2.5 Cellulitis

Why is this important?

Cellulitis is an infection of the subcutaneous tissues. Crowded living conditions and socioeconomic disadvantage increase the risk of some bacterial causes of cellulitis.¹

What did we find?

Between 2014–15 and 2017–18, the rate of cellulitis hospitalisations nationally increased by 9%. The rate increased by 18% among Aboriginal and Torres Strait Islander people. The rate for Aboriginal and Torres Strait Islander people was 3.0 times as high as the rate for other Australians.

Rates of hospitalisation for cellulitis were substantially higher in remote areas than in other areas. Hospital admission rates also increased with socioeconomic disadvantage, regardless of remoteness, except in outer regional areas.

What can be done?

The rates of hospitalisation for cellulitis reported in this chapter are unacceptably high, and more must be done to prevent these infections. Addressing the social determinants of skin health, such as housing conditions, is key to reducing skin infections and cellulitis among Aboriginal and Torres Strait Islander people.^{2,3} More effective prevention and management of type 2 diabetes, an important risk factor for cellulitis, may also reduce rates of hospitalisation for cellulitis. Increasing availability of podiatry services that specialise in care of diabetic and ischaemic foot ulcers may help prevent infections and hospitalisations, particularly in rural and remote areas. Increasing availability of lymphoedema services and specific compression stockings may reduce rates of cellulitis in patients with chronic lymphoedema. Improving the accuracy of cellulitis diagnoses - for example, by early consultation with an infectious diseases specialist and/or a dermatologist - could reduce unnecessary hospitalisations and antibiotic use.

Context

Cellulitis is an infection of the subcutaneous tissues. It occurs in a range of disparate conditions and circumstances, with different causes and management – for example, penetrating injuries, insect bites and wounds.⁴ Risk factors for recurrent cellulitis include lymphoedema, obesity, diabetes and pre-existing skin infections such as tinea.^{4,5} Crowded living conditions and socioeconomic disadvantage increase the risk of some infections associated with cellulitis.¹

Cellulitis was the fourth most common cause of potentially preventable hospitalisation in Australia in 2017–18, after dental conditions, kidney infections and urinary tract infections combined, and chronic obstructive pulmonary disease.⁶ Among Aboriginal and Torres Strait Islander people, cellulitis was the second most common cause of potentially preventable hospitalisation in 2017–18, after chronic obstructive pulmonary disease.⁷ Hospitalisations for cellulitis accounted for 275,653 bed days in Australia in 2017–18.⁶

Older, frail people are particularly at risk of hospitalisation due to cellulitis because even minimal infection can mean that they are unable to manage at home. The rate of hospitalisation for cellulitis in Australia is 3.0 times higher among people aged 65 years and over compared with younger adults.⁷

Few international rates of hospitalisation for cellulitis are available for comparison. The rate of hospital discharge for treatment for infection of the skin or subcutaneous tissues was 359 per 100,000 in Australia, compared to 328 per 100,000 in New Zealand, in 2016.⁸

Cellulitis is caused by a variety of pathogens. Spontaneous, rapidly spreading cellulitis and nonpurulent recurrent cellulitis (for example, associated with lymphoedema) are most commonly caused by *Streptococcus pyogenes* or other streptococci.⁹ Purulent cellulitis is usually caused by *Staphylococcus aureus (S. aureus)*.⁹ Some community-acquired *S. aureus* infections in Australia are now due to methicillin-resistant organisms.¹⁰ Cellulitis caused by *S. aureus* is less common than cellulitis caused by streptococci, and is often associated with an abscess, ulceration or penetrating injury.⁹

Oral antibiotics are recommended for cellulitis without systemic features of infection. Intravenous antibiotics are usually required for patients with two or more features of systemic infection.⁹

About the data

All hospitalisations with a principal diagnoses of cellulitis are included.

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

Rates are based on the number of hospitalisations for cellulitis per 100,000 people of all ages in 2017–18.

Because a record is included for each hospitalisation for cellulitis, rather than for each patient, patients hospitalised for cellulitis 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.

What do the data show?

Magnitude of variation

In 2017–18, there were 68,663 hospitalisations for cellulitis, representing 256 hospitalisations per 100,000 people of all ages (the Australian rate).

The number of hospitalisations for cellulitis across 330* local areas (Statistical Area Level 3 – SA3) ranged from 90 to 1,393 per 100,000 people. The rate was **15.5 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 185 per 100,000 people in the Australian Capital Territory to 679 in the Northern Territory (Figures 2.35–2.38).

After the highest and lowest 10% of results were excluded and 264 SA3s remained, the number of hospitalisations per 100,000 people was 2.9 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 hospitalisation for cellulitis were substantially higher in remote areas than in other areas. Hospital admission rates also increased with socioeconomic disadvantage, regardless of remoteness category, except in outer regional areas (Figure 2.39).

