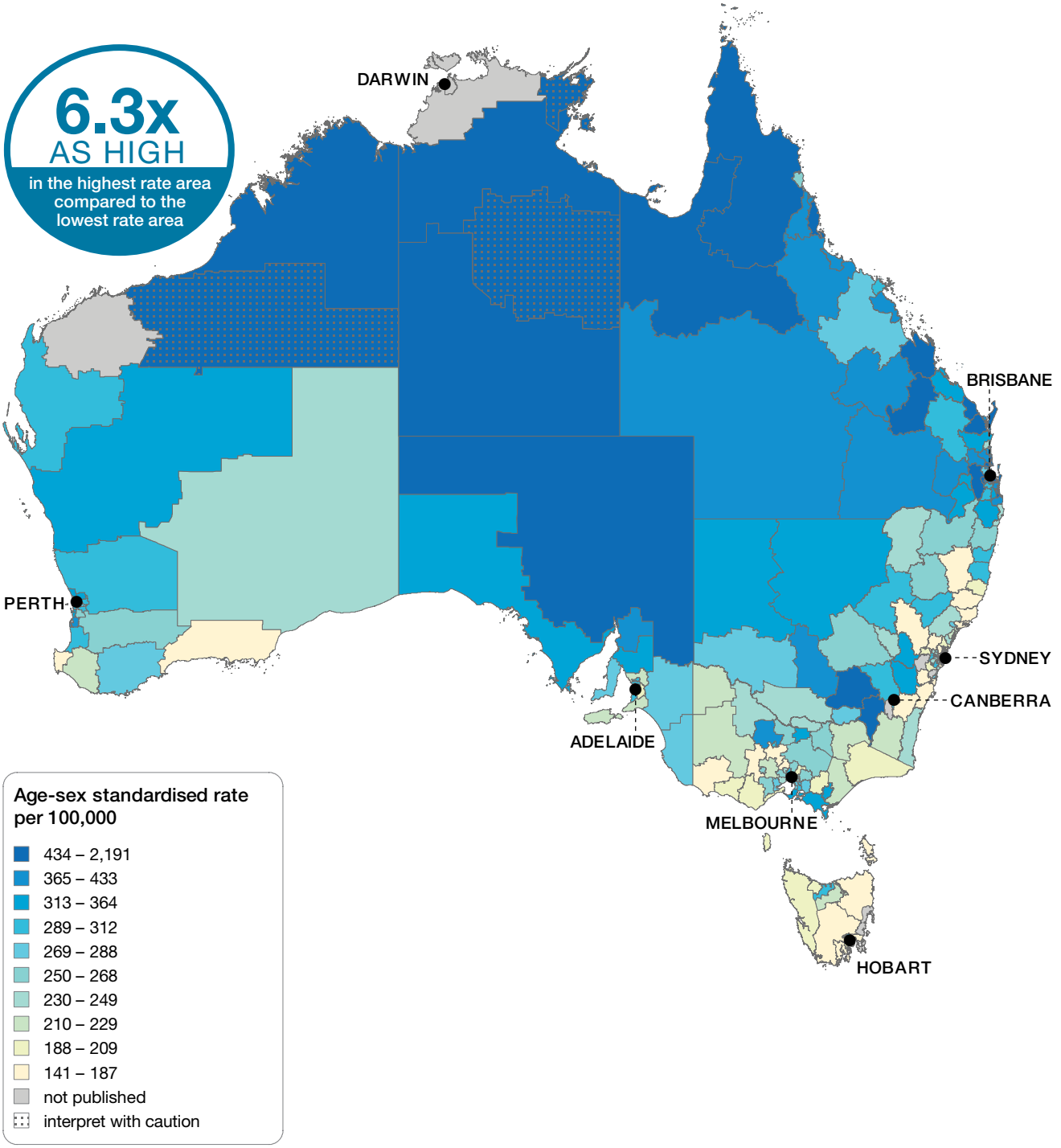
SA3	State	Rate	Hospitalisations
Barkly	NT	2,191*	65
Kimberley	WA	893	263
Palmerston	NT	655	145
Alice Springs	NT	620	232
Outback - North	Qld	606	131
Katherine	NT	604	109
Maryborough	Qld	583	301
Caboolture	Qld	565	411
Innisfail - Cassowary Coast	Qld	562	226
Darwin Suburbs	NT	561	265
East Pilbara	WA	559*	105
Biloela	Qld	552	79
Darwin City	NT	540	127
Tumut - Tumbarumba	NSW	540	104

Notes:
Squares (■) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of hospitalisations are not published (n.p.) for confidentiality reasons.
Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Kidney infections and urinary tract infections

Rates across Australia

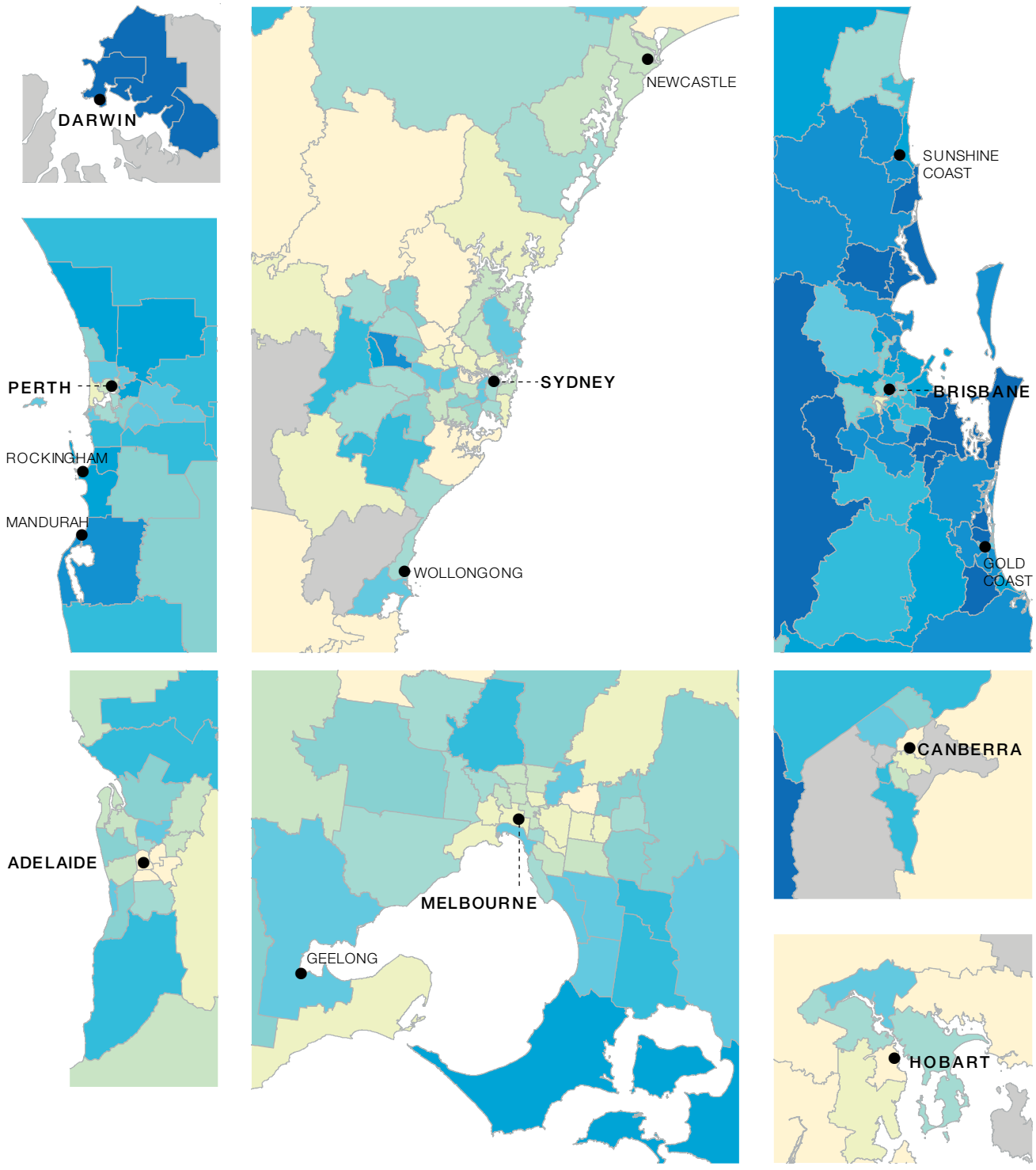
Figure 2.28: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Rates across capital city areas

Figure 2.29: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



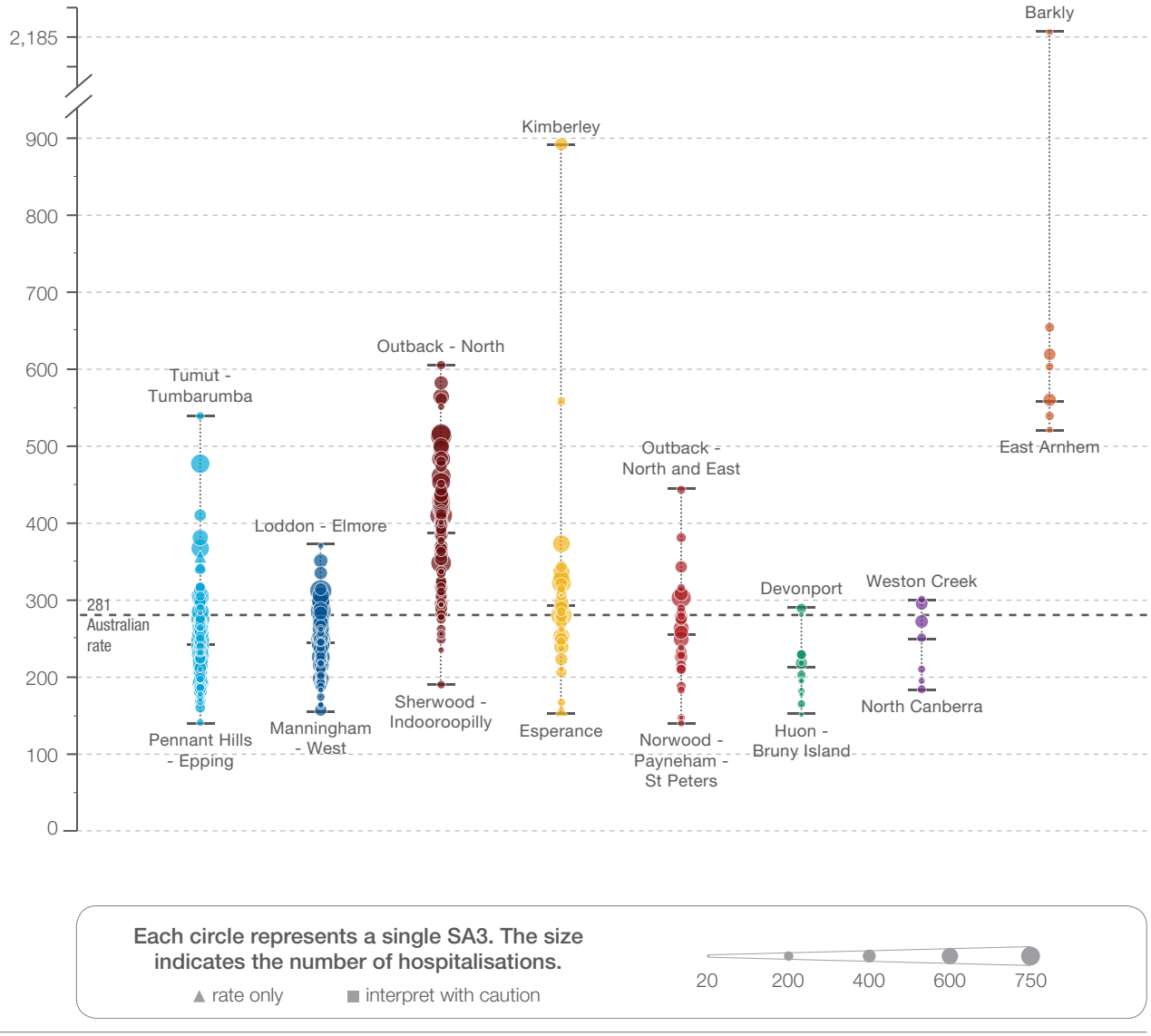
Notes:
Dotted areas indicate rates that are considered more volatile than other published rates and should be interpreted with caution.
Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Kidney infections and urinary tract infections

Rates by state and territory

Figure 2.30: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18

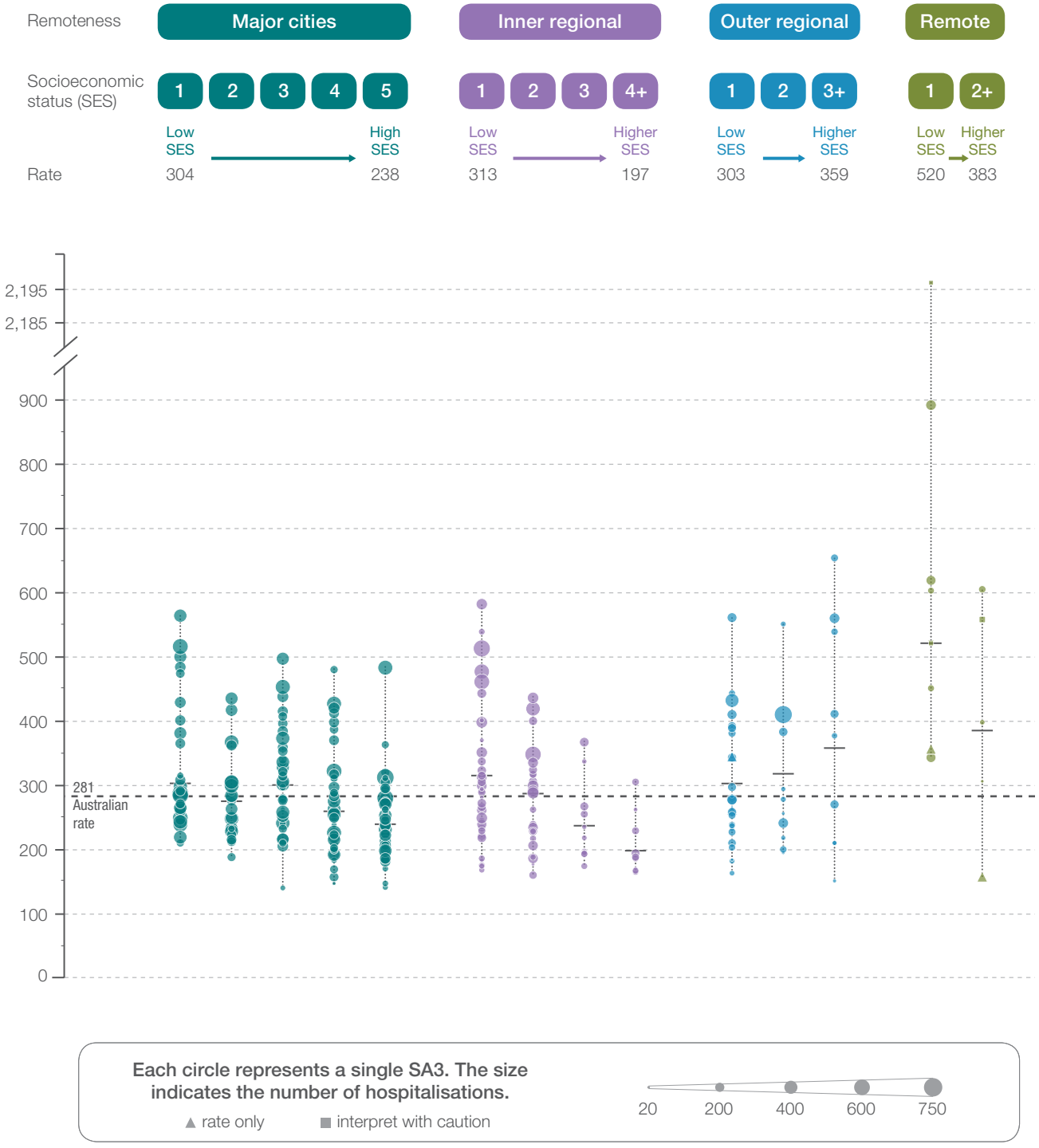
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Highest rate	540	371	606	893	444	290	302	2,191*
State/territory	241	244	386	291	256	212	248	559
Lowest rate	142	158	191	158	141	152	185	522*
No. hospitalisations	21,738	17,215	20,603	7,867	5,417	1,300	1,034	1,108



Notes:
Squares (■) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of hospitalisations are not published for confidentiality reasons.
Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Rates by remoteness and socioeconomic status

Figure 2.31: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



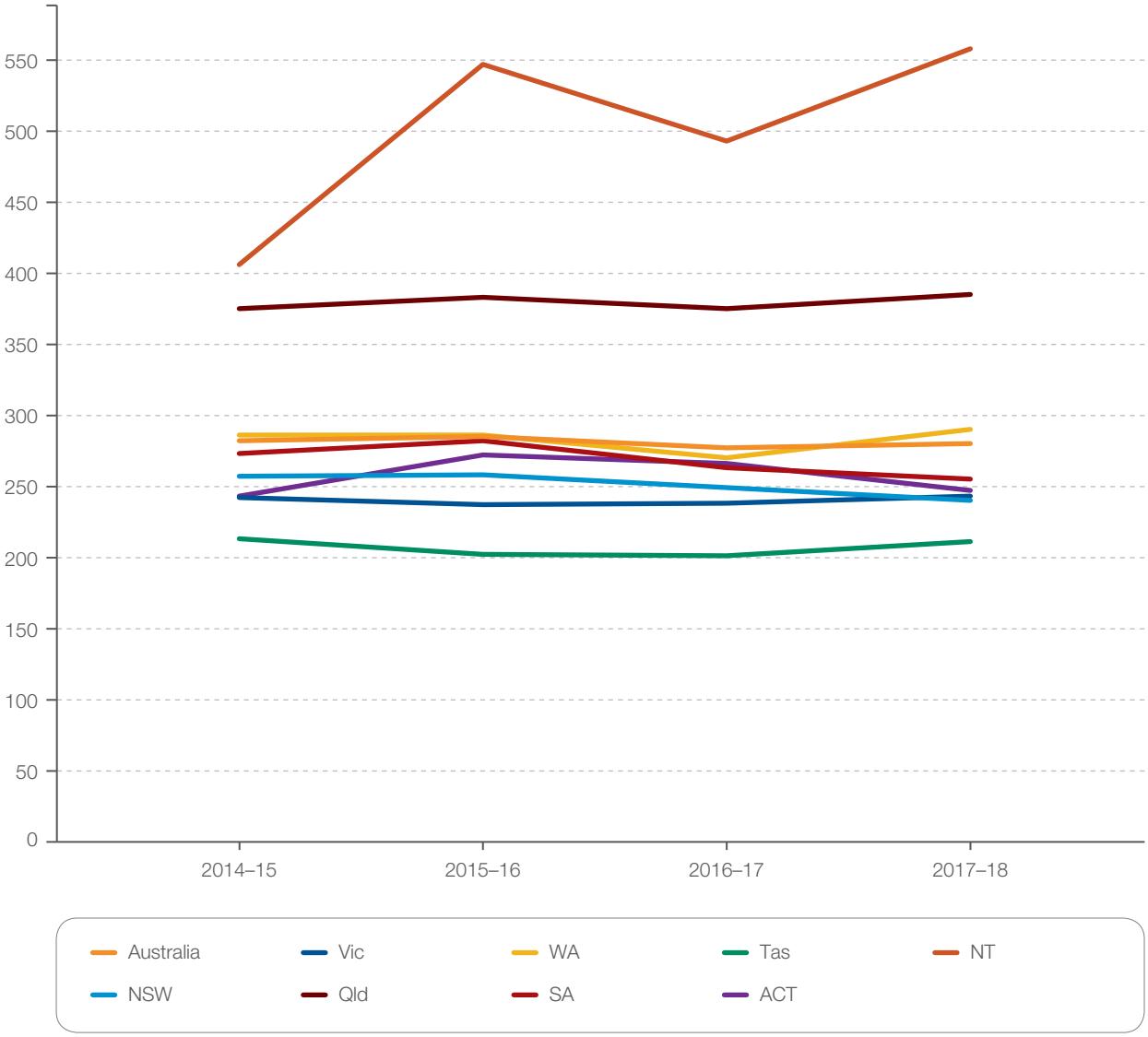
Notes:
Squares (■) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution.
Triangles (▲) indicate SA3s where only rates are published. The numbers of hospitalisations are not published for confidentiality reasons.
Population estimates as at 31 December 2017 are calculated as the average of the 30 June populations in 2017 and 2018.
For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2017 and 2018.

Kidney infections and urinary tract infections

Rates across years

Figure 2.32: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by state and territory of patient residence, 2014–15 to 2017–18

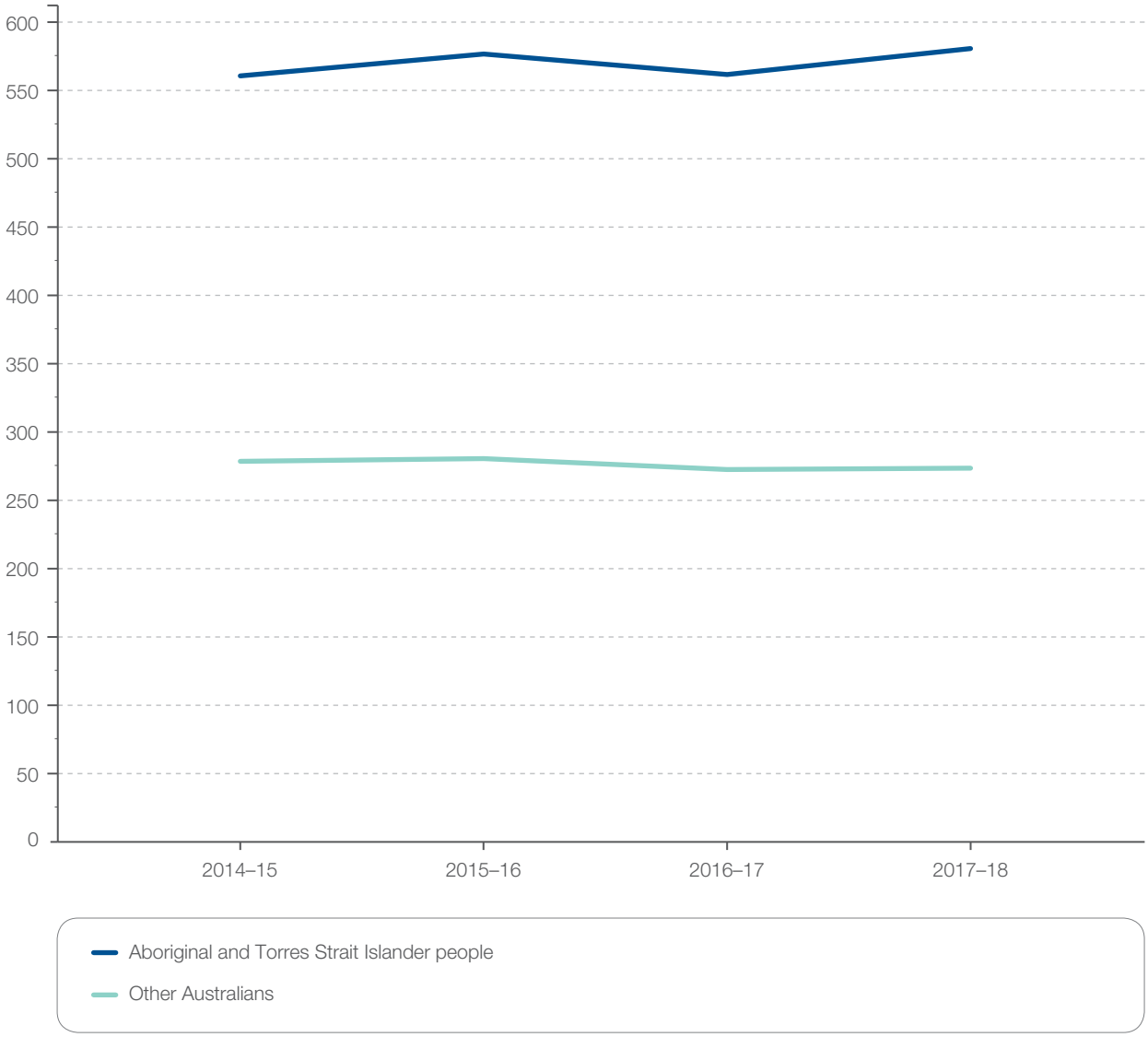
	2014–15	2015–16	2016–17	2017–18
Highest SA3 rate	1,097*	1,445*	1,041*	2,191*
Australian rate	**283**	**286**	**278**	**281**
Lowest SA3 rate	135	113	104	141
Magnitude of variation	6.9	8.2	6.4	6.3
Magnitude of variation without top & bottom 10% SA3	2.2	2.2	2.2	2.3



Notes:
The asterisks (*) indicate rates that are considered more volatile than others, and should be interpreted with caution. These rates are excluded from the calculation of the difference between the highest and lowest SA3 rates in Australia.
Population estimates as at 31 December of the relevant year are calculated as the average of the 30 June populations before and after the relevant December. For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2014 to 2018.

Rates for Aboriginal and Torres Strait Islander people across years

Figure 2.33: Number of potentially preventable hospitalisations – kidney and urinary tract infections per 100,000 people of all ages, age and sex standardised, by Aboriginal and Torres Strait Islander status, 2014–15 to 2017–18



Notes:
Data by Aboriginal and Torres Strait Islander status should be interpreted with caution as hospitalisations for Aboriginal and Torres Strait Islander patients are under-enumerated, with variation among states and territories.
Population estimates as at 31 December of the relevant year are calculated as the average of the 30 June populations before and after the relevant December. For further detail about the methods used, please refer to the Technical Supplement.
Sources: AIHW analysis of National Hospital Morbidity Database and ABS Estimated Resident Populations 30 June of 2014 to 2018.

Kidney infections and urinary tract infections

Resources

- Antibiotic guidelines: urinary tract infections (in eTG complete)[12]
- Antibiotic guidelines: urinary tract infection in aged-care facility residents (in eTG complete)[12]
- *RACGP Aged Care Clinical Guide (Silver Book)*. Melbourne: Royal Australian College of General Practitioners
- *Asymptomatic Bacteriuria: Reducing inappropriate antimicrobial prescribing for aged care facility residents* (fact sheet)[11]
- Urinary tract infections, interactive flowchart, National Institute for Health and Care Excellence (UK), pathways.nice.org.uk/pathways/urinary-tract-infections#path=view%3A/pathways/urinary-tract-infections/urinary-tract-infections-in-people-aged-16-years-and-over.xml&content=view-index
- Non-antibiotic prevention and management of recurrent urinary tract infection[37]
- *Urinary Catheter Passport: A guide to looking after a urinary catheter for service users and healthcare workers*. Infection Prevention Control & National Health Service, UK
- Diagnosis of urinary tract infection in older persons in the emergency department: To pee or not to pee, that is the question[23]

References

1. Australian Institute of Health and Welfare. Chronic kidney disease. (Cat. No. CDK 16.) Canberra: AIHW; 2020.
2. Wawrysiuk S, Naber K, Rechberger T, Miotla P. Prevention and treatment of uncomplicated lower urinary tract infections in the era of increasing antimicrobial resistance – non-antibiotic approaches: a systemic review. Arch Gynecol Obstet 2019;300(4):821–8.
3. Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L et al. General practice activity in Australia 2015–16. General Practice Series No. 40. Sydney: Sydney University Press; 2016.
4. Australian Institute of Health and Welfare. Potentially preventable hospitalisations in Australia by age groups and small geographic areas, 2017–18. (Cat. No. HPF 36.) Canberra: AIHW; 2019.
5. Dr Foster. Reducing avoidable emergency admissions, Healthcare Insight Report. London: Dr Foster; 2019. Available from: drfoster.com/2019/06/20/healthcare-insight-report-reducing-avoidable-emergency-admissions/
6. McDarby G, Smyth B. Identifying priorities for primary care investment in Ireland through a population-based analysis of avoidable hospital admissions for ambulatory care sensitive conditions (ACSC). BMJ Open 2019 Nov 5;9(11):e028744.
7. Grabe M, Bartoletti TE, Johansen B, Cai T, Cek M, Koves B, et al. Guidelines on urological infections. Arnhem: European Association of Urology; 2015.
8. Hooton TM, Gupta K. Acute complicated urinary tract infection (including pyelonephritis) in adults. UpToDate [Internet]. 2019 Available from: uptodate.com/contents/acute-complicated-urinary-tract-infection-including-pyelonephritis-in-adults
9. Benfield T, Jensen JS, Nordestgaard BG. Influence of diabetes and hyperglycaemia on infectious disease hospitalisation and outcome. Diabetologia 2007;50(3):549–54.
10. Pertel PE, Haverstock D. Risk factors for a poor outcome after therapy for acute pyelonephritis. BJU Int 2006;98(1):141–7.
11. Australian Commission on Safety and Quality in Healthcare. Asymptomatic bacteriuria: reducing inappropriate antimicrobial prescribing for aged care facility residents, fact sheet. Sydney: ACSQHC; 2020.
12. Therapeutic Guidelines. Antibiotic guidelines In: eTG complete [Internet]. Melbourne: Therapeutic Guidelines Limited; 2020.
13. Boyko EJ, Fihn SD, Scholes D, Chen CL, Normand EH, Yarbro P. Diabetes and the risk of acute urinary tract infection among postmenopausal women. Diabetes Care 2002;25(10):1778–83.
14. Stumpers S, Thomson N. Review of kidney disease among Indigenous people. Aust Indigenous Health Bull 2013;13(2).
15. Mohan JV, Atkinson DN, Rosman JB, Griffiths EK. Acute kidney injury in Indigenous Australians in the Kimberley: age distribution and associated diagnoses. Med J Aust 2019;211(1):19–23.
16. Coca SG, Singanamala S, Parikh CR. Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. Kidney Int 2012;81(5):442–8.
17. Mazor-Dray E, Levy A, Schlaeffer F, Sheiner E. Maternal urinary tract infection: is it independently associated with adverse pregnancy outcome? J Matern Fetal Neonatal Med 2009;22(2):124–8.
