Streptococcal Disease – Group A, Invasive

Revision Dates

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Case Definition

**Confirmed Case**
- Isolation of group A streptococcus (*Streptococcus pyogenes*) from a normally sterile site\(^1\). Confirmed cases may or may not have severe invasive disease\(^2\).

**Probable Case**
- Severe invasive disease\(^2\) in the absence of another identified etiology and with isolation of group A streptococcus from a non-sterile site.

\(^1\) Normally sterile site specimens are defined as:
- blood,
- cerebrospinal fluid (CSF),
- pleural fluid,
- peritoneal fluid,
- pericardial fluid,
- bone,
- joint fluid or
- specimens taken during surgery (e.g., muscle collected during debridement for necrotizing fasciitis or fluid from a deep abscess). NOTE: A specimen taken from a non-sterile site collected during a sterile procedure is not considered a “normally sterile site”.

\(^2\) Severe invasive disease may manifest as several conditions. These include:
- streptococcal toxic shock syndrome (STSS), which is characterized by hypotension (systolic blood pressure < 90 mm Hg in an adult and < 5\(^{th}\) percentile for age of children) and at least TWO of the following signs:
  - renal impairment (creatinine level > 177 \(\mu\)mol/L for adults)
  - coagulopathy (platelet count < 100,000/mm\(^3\) or disseminated intravascