

Group A Streptococcus

What paediatric health-care providers need to know

The purpose of this document is to provide an overview of Group A Streptococcal (GAS) infections, especially severe invasive disease, as is relevant to the paediatric care provider. The following is a list of common questions related to the epidemiology, classification, diagnosis, and management of GAS infections, notably severe invasive GAS (iGAS). The full spectrum of the epidemiology of iGAS in Ontario, including monthly case counts, age distribution, hospitalizations and fatal outcomes is available [here](#).

What clinical syndromes are caused by GAS?

GAS can cause non-invasive infections that are typically mild, including pharyngitis, otitis media, sinusitis, and impetigo.

iGAS infections are characterized by isolation of GAS from a normally sterile site. These infections are more severe and include the following entities: Bacteremia, pneumonia, deep soft-tissue infections (myositis, necrotizing fasciitis), bone and joint infections (septic arthritis, osteomyelitis), endocarditis, meningitis, and toxic shock syndrome (TSS). TSS, pneumonia (with isolation of GAS from a sterile site such as pleural fluid), meningitis, soft tissue necrosis, and/or infection resulting in mortality are characterized as severe invasive disease. To meet the criteria for TSS, the patient must have hypotension and two or more of: generalized erythematous macular rash, transaminitis, renal impairment, coagulopathy, or acute respiratory distress syndrome (ARDS).

Non-suppurative sequelae include acute rheumatic fever, post-streptococcal glomerulonephritis and scarlet fever. Acute rheumatic fever can be avoided with adequate treatment of the primary infection.

Who is most affected by GAS pharyngitis?

GAS pharyngitis most commonly occurs in school-aged children and adolescents. It is uncommon in children younger than 3 years old.

How is GAS pharyngitis diagnosed?

A throat swab sent for bacterial culture is the gold-standard test to diagnose GAS pharyngitis. Point-of-care rapid antigen tests have a high specificity for detection of GAS, but lower sensitivity compared to bacterial culture; a negative point-of-care rapid antigen test does not rule out GAS pharyngitis. A bacterial culture may be considered as a back-up in children with a negative rapid antigen test.

Testing should be performed in patients 3 years and older if there is high clinical suspicion for GAS pharyngitis (fever, sore throat, inflamed/purulent tonsils, palatal petechiae, tender anterior cervical lymphadenopathy, and absence of viral symptoms). Clinical decision rules such as the Modified Centor score can assist with determining which individuals should be tested. Establishing a diagnosis is important in limiting inappropriate antibiotic use.

Testing should not be routinely performed in children presenting with a sore throat if viral symptoms such as cough, rhinorrhea or hoarseness are also present as these children almost

always have viral pharyngitis; positive results likely indicate colonization rather than infection. Asymptomatic carriage rates as high as 25% have been reported in children. Carriage may persist for many months, but generally is associated with a low risk of transmission to others.

How should GAS pharyngitis be treated?

Penicillin is the treatment of choice for GAS infections, as resistance to penicillin has never been described. A 10-day course of penicillin V (twice daily) or amoxicillin (once daily) should be prescribed for treatment of GAS pharyngitis. In patients with non-anaphylactic penicillin allergies, a 10-day course of cephalexin may be used. In patients with anaphylactic penicillin allergies, treatment options include azithromycin (5-day course), clarithromycin (10-day course), or clindamycin (10-day course). Resistance rates to non-beta-lactam antibiotics can be as high as 20%; susceptibilities to these agents should be confirmed if use is necessary. Please refer to dosing options in a reliable pediatric formulary.

Asymptomatic carriage should not be treated with antibiotics, except in very specific scenarios which are beyond the scope of this document.

What are the chances of developing severe invasive disease following pharyngitis?

GAS pharyngitis is not expected to lead to severe iGAS infection. Based on preliminary information from recent cases of severe iGAS, viral pharyngitis has been documented prior to some cases of iGAS, but the relationship and risk factors are not clear.

What are the early signs and symptoms of necrotizing fasciitis and TSS?

Early signs and symptoms of necrotizing fasciitis include severe pain (out of keeping with clinical findings) and signs of cellulitis (fever, swelling, redness). In some cases, a wound might not be apparent, and severe pain might be the predominant symptom.

Early signs and symptoms of streptococcal TSS may include fever, dizziness, confusion, low blood pressure, rash and abdominal pain.

What is the role of surgery?

Early surgical assessment is crucial in cases of suspected necrotizing fasciitis. Swift evaluation and involvement of surgical specialists can aid in early detection, prompt intervention, and mitigation of potential complications. The surgical specialty to be involved depends upon the clinical presentation and involved tissues (at SickKids, Plastic Surgery manages skin, fat and muscle involvement, while both Plastic Surgery and Orthopedic Surgery manage elevated extremity compartment pressures). Timely surgical interventions, such as debridement and fasciotomy, are essential to remove necrotic tissue, control infection spread, and improve patient outcomes.

How should iGAS be treated?

Empiric regimens for GAS infections depend on the site and severity of infection.

Treatment regimens for selected non-severe GAS infections		
	Empiric regimen	Once GAS confirmed
Lymphadenitis	Cephalexin (PO) / Cefazolin (IV)	Penicillin V (PO)* / Penicillin G (IV)
Cellulitis	Cephalexin (PO) / Cefazolin (IV)	Penicillin V (PO)* / Penicillin G (IV)
Soft tissue abscess	Cephalexin (PO) / Cefazolin (IV)	Penicillin V (PO)* / Penicillin G (IV)
Septic arthritis	Cefazolin	Penicillin G
Osteomyelitis	Cefazolin	Penicillin G
Pneumonia (if not regarded as severe, non-ICU patient)	Ampicillin Alternative – ceftriaxone	Penicillin G
Bacteremia	Ceftriaxone + vancomycin	Penicillin G

Treatment regimens for selected severe iGAS infections		
	Empiric regimen	Once invasive GAS confirmed
Pneumonia (if regarded as severe, including in ICU patient)	Ceftriaxone +/- vancomycin +/- clindamycin**	Penicillin G +/- clindamycin**
Meningitis	Ceftriaxone + vancomycin	Penicillin G
Toxic shock syndrome	Ceftriaxone + vancomycin + clindamycin Consider IVIG	Penicillin G + clindamycin Consider IVIG
Necrotizing fasciitis	Piperacillin-tazobactam + clindamycin +/- vancomycin Consider IVIG	Penicillin G + clindamycin Consider IVIG

Additional Treatment Considerations

***Amoxicillin PO** may replace Penicillin V when an oral suspension is required, as Penicillin is only available as a 300mg tablet.

Adjunctive therapies - Adjunctive therapies for severe iGAS infection target toxin production or the effects of toxins. The main adjunctive therapies used in this context are clindamycin and IVIG. When indicated, these should be initiated in an expeditious manner.

****Clindamycin** – For severe invasive toxin-mediated disease, including TSS. Reassess the need for ongoing clindamycin once patient is hemodynamically stable, with negative blood cultures, and clinically beginning to improve.

IVIG – For severe invasive toxin-mediated disease, including TSS. The dosing regimen is 1g/kg on day 1, followed by 0.5g/kg on days 2 and 3.

TSS - Empiric regimens for TSS should cover for GAS as well as other pathogens such as *Staphylococcus aureus*, as these organisms cannot be differentiated based on presentation alone.

Which cases are reportable to public health?

All cases of iGAS are reportable to the patient's [local public health unit](#). This includes cases with signs and symptoms of severe iGAS with GAS detected from a non-sterile specimen, in the absence of another etiology (see case definition [here](#)). Reports should occur immediately upon iGAS confirmation, and not delayed to the next business day. Reporting is to be performed by the most responsible physician in the patient's care and the laboratory isolating GAS from a sterile site culture.

How should close contacts be managed?

Prophylaxis with cephalexin should be initiated as soon as possible (but up to 7 days after last contact) for close contacts of patients with severe iGAS, if deemed appropriate by the patient's local public health unit. Close contacts of patients with iGAS (including non-severe cases) should be counselled to self-monitor for fever and other signs/symptoms of GAS for 30 days. The definition of close contacts is available [here](#).

What steps can be taken to prevent iGAS infections?

Encourage good hygiene measures, including hand washing, to reduce the risk of spread of GAS and respiratory viral infections that might precede iGAS. Counsel patients that staying home until 24 hours after starting appropriate antibiotic therapy for group A strep pharyngitis may reduce transmission to others. While there is no currently available vaccine for GAS, it is important to encourage patients to stay up to date with their immunizations, particularly influenza and varicella immunizations, as these infections can predispose to GAS infection.

How should parents be counseled regarding signs and symptoms of iGAS?

Parents and clinicians should be aware of the potential for secondary bacterial infections, including severe iGAS, in settings where an antecedent viral illness with initial improvement is associated with subsequent clinical deterioration.

Parents should seek prompt medical attention for their children should they develop any of the following signs/symptoms:

- Rapid progression of illness
- Fever longer than 5 days in duration, fever in a child under the age of 3 months, or fever in an immunocompromised child
- Dehydration
- Lethargy, confusion, unusual behaviour, movement, or speech
- Severe headache or pain with neck movement, persistent vomiting
- Rapid breathing, difficulty breathing or breathlessness
- Pale, cool and/or clammy skin, pale or blue lips
- Full body sunburn-like rash, sandpaper rash
- Severe pain, swelling and/or redness to an extremity

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