COMPLICATED SKIN AND SOFT TISSUE INFECTIONS IN REMOTE INDIGENOUS COMMUNITIES

Running title: Review of Skin Infection Complications

Lauren Thomas¹, Asha Bowen^{2, 3, 4}, Steven Tong^{4, 5, 6}

¹Faculty of Medicine Nursing and Health Sciences, Flinders University, Northern Territory, Australia ²Infectious Diseases department, Perth Children's Hospital, Western Australia, Australia ³Wesfarmers Centre for Vaccines and Infectious Diseases, Telethon Kids Institute, Western Australia, Australia ⁴Menzies School of Health Research, Northern Territory, Australia ⁵Victorian Infectious Disease Service, The Royal Melbourne Hospital, and ⁶Doherty Department University of Melbourne, at the Peter Doherty Institute for Infection and Immunity, Victoria, Australia

Correspondence

Steven Y. C. Tong, Victorian Infectious Diseases Service, 792 Elizabeth Street, Melbourne, Vic., Australia.

Email: steven.tong@mh.orgh.au

ABSTRACT

The burden and consequences of skin infections for remote living Indigenous people are high. While skin infections are recognised as an antecedent to conditions such as acute rheumatic fever in children, data are limited concerning skin infection complications such as cellulitis, abscesses and osteomyelitis in older children and adults. In a one-year retrospective audit of 439 patients presenting to two remote health clinics, 330/439 (75%) patients presented with a skin infection and 18 (4%) developed a complication.

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Bacterial skin infections are a common cause of morbidity and mortality in disadvantaged populations^{1, 2}. Indigenous Australians, particularly those living in remote communities, are amongst those most at risk for skin and soft tissue infections and resulting complications. Numerous clinical audits and research studies have confirmed the high burden of skin infections and hypothesized that early treatment may reduce the risk and subsequent morbidity and mortality associated with acute rheumatic fever (ARF), acute post streptococcal glomerulonephritis (APSGN), and skin related sepsis³. There is a gap in our understanding of the overall incidence of complicated skin infections across all age groups.

We aimed to determine the population incidence of complicated skin infections in two remote Aboriginal communities in the Northern Territory, Australia, and to describe these episodes. Human research ethics approval was granted from Menzies (2015-2378) to access the electronic health records of the entire resident population of two remote Aboriginal communities for the 2014 calendar year. We reviewed all clinic presentations to document the number and subsequent complications of skin infections. A detailed description of the methods and general findings has been published⁴. We defined a complication as any skin condition requiring treatment or investigation beyond typical primary care clinical recommendations and included the need for intravenous antibiotics, formal surgical debridement in an operating theatre, or hospital admission. We considered presentations as a single episode of a complicated skin infection if they presented within one month of each other and were described in clinic notes as being in the same anatomical location or if the notes clearly described the infection as a continuation of a previous presentation.

Of 439 residents, 330 (75%) presented with a skin infection at least once during the year⁴, and 18 of these infections were complicated. In total there were 19 escalation episodes, with one patient requiring hospitalization twice several months apart for the same infection. Of the 18 patients affected, 10 were male. The median age was 25 years with a range of 4-72 years; six patients were below the age of 18 years, including one patient below five, and four patients were aged over 50 years.

Infected wounds were the most common complicated skin infection (12/19) with antecedents including dog and human bites, trauma, and a post-operative wound. Abscesses accounted for 5/19 and impetigo 2/19 cases. The two cases of impetigo occurred in primary school aged children. Fourteen patients had microbiology results from skin swabs recorded. Methicillin-resistant *Staphylococcus aureus* (MRSA) was detected in 8/14. Of the 19 cases, 16 required intravenous antibiotics, with five of these provided at the remote clinic. Patients were seen between one and 12 (mean five episodes of care) times in the clinic for the same infection.

Fifteen patients were referred to a regional hospital for further investigations or treatment with 14 requiring hospital admission and two a transfer to a tertiary hospital. Mean length of hospitalization was 10 days (range 2 – 35 days). The complications included osteomyelitis (n=6), APSGN (n=2), and need for surgical debridement (n=6) (Figure 1). No cases of ARF were recorded.

