Objectives. To study the epidemiology of *Staphylococcus aureus* skin and soft-tissue infections (SSTIs) in hospitalised children and adults in Gaborone, Botswana, and to describe the changes in antimicrobial susceptibilities of *S. aureus* isolates over time.

Methods. A retrospective cohort study evaluated SSTI isolates from January 2000 to December 2007 at Princess Marina Hospital (PMH), a large tertiary referral centre in Gaborone.

Eligible subjects were those hospitalised at PMH during the study period who had a skin or soft-tissue culture yielding a bacterial or fungal pathogen. The primary outcome measure was a skin or soft-tissue culture yielding *S. aureus*. Secondary outcomes were the organism's antimicrobial susceptibilities.

Results. *S. aureus* was detected in 857 (35.8%) of single-organism SSTI cultures, and 194 (22.6%) of these isolates were methicillin-resistant (MRSA). The proportion of MRSA isolates increased over time (linear test of trend: \( p = 0.03 \) from 2000 to 2003), and MRSA isolates were more likely than methicillin-susceptible isolates to be resistant to commonly used antimicrobials recommended by the national SSTI treatment guideline.

Conclusions. We report a high and increasing proportion of MRSA SSTIs in Gaborone. This high rate of MRSA resistance to currently recommended empiric antibiotics for SSTIs dictates the need for revising national guidelines and ongoing prospective surveillance of SSTIs in this setting.

Over the past decades, methicillin-resistant *Staphylococcus aureus* (MRSA) has become a key pathogen in skin and soft-tissue infections (SSTIs). The emergence of MRSA in 1961 occurred predominantly in patients exposed to health care facilities;\(^1,2\) community-acquired MRSA (CA-MRSA) isolates were identified in the 1990s.\(^3,4\) From 1993 to 2005, the impact of CA-MRSA nearly tripled emergency department SSTI visits in the USA.\(^4\) However, there are limited data on the incidence and characteristics of SSTIs in sub-Saharan Africa, and knowledge of pathogen-specific attributable morbidity is lacking.

HIV-infected patients are at markedly increased risk for CA-MRSA SSTI. In Chicago the incidence of CA-MRSA SSTIs was 6-fold higher among HIV-infected patients than among HIV-negative patients.\(^5\) Given the region's high HIV seroprevalence rate, the impact of MRSA may be particularly pronounced in sub-Saharan Africa.\(^6\) A multinational surveillance project in eight African hospitals and Malta found that 14.8% of clinically significant *S. aureus* strains isolated from patients were resistant to methicillin.\(^7\) The prevalence of MRSA isolates was even higher in sub-Saharan countries, ranging from 16.8% in Côte d’Ivoire to 29.6% in Nigeria.\(^8\) The prevalence of HIV in Botswana’s general population is estimated to be 17% and reaches nearly 35% among individuals aged 15 - 49 years, the highest infection rate after Swaziland.\(^9\) An *S. aureus* colonisation rate of 57.5% has been reported among food handlers in Gaborone, and 11.2% of bacteraemias in this setting are caused by MRSA, with neither study stratifying results by HIV status.\(^9,10\) Owing to the high prevalence of HIV in Botswana and the emergence of MRSA in blood isolates, we hypothesise that MRSA plays a significant role in SSTIs in this setting. However, the actual incidence and characteristics of SSTIs in this population remain unknown.

Knowledge of regional antimicrobial susceptibility patterns of SSTI pathogens influences treatment decisions and has broad public health implications. However, no data describing the antimicrobial susceptibility patterns of bacteria causing SSTIs in Botswana are available. In 2007 the Botswana Ministry of Health published national treatment guidelines for SSTIs, recommending doxycycline or penicillin for treatment of skin breaks with clinical signs of bacterial infections in adults, and co-trimoxazole, erythromycin or penicillin in children.\(^11\) These treatment guidelines and the lack of epidemiological and antimicrobial susceptibility data on SSTIs set the stage for this study. The primary objective was to determine the epidemiology of *S. aureus* SSTIs in hospitalised children and adults in Botswana’s capital city of Gaborone over an 8-year period. The secondary objective was to describe temporal changes in antimicrobial susceptibilities of *S. aureus* isolates over this period.