18. Li M, McDermott R. High absolute risk of severe infections among Indigenous adults in rural northern Australia is amplified by diabetes: a 7 year follow up study. J Diabetes Complications 2016;30(6):1069–73.
19. Australian Institute of Health and Welfare. Australian Burden of Disease Study: impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2011. (Australian Burden of Disease Study Series No. 6. Cat. No. BOD 7.) Canberra: AIHW; 2016.
20. Waterworth P, Dimmock J, Pescud M, Braham R, Rosenberg M. Factors affecting Indigenous West Australians' health behavior: Indigenous perspectives. Qual Health Res 2016;26(1):55–68.
21. Spector WD, Limcangco R, Williams C, Rhodes W, Hurd D. Potentially avoidable hospitalizations for elderly long-stay residents in nursing homes. Med Care 2013;51(8):673–81.
22. Woodford HJ, George J. Diagnosis and management of urinary tract infection in hospitalized older people. J Am Geriatr Soc 2009;57(1):107–14.
23. Burkett E, Carpenter CR, Arendts G, Hullick C, Paterson DL, Caterino JM. Diagnosis of urinary tract infection in older persons in the emergency department: To pee or not to pee, that is the question. Emerg Med Australas 2019;31(5):856–62.
24. Rodhe N, Lofgren S, Matussek A, Andre M, Englund L, Kuhn I, et al. Asymptomatic bacteriuria in the elderly: high prevalence and high turnover of strains. Scand J Infect Dis 2008;40(10):804–10.
25. Ducharme J, Neilson S, Ginn JL. Can urine cultures and reagent test strips be used to diagnose urinary tract infection in elderly emergency department patients without focal urinary symptoms? CJEM 2007;9(2):87–92.
26. O'Kelly K, Phelps K, Regen EL, Carvalho F, Kondova D, Mitchell V, et al. Why are we misdiagnosing urinary tract infection in older patients? A qualitative inquiry and roadmap for staff behaviour change in the emergency department. Eur Geriatr Med 2019;10:585–93.
27. Mitchell BG, Ferguson JK, Anderson M, Sear J, Barnett A. Length of stay and mortality associated with healthcare-associated urinary tract infections: a multi-state model. J Hosp Infect 2016;93(1):92–9.
28. Australian Commission on Safety and Quality in Health Care. Internal ACSQHC analysis of the APC NMDS 2017–18, using the Avoidable Hospital Readmissions criteria. Sydney: ACSQHC; 2020.
29. Australian Commission on Safety and Quality in Health Care. AURA 2019: third Australian report on antimicrobial use and resistance in human health. Sydney: ACSQHC; 2019.
30. Osthoff M, McGuinness SL, Wagen AZ, Eisen DP. Urinary tract infections due to extended-spectrum beta-lactamase-producing gram-negative bacteria: identification of risk factors and outcome predictors in an Australian tertiary referral hospital. Int J Infect Dis 2015;34:79–83.
31. Cass A, Hughes JT. Acute kidney injury in Indigenous Australians: an unrecognised priority for action. Med J Aust 2019;211(1):14–5.
32. Ngangk Yira Research Centre for Aboriginal Health and Social Equity. Birthing on Noongar Boodjar (Cultural Security and Aboriginal Birthing Women) project recommendations. Perth: Murdoch University; 2019.
33. Hill K, Ward P, Grace BS, Gleadle J. Social disparities in the prevalence of diabetes in Australia and in the development of end stage renal disease due to diabetes for Aboriginal and Torres Strait Islanders in Australia and Maori and Pacific Islanders in New Zealand. BMC Public Health 2017;17(1):802.
34. Luis A, Domingues F, Pereira L. Can cranberries contribute to reduce the incidence of urinary tract infections? A systematic review with meta-analysis and trial sequential analysis of clinical trials. J Urol 2017;198(3):614–21.
35. Jepson RG, Williams G, Craig JC. Cranberries for preventing urinary tract infections. Cochrane Database Syst Rev 2012 Oct 17;10:CD001321.
36. Schwenger EM, Tejani AM, Loewen PS. Probiotics for preventing urinary tract infections in adults and children. Cochrane Database Syst Rev 2015 Dec 23(12):CD008772.
37. Sihra N, Goodman A, Zakri R, Sahai A, Malde S. Nonantibiotic prevention and management of recurrent urinary tract infection. Nat Rev Urol 2018;15(12):750–76.