DISCUSSION

In addition to the high general burden of skin infections presenting to the remote health clinic⁴, we describe a remarkably high rate of complicated infections that often necessitated hospitalization. The dominant pathogen associated with complicated infections was MRSA rather than Group A *Streptococcus* and most complications occurred in the adult population.

Among the 439 residents, six cases of osteomyelitis equates to a population incidence of >1,300 cases per 100,000 person years (95% confidence interval 617-3,026). In contrast, the estimated incidence of osteomyelitis in the United States is 22 cases per 100,000 person years⁵. Similarly, two cases of APSGN equates to a population incidence of 460 cases per 100,000 person years (95% CI 114-1816). The estimated Incidence rates of APSGN in developing nations is 9 cases per 100,000 person years⁶. These incidence estimates in remote communities are likely to fluctuate by year and community, and confidence intervals are large due to sampling from a small population. However, the estimates are broadly in keeping with larger population based studies of complicated skin and soft tissue infections⁷, invasive staphylococcal⁸ and streptococcal infections⁹, and osteomyelitis¹⁰ presenting to the tertiary hospitals in the Northern Territory.

There are significant costs associated with the hospitalisations required for these complicated skin and soft tissue infections. For the residents in these two communities, the collective length of hospital stay for complicated skin infections was 138 days for 14 patients. Hospital stay costs alone would be in excess of \$270,000 (at an estimated \$1,938 per day in the Northern Territory¹¹). Additional health system costs include retrieval and transfer costs and follow up care.

We identified MRSA associated in almost 60% of complicated skin and soft tissue infections. This finding is in keeping with other studies from the Northern Territory and highlights the growing public health issue of MRSA infections in remote and Aboriginal communities in Australia^{2, 7, 12, 13}. Accordingly, non β -lactam antibiotic agents such as trimethoprim-sulphamethoxazole may be the most appropriate treatment options to cover both *S. pyogenes* and MRSA^{14, 15}.

A limitation of this audit is that only one of several electronic health records in use in the NT was assessed. With high population mobility¹⁶, patients may have also been seen at other clinics or self-referred to hospital for investigation of complications. As such, these results may under-estimate the true burden. Similarly, if the referred hospital did not complete a discharge summary and the patient did not present to the clinic post discharge, the episode of escalation would not be included. The audit only included two communities, with a small population of 439. Detailed patient information on housing conditions and co-morbidities was not collected, and as such, conclusions were unable to be drawn regarding risk factors for skin infection complications.

This audit of remote clinical care reveals three key findings: complications of skin and soft tissue infections affected 4% (18/439) of the population in remote NT Indigenous communities with an attendant high cost burden; MRSA was the most common pathogen detected; and skin and soft tissue infections are a significant cause of clinic activity for remote health care workers. Health promotion activities, training of health care workers in early recognition and treatment of skin infections and ultimately attention to the social determinants of health are all needed to reduce this burden. The SToP trial currently underway in the Kimberley seeks to comprehensively address these to reduce skin infections and subsequent complications¹⁷.

FIGURES

Table 1

Skin Infection Complication	Number of People Affected (Percentage)
Osteomyelitis	6 (32%)
Sepsis	1 (5%)
Melioidosis	1 (5%)
Debridement Needed	6 (32%)
Cellulitis	3 (16%)
Acute Step. Glomerulonephritis	2 (10%)
Total	18 (100%)

Table 1 - Distribution of complicated skin and soft tissue infections

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ABSTRACT

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Figure 1 – Distribution of complicated skin and soft tissue infections (n=18) as mutually exclusive categories.

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Correspondence

Steven Y. C. Tong, Victorian Infectious Diseases Service, 792 Elizabeth Street, Melbourne, Vic., Australia.

Email: steven.tong@mh.org.au

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Author/s:

Thomas, L;Bowen, AC;Tong, SYC

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