Analysis by Aboriginal and Torres Strait Islander status

The rate for Aboriginal and Torres Strait Islander people (727 per 100,000 people) was 3.0 times as high as the rate for other Australians (242 per 100,000 people) (Figure 2.34).

Figure 2.34: Number of potentially preventable hospitalisations – cellulitis 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 2.34, and the data and graphs for Analysis by Primary Health Network are available at safetyandquality.gov.au/atlas

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.

^{*} There are 340 SA3s. For this item, data were suppressed for 10 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 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.

Trends over time

Between 2014–15 and 2017–18, the rate of cellulitis hospitalisations per 100,000 people nationally increased by 9% (Figure 2.40).

For Aboriginal and Torres Strait Islander people, the rate of cellulitis hospitalisations per 100,000 people nationally increased by 18% between 2014–15 and 2017–18 (Figure 2.41).

Interpretation

Potential reasons for the variation include geographical differences in:

- Clinician factors:
 - Diagnostic error, potentially leading to both under-diagnosis and over-diagnosis of cellulitis. Several other conditions can be mistaken for cellulitis, due to its non-specific features, and reported rates of misdiagnosis range from 30% to 74% in United States (US) hospitals.^{11,12} In one US study where 30% of cellulitis diagnoses were later found to be incorrect, 85% of the misdiagnosed patients were unnecessarily hospitalised and 92% received unnecessary antibiotics due to the misdiagnosis¹³ (see 'Improving diagnostic accuracy' on page 157).
- Demographic and consumer factors
 - prevalence of diabetes, and poorly managed diabetes, which increase the risk of skin disease; diabetes is more prevalent among Aboriginal and Torres Strait Islander people
 - prevalence of obesity, chronic venous stasis, immobility and lymphoedema, which increase the risk of oedema and cellulitis, and prevalence of heart failure with lymphoedema
 - prevalence of community-associated methicillin-resistant *Staphylococcus aureus* (MRSA), which is high in outer regional, remote and very remote areas compared with major cities and inner regional areas of Australia¹⁴

- prevalence of streptococcal infections in some Aboriginal and Torres Strait Islander communities
- overcrowded housing
- swimming facilities (type, cleanliness and frequency of use); use of swimming pools may reduce skin infections¹⁵
- occupational risk factors for skin injury
- density of populations with a high risk of cellulitis, such as residents of aged care homes¹⁶
- temperature and humidity, and associated effects (for example, open footwear, tinea).
- Health system factors
 - delayed or inadequate access to appropriate health care; poor health literacy may contribute to delays in seeking health care, resulting in increased need for hospitalisation
 - access to dermatologists for managing serious skin conditions and preventing progression to cellulitis
 - access to culturally appropriate health care for Aboriginal and Torres Strait Islander people
 - implementation of hospital avoidance schemes
 - availability of integrated care that connects patients with social services and programs
 - use of emergency department short-stay units, where a patient stay is coded as a hospitalisation rather than an emergency department–only visit.

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.

Impact of MRSA

The prevalence of community-associated MRSA is higher in outer regional, remote and very remote areas than in major cities and inner regional areas of Australia.¹⁴ In 2017, 41% of *S. aureus* infections in remote areas were methicillin resistant, compared with 20% in major cities of Australia.¹⁴ Prevalence of MRSA increased in Australia overall between 2015 and 2017, but to a larger extent in remote and very remote areas than in major cities.¹⁴ Higher prevalence of MRSA is likely to contribute to higher rates of hospitalisation for cellulitis for several reasons:

- Ineffectiveness of antibiotics used for empirical treatment can result in progression of the infection
- MRSA infections require surgical drainage, which is more likely to require hospital care
- Higher prevalence of MRSA may cause an increase in rates of skin abscesses, furuncles and boils, which can progress to cellulitis.

In addition, longer waiting times for the results of microbiological investigations in remote areas lead to longer periods before a change in antibiotic if there is a mismatch in susceptibility, and greater opportunity for progression of infection.

Addressing variation

The rates of hospitalisation for cellulitis reported in this chapter are unacceptably high, and more must be done to prevent these severe infections. The 9% increase in cellulitis hospitalisations overall, and the 18% increase among Aboriginal and Torres Strait Islander people, between 2014–15 and 2017–18 underscore this need. Suitable strategies to reduce potentially preventable hospitalisations for cellulitis will depend on the specific underlying causes in local areas and their accurate diagnosis.

Improving diagnostic accuracy

Several other conditions can be mistaken for cellulitis, due to its non-specific features. Reported rates of misdiagnosis range from 30% to 74% in US hospitals.^{11,12} In one US study where 30% of cellulitis diagnoses were later found to be incorrect, 85% of the misdiagnosed patients were unnecessarily hospitalised, and 92% received unnecessary antibiotics as a result of the misdiagnosis.¹³

Early consultation with an infectious diseases specialist or a dermatologist can improve outcomes for patients with a presumed diagnosis of cellulitis, and so reduce antibiotic use.¹¹ In a US trial, patients who were assessed by a dermatologist within 24 hours of admission had significantly better clinical improvement after two weeks, and had significantly lower duration of antibiotic treatment, than patients treated by the usual medical team.¹¹

Ambulatory Care

Many patients with cellulitis are treated in ambulatory settings, community health, specialist outpatient clinics, general practice and Hospital in the home. Ambulatory settings may be preferable for selected older patients, to reduce the risk of geriatric complications such as delirium.¹⁷

Managing predisposing conditions and recurrent cellulitis

More effective prevention and management of type 2 diabetes, an important risk factor for cellulitis, may contribute to reducing rates of hospitalisation for cellulitis. Access to information about self-management at an appropriate health literacy level, and in languages other than English, is fundamental to enabling consumers to prevent future episodes of cellulitis. Improved self-management of skin diseases such as eczema, and encouraging early action to prevent worsening of infections, may reduce hospitalisations for cellulitis.

Increasing availability of podiatry services that specialise in care of diabetic and ischaemic foot ulcers may help prevent infections and hospitalisations, particularly in rural and remote areas. Similarly, increasing availability of lymphoedema services and specific compression stockings may reduce rates of cellulitis in patients with chronic oedema. In a small Australian trial, leg compression therapy halved the rate of hospitalisation for cellulitis among patients with chronic oedema of the leg and recurrent cellulitis.¹⁸

Other factors that increase the risk of recurrent cellulitis include tinea of the feet, lymphoedema and lymphatic malformation.⁹ In addition to managing these risk factors, giving patients with recurrent cellulitis a prescription for antibiotic treatment so that they can start treatment as soon as symptoms appear may prevent rapid progression of infection.⁹

Antibiotic prophylaxis is recommended for some people with frequent recurrences.^{9,19} Recommended prophylaxis is phenoxymethylpenicillin 250 mg orally, twice daily for up to six months initially, followed by regular review.⁹

Individualising treatment

Using better-tolerated treatments for impetigo (also known as school sores) in primary care may encourage earlier presentation. Delays in presentation due to the pain of treatment with penicillin G injection may contribute to treatment failure in the primary healthcare setting. Previous experience of ineffective treatment with flucloxacillin or other β -lactam antibiotics for MRSA infections may also contribute to treatment failure in the primary healthcare setting.

Treatment for patients with suspected MRSA or risk factors

For patients with purulent cellulitis (or suspected *S. aureus* infection) and risk factors for MRSA infection, intravenous vancomycin is recommended.²⁰ In some areas, clindamycin or lincomycin is a suitable alternative, based on local community-associated MRSA susceptibility patterns.²⁰

Risk factors for infection with MRSA include:

- Living in an area with a high prevalence of MRSA (for example, the Northern Territory, remote communities in northern Queensland, regions north of metropolitan Perth in Western Australia – especially the Pilbara and Kimberley)
- Previous colonisation or infection with MRSA, particularly if recent (this also applies to neonates exposed to caregivers colonised or infected with MRSA)
- Residence in an aged care home with a high prevalence of MRSA, particularly if the patient has had several courses of antibiotics
- Frequent stays, or a current prolonged stay, in a hospital with high MRSA prevalence, particularly if the patient has had antibiotic treatment or recent surgery.²⁰

Promoting skin health among Aboriginal and Torres Strait Islander people

The burden of bacterial skin infections and parasitic skin infestations among Aboriginal and Torres Strait Islander people is highest in remote communities.²¹ These conditions can lead to impetigo and cellulitis.²¹ The risk of skin infections is reduced by adequate housing conditions, including adequate space for the number of people living in the house.²²

The Housing for Health Program involves repairs and maintenance of housing items required for healthy living practices. The program has significantly reduced the rate of hospitalisations for skin infections, and led to other benefits for people living in Aboriginal community housing (see 'Case study: Housing for health' on this page).²³

Children in remote Aboriginal and Torres Strait Islander communities in northern Australian have the highest rates of impetigo in the world.²⁴ Prevention programs for skin infections can increase protective factors against cellulitis in these settings.^{25,26} Public swimming pools have also been associated with a lower prevalence and severity of skin sores in remote Aboriginal and Torres Strait Islander communities, and may decrease the burden of infections and staphylococcal diseases in particular.^{15,27}

In areas with very high rates of skin infections in children, such as the Kimberley and Pilbara, skin infections may become normalised, meaning that clinicians may not offer treatment unless asked, and patients may not seek treatment.³ However, in settings with a high burden of skin infections, individual treatment without community-level interventions is likely to be ineffective, partly because of extensive community-level transmission of impetigo.² Addressing the normalisation of skin infections and the social determinants of skin health is key to increasing protective factors against skin infections among Aboriginal and Torres Strait Islander children.^{2.3} Strengthening the capacity of the Aboriginal Community Controlled Health Service sector and improving the cultural safety of mainstream services are important for improving access to care for Aboriginal and Torres Strait Islander people. Strengthening the Aboriginal and Torres Strait Islander health workforce is also fundamental to improving access to culturally safe health care.

Case study: Housing for health

The risk of skin infections is increased by poor housing conditions, including inadequate facilities for healthy living practices.²² The Housing for Health Program involves repairs and maintenance of housing items required for healthy living practices. The program has significantly reduced the rate of hospitalisations for skin infections, and led to other benefits for people living in Aboriginal community housing.²³

Over the 10-year evaluation period, repairs were made to 2,230 houses in 71 communities around New South Wales. Repairs included fixing hot water systems, showers, washing machines, toilets and insect screens. Repairs to improve safety, temperature control, and the ability to store and prepare food were also carried out. The proportion of houses with adequate facilities for residents to wash themselves, their clothes and their bedding doubled after the intervention.

The rate of hospitalisations for skin infections was 19% lower in the intervention group than in the non-intervention group. Hospitalisations were also reduced by 42% for respiratory conditions and by 43% for intestinal infections. The program had broader benefits in building goodwill through timely repairs (either the same day or the day after houses were surveyed), and employing local Aboriginal and Torres Strait Islander tradespeople to carry out repairs, where possible.²³

Rates by local area

Figure 2.35: Number of potentially preventable hospitalisations – cellulitis per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



Notes:

Squares (iii) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution.

Triangles (a) 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.

Rates across Australia

Figure 2.36: Number of potentially preventable hospitalisations – cellulitis 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.

Rates across capital city areas

Figure 2.37: Number of potentially preventable hospitalisations – cellulitis 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.

Rates by state and territory

Figure 2.38: Number of potentially preventable hospitalisations – cellulitis per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



Notes:

Squares (III) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution.

Triangles (A) 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.

Rates by remoteness and socioeconomic status

Figure 2.39: Number of potentially preventable hospitalisations – cellulitis per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2017–18



Notes:

Squares (iii) and asterisks (*) indicate rates that are more volatile than other rates and should be interpreted with caution. Triangles (a) 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 of 2017 and 2018. For further detail about the methods used, please refer to the Technical Supplement.

Rates across years

Figure 2.40: Number of potentially preventable hospitalisations – cellulitis per 100,000 people of all ages, age and sex standardised, by state and territory of patient residence, 2014–15 to 2017–18



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.

Rates for Aboriginal and Torres Strait Islander people across years

Figure 2.41: Number of potentially preventable hospitalisations – cellulitis 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.

Resources

- Cellulitis and erysipelas (Antibiotic Guidelines, in eTG complete)⁹
- Cellulitis and other bacterial skin infections, clinical practice guidelines, Royal Children's Hospital Melbourne, rch.org.au/clinicalguide/guideline_ index/cellulitis_and_skin_infections
- Healthy Skin Program: Guidelines for community control of scabies, skin sores, tinea and crusted scabies in the Northern Territory. Darwin: Northern Territory Department of Health; 2015
- Housing Strategies that Improve Indigenous
 Health Outcomes²⁸
- *CARPA Standard Treatment Manual*, 7th ed. Alice Springs: Remote Primary Health Care Manuals; 2017
- National Healthy Skin Guideline: For the prevention, treatment and public health control of impetigo, scabies, crusted scabies and tinea for Indigenous populations and communities in Australia²¹
- Penicillin to prevent recurrent leg cellulitis¹⁹
- Top 10 myths regarding the diagnosis and treatment of cellulitis²⁹
- Community packages to support independence at home, available in some states and territories
- Cellulitis (patient fact sheet)³⁰

Australian initiatives

The information in this chapter will complement work already underway to reduce the rate of hospitalisations for cellulitis in Australia. At a national level, this work includes:

- National Partnership Agreement on Remote Indigenous Housing, Council of Australian Governments
- HotNorth collaborative skin health projects, hotnorth.org.au/projects

Many states and territory initiatives are also in place, including:

- Housing for Health in the Aboriginal community, New South Wales
- Integrated Care initiatives, New South Wales
- Cellulitis patient fact sheet, Victoria³⁰
- Delivering Connected Care for Complex Patients with Multiple Chronic Needs, Tasmania
- Aboriginal Environmental Health Program, Western Australia.

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