Methods

This retrospective cohort study evaluated SSTI isolates from January 2000 to December 2007 at Princess Marina Hospital (PMH) in
Discussion

The epidemiology and drug susceptibility of S. aureus SSTIs in Botswana are described. There is a high proportion of S. aureus SSTIs, particularly MRSA, at the tertiary hospital that serves the population of southern Botswana. Significant factors that increase the odds of MRSA infection among our cohort include age group 13 - 49 years, and hospitalisation in the intensive care unit, male orthopaedic and male medical wards.

An increasing proportion of MRSA SSTIs in Botswana between 2000 and 2003 and high levels of MRSA resistance to commonly used antibiotics are revealed. There is considerable variation in MRSA resistance profiles between regions and countries. In Australia, Singapore and Taiwan, MRSA is predominantly resistant to ciprofloxacin, clindamycin, erythromycin, gentamicin, TMP/SMX and tetracycline. In KwaZulu-Natal, South Africa, MRSA is resistant to clindamycin, erythromycin and TMP/SMX. Similarly, MRSA cases in this Botswana study displayed high resistance rates to clindamycin, erythromycin and tetracycline. This susceptibility pattern is of concern because patients with SSTIs in Botswana are routinely treated with one of these medications or penicillin. The empiric prescription of penicillin is probably targeting infection by Streptococcus group A, but our findings suggest that S. aureus is an under-recognised cause of SSTIs in Botswana.

Despite the Botswana Ministry of Health’s recommendation to administer co-trimoxazole as the drug of choice for cutaneous bacterial infections, which is supported by current US guidelines...
advocating TMP-SMX as the first-line therapy against community-acquired MRSA, S. aureus isolate susceptibilities to TMP-SMX were not routinely tested. Additionally, we found that vancomycin, the most effective antibiotic against MRSA, is not readily available at health centres other than the main hospital. Hence, we propose four improvements in managing SSTIs in Botswana: (i) revision of Botswana’s national SSTI guidelines, including discontinuing advocating penicillin as empiric treatment for SSTIs in a setting where S. aureus accounts for more than a third of culture-positive SSTIs and virtually all of these S. aureus isolates are resistant to this class of antibiotics (this has been achieved, as Botswana’s national antibiotic guidelines, informed by information from this study, were revised in July 2010); (ii) TMP-SMX susceptibility testing of all S. aureus SSTI isolates; (iii) improved hospital infection control guidelines and practices to prevent MRSA transmission in the hospital setting; and (iv) vancomycin availability in district hospitals with strict guidelines governing its use.

Limitations of this study include: (i) missing laboratory data from our study period may have contributed to an underestimate of SSTI...
prevalence; (ii) the anatomical site was not known for most S. aureus isolates, making it impossible to define the exact nature of each SSTI; (iii) owing to the retrospective study design, standard laboratory techniques may have shifted over the 8-year study period; and (iv) our retrospective design makes our results susceptible to potential biases of studies of similar design.

In summary, we found a high and increasing proportion of MRSA SSTIs in Gaborone. Additionally, the high rate of MRSA resistance to currently recommended empiric antibiotics for SSTIs dictates the need for revising national guidelines and ongoing prospective surveillance of SSTIs in this setting.

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References

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I love to watch the busy EGRET (both the she-gret and the he-gret) But what a way to earn your keep... Picking ticks off cows and sheep!

The egret has a graceful torso And the HERON even more so. See him, stone-still, in the creek, S-shaped neck and dagger beak; All-of-a-sudden with a swish! Look – the heron has a fish!

Wheeling high up in the sky The SEAGULL flies with raucous cry. When underneath, you should be careful, Or you’ll land up with a hairful.

I wish the awkward HA-DI-DAH Would learn to whistle, tweet or baa A brownish bird, with fearsome beak She calls her mate with rasping shriek But someone loves the ha-di-dah It is of course the ha-di-ma.

I’ve the greatest respect for the PLOVER He is always so true to his lover Her eggs he will shield So exposed in the field And he’ll never run off with anover. 

Maurice Kibel Children’s poems