BC Centre for Disease Control
An agency of the Provincial Health Services Authority

Guidelines for the Management of Community-Associated Methicillin-Resistant Staphylococcus aureus (CA-MRSA)-related Skin and Soft tissue Infections in Primary Care

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1. Background

Community-associated Methicillin-Resistant *Staphylococcus aureus*(CA-MRSA) were historically referred to as MRSA strains acquired in the community.[1] They are genetically distinct and thought to have evolved separately from the healthcare-associated strain (HA-MRSA). However, currently, CA-MRSA is the predominant strain in both community and hospital settings. Predominant clones in Canada are USA 300 and USA 400.[2] Similar to Methicillin-susceptible *Staphylococcus aureus* (MSSA), they are most commonly implicated in skin and soft tissue infection (SSTI) and less commonly in invasive and severe infections like necrotizing pneumonia, empyema, sepsis and osteomyelitis. [3]

The incidence of CA-MRSA infection has been on the rise. Canadian data demonstrate a dramatic increase of infection attributed to the USA 300 clone from less than 1% of MRSA isolates in 1995-1999 to 13% in 2004-2007; then almost doubling itself to 29% in 2011. [4,5] The evolving epidemiology of staphyloccocci infection calls for changes in the practice of managing SSTI in the community. Recommendations of this guideline were formulated based on the latest guideline by the Infectious Diseases Society of America (IDSA) [6] and relevant literature, and serve as a quick reference for primary care practitioners in British Columbia.

2. Populations at Risk

Some populations are at greater risk of contracting CA-MRSA: [7]

1) Neonates, children
2) Homeless, incarcerated, intra-parenteral drug user (IVDU)
3) Men who have sex with men (MSM), human immunodeficiency virus (HIV)-infected
4) Military personnel
5) Athletes of contact sports
6) Native aboriginals
7) Household contacts
8) Veterinarians, livestock handlers

Although anyone can acquire CA-MRSA, populations at increased risk include those with risk factors summarized as the "5 Cs": [3, 8]

1) **C**rowding (e.g incarcerated)
2) Frequent skin **C**ontact (e.g. athletes of contact sports)
3) **C**ompromised skin
4) Sharing **C**ontaminated personal items (e.g. injection drug use)
5) Lack of **C**leanliness

3. Diagnosis

3.1 Clinical Presentation

Common clinical manifestations of CA-MRSA include furuncles, carbuncles and abscesses. (Table 1) The spontaneous red raised lesions are frequently described as "spider bite". There is also a tendency for

lesions to develop necrotic areas. Severity may vary from mild superficial infections to deep soft tissue abscesses requiring hospital admission for incision and drainage (I & D) and parenteral antibiotics. Recurrent skin infections and clustering of infections within a household are relatively common.[3]

Table 1 Frequency Distribution of the Different Types of SSTI [9-11]

Type of SSTI	**Frequency (%)**
Abscess	59-81
Wound infection	10-11
Cellulitis (usually with abscess or wound infection)	8-42
Follicullitis	7
Impetigo	3

3.2 Investigations

MRSA should be on the differentials of SSTIs compatible with *S. aureus* infection such as skin abscess and a chief complaint of "spider bite". [3] Other pathogens include MSSA, and less commonly, streptococcus.

The IDSA guideline recommends cultures from abscesses and other purulent SSTIs in the following circumstances:

1) Treatment with antibiotic therapy
2) Severe local infection or signs of systemic illness
3) Inadequate response to initial treatment
4) Concern for cluster or outbreak

Diagnosis of CA-MRSA is made based on culture and sensitivity testing of clinical isolates and in the absence of 1) history of hospitalization, surgery, dialysis or residence in a long term care facility within 1 year of MRSA culture date, 2) indwelling catheter or percutaneous device as well as 3) history of previous isolation of MRSA (case definition by the US Centers for Disease Control and Prevention). [3] However, the distinction between CA-MRSA and HA-MRSA is blurring. According to a report by the Canadian Nosocomial Infection Surveillance Program (CNISP), in 2009 the overall MRSA infection rate was 3 per 1000 patient days whereas the HA-MRSA was 2 per 1000 patient days; this gap suggests increasing portion of the MRSA in hospitals are CA-MRSA. [12]

3.3 Reporting

CA-MRSA infection is not a reportable disease in British Columbia. Information about its distribution is inferred from laboratory information, hospital epidemiology and discrete studies, and is available on the PICNet website. [13]

4. Susceptibility Patterns of CA-MRSA

CA-MRSA is resistant to β-lactams (penicillins and cephalosporins). However, unlike HA-MRSA isolates which are resistant to multiple classes of antimicrobial agents, the majority of CA-MRSA isolates demonstrate greater susceptibility to trimethoprim-sulfamethoxazole (TMP/SMX), doxycycline and sometimes clindamycin (Table 2 and 3) [3, 14, 15] Antibiotics to which CA-MRSA is usually resistant to, and, therefore, should not be used empirically include macrolides (clarithromycin, erythromycin, azithromycin) and quinolones (ciprofloxacin, levofloxacin, moxifloxacin).

Table 2 provides susceptibility data to antibacterials for the different CA-MRSA strains across Canada and Table 3 provides local British Columbia's susceptibility pattern for CA-MRSA from Providence Health Care. The main difference between the two tables is related to clindamycin susceptibility, which is worse in the West of the country compared to the East.

Table 2 Antimicrobial Susceptibilities of Canadian MRSA SSTI Isolates [14]

Antimicrobial agent	**Susceptibility**	
	CMRSA-7/CMRSA-10 (prototypical community-associated MRSA strains)	**Other MRSA strains**
Vancomycin	100%	100%
Tigecycline	100%	100%
Trimethoprim/ sulfamethoxazole	100%	91%
Tetracycline	99%	88%
Mupirocin	93%	87%
Clindamycin	83%	35%
Ciprofloxacin	19%	38%
Erythromycin	10%	35%
Linezolid	100%	100%

Table 3 Providence Health Care 2013 Cumulative Antibiogram [15]

Antimicrobial agent	**Susceptibility**	
	MSSA	**CA-MRSA**
TMP-SMX	96%	86%
Doxycycline	95%	82%
Clindamycin	76%	44%
Erythromycin	71%	9%
Ciprofloxacin	85%	5%

5. Management

Management of SSTI in the era of CA-MRSA is based on clinical presentation: [6]

5.1 For Simple Abscesses or Boils

Incision and drainage (I & D) alone is likely adequate. If unsure whether pus is present, one may attempt to aspirate fluid from the lesion with needle and syringe of adequate size (e.g. a 16-19 gauge needle on a 10 cc syringe). For small furuncles not amenable to I & D, moist heat may promote drainage. [3]

Antibiotics are recommended for abscesses associated with the following conditions:

1) Severe or extensive disease (e.g. involving multiple sites of infection) or rapid progression in the presence of associated cellulitis
2) Signs and symptoms of systemic illness
3) Associated comorbidities or immunosuppression
4) Extremes of age
5) Abscess in area difficult to drain (e.g. face, hand, and genitalia)
6) Associated septic phlebitis
7) Lack of response to I & D alone

5.2 For Cellulitis

With no wound/ abscess/ pus

1) Group A streptococcus is the likely pathogen.
2) Five to 10 days of empirical therapy that covers β-hemolytic streptococci e.g. cephalexin is indicated.
3) Empirical coverage for CA-MRSA (e.g. TMP/SMX or doxycycline) should be considered in patients who do not respond to β-lactam therapy and may be considered in those with systemic toxicity.

With wound infection/ abscess/ pus

1) *Staphylococcus aureus* is the likely pathogen.
2) I & D, followed by 5-10 days of empirical coverage for CA-MRSA e.g. TMP/SMX or doxycycline pending culture results.
3) Cephalexin may be added for Group A streptococcal coverage but according to the IDSA guideline, is likely unnecessary.

With modifying factors like bites and diabetes mellitus

1) Group A streptococcus, *Staphylococcus aureus* or other pathogens may be present.
2) Empiric treatment should be based on clinical presentation and modifying factors.

5.3 For Recurrent Infection

Preventive educational messages on personal hygiene and appropriate wound care are recommended for all patients with SSTI.

Environmental hygiene measures could be considered for those with recurrent disease.

1) Cleaning efforts should be focused on high-touch surfaces that may contact bare skin or uncovered infections (e.g. counters, door knobs, bath tubs and toilet seats).
2) Appropriate cleaners or detergents should be used according to label instructions for routine cleaning of surfaces.

Decolonization is recommended for selected cases.

5.4 For Cases where Household or Interpersonal Transmission is Suspected

Personal and environmental hygiene measures should be implemented for the patient and contacts. This includes hand hygiene through hand washing (with plain soap and running water) or with alcohol-based hand rub, particularly after touching wounds or contaminated items.

Symptomatic contacts should be evaluated for *S. aureus* infection and treated.
Nasal and topical body decolonization may be considered for symptomatic contacts post treatment and asymptomatic household contacts.

5.5 Antibiotic Recommendations

Oral antibiotics

Table 4 Dosing Recommendations for Antibiotics with CA-MRSA coverage [6]

Antibiotic	**Dose (Adult)**	**Remarks**
TMP-SMX	1-2 DS BID PO	May not cover Group A streptococcus Not recommended for pregnant women in their first and third trimester Not recommended for infants less than 2 months
Doxycycline, minocycline	100 mg BID PO	Covers Group A streptococcus Not recommended for pregnant women Not recommended for children under the age of 8
Linezolid	600 mg BID PO	Very expensive (approx.. $2000 for a 12 day course) screen for drug interaction with concomitant therapy Prolonged therapy has been associated with myelosuppression, neuropathy and lactic acidosis.

(Clindamycin)	(300-450 mg TID PO)	(Not first choice due to lower sensitivity compared to the other three. Inducible resistance reported in erythromycin resistant isolates)

Topical antibiotics

Topical antibiotics like mupirocin and fusidic acid are indicated for the treatment of impetigo. However, fusidic acid is also an adjunctive oral agent for invasive MRSA infection. According to data from the United Kingdom, in patients infected with fusidic resistant *S. aureus* (FRSA), 96% had used topical fusidic acid therapy in the previous 6 months compared with 29% of those infected with fusidic acid susceptible strains. [16] It is thus advised to either avoid topical fusidic acid therapy when considering prolonged treatment course to prevent the development of resistance.

6. Decolonization of the Patient

Decolonization may be considered in: [6]

1) Patients with recurrent SSTI
2) Ongoing transmission among household members or close contacts despite optimal wound care and hygiene measures

Strategies to decolonize should be implemented in conjunction with hygiene measures and include: [6]

1) Nasal decolonization with mupirocin ointment 2% to nares twice daily for 5-10 days, and/ or
2) Topical body decolonization regimens with a skin antiseptic solution (e.g. chlorhexidine 4%) for 5-14 days or dilute bleach bath (1 teaspoon per gallon of water, or ¼ cup per ¼ tub/ 13 gallons of water) 15 min twice weekly for 3 months.

   A randomized controlled trial comparing 4 strategies of decolonization: education, intranasal mupirocin, intranasal mupirocin + chlorhexidine body wash and intranasal mupirocin + bleach bath, found intranasal mupirocin + bleach bath to be the only strategy that is significantly more effective at decolonization than education at 4 months (63% vs. 38%, p=0.006).[17]

3) If infection occurs despite the above measures, an oral antimicrobial agent in combination with rifampin (if the strain is susceptible) may be considered for decolonization (eg doxycycline plus rifampin). [6] This is supported by a systematic review that found oral antibiotics combined with rifampin to be more successful in eradicating *S. aureus* colonization than oral antibiotics alone.[18]
4) Screening and surveillance cultures are not routinely recommended. [6]

7. Prevention and Control

7.1 General recommendations for healthcare practitioners

The Canadian Working Group (CWG) recommends the following to prevent CA-MRSA: [19]

1) Judicious and appropriate prescription of antibiotics
2) Notification to public health officials if outbreak is suspected i.e. spread beyond a family unit to a localized community group
3) Patient education about hygiene practices (See Section 7) and adherence to the prescribed course of antibiotics

The CWG guideline also makes recommendations for individuals with MRSA (see Section 7) and for different settings such as the setting of an outbreak (Refer to the original guideline for details). [19]

7.2 Screening

The BC Centre for Disease Control (BCCDC) recommends against active screening for carriers except for individuals with recurrent *S. aureus* infection (≥2 per 6 months) despite enhanced hygiene measures and their closed communities or families.[13] Nares are the recommended site to screen for CA-MRSA in the community.

7.3 Environmental Cleaning [13]

Soaps and disinfectants are used to reduce the amount of MRSA and other bacteria in the environment. Alcohol-based hand rubs are an antiseptic and should not be used for environmental cleaning.

Surfaces that are likely to come in contact with skin should be cleaned and these include:

- Towels or wash cloth
- Clothes
- Bedding (sheets and linens)
- Razors, nail files, tweezers
- Counters
- Chairs and benches (e.g. gym benches)
- Shared equipment

Soaps (aka cleaner or detergent) remove soil, dirt, dust, organic matter and germs off surfaces so they can be rinsed away with water.

- Use a bar of soap or plain liquid soap for everyday washing
- Do NOT use antibacterial or antibiotic soaps – these chemicals are ineffective, unnecessary, harmful to the environment and may increase bacterial resistance to antibiotics

Disinfectants (e.g. bleach) destroy or inactivate bacteria and prevent them from growing. They do not remove dirt, soil or dust.

- Disinfectants can be used on surfaces etc but not on skin
- Sanitize surfaces that have come in contact with the infected area
- The BCCDC recommends using Health Canada approved disinfectants

Using Disinfectants

- Check the disinfectant product's label on the container. Most will provide a list of germs that their product can kill.
- Read the label for instructions about:
    - How to apply the product to a surface
    - How long one should leave it on the surface to be effective (contact time)
    - If the disinfectant is safe for the surface
    - Dilution with water before use (if required)
    - Precautions to take when applying the product, such as wearing gloves or aprons and good ventilation

Laundry

- Towels, washcloths, sheets, linens and clothing can be cleaned using regular laundry detergent
- Hot water washing is not necessary for all laundry. Read and follow the clothing and soap or detergent label instructions.
- It is not necessary to use bleach for each load of laundry. Clean laundry produced by washing with detergent alone will be safe for wear and use. Use of bleach as a disinfectant in laundering is optional, and not all fabrics are suitable for bleach.

8. Information for Patients [13]

8.1 Personal Hygiene

Clean your hands frequently with soap and water or use an alcohol-based hand rub.

Do not use disinfectants to clean your hands.

For those with an infection, you, your family, and others in close contact should clean your hands frequently - especially before and after changing the bandage or touching the infected area.

Differences between soap and hand sanitizers

- **Soaps** (aka cleaner or detergent) works by removing soil, dirt, dust, organic matter and germs off surfaces so they can be rinsed away with water
- Use a bar of soap or plain liquid soap for everyday washing
- Do NOT use antibacterial or antibiotic soaps – these chemical are not effective, are not needed and are harmful to the environment. They can increase bacterial resistance to antibiotics.

- **Alcohol- based hand sanitizers** are used to reduce germs to levels considered safe from the surface of the hands.
- Sanitizers will not remove dirt, soil, or dust
- Hands that are visibly soiled need to be washed with soap and water to mechanically remove the dirt, soil etc.

On a daily basis, wash your body with soap and water. For athletes, shower immediately after each game or practice.

8.2 Personal Items

Avoid sharing personal items. If you have an MRSA infection, do not share personal items that may have had contact with the infected wound or bandage. Wash sheets, towels, and clothes that come in to contact with the infection using water and laundry deter gent. Usual laundry and dryer settings are effective in killing MRSA.

Personal items include:

- Razor
- Towels
- Clothing or uniforms
- Toothbrushes
- Nail files
- Combs and brushes
- Creams or lotions
- Soaps and make-up
- Athletic equipment that touches the skin

8.3. Wound Care

Keep any wounds that are draining, or have pus, covered with clean, dry bandages until they have healed (scabbed over). Follow your doctor's instructions on proper care of the wound.

Keeping the infection covered will help prevent spreading it to others. Bandages and tape can be discarded with regular waste... and don't forget to clean your hands!

8.4 Clean Environment

Create a daily cleaning schedule for surfaces that come in contact with your skin. For those with an MRSA infection, clean all surfaces that come into direct contact with infected area.

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10. Clinical Flow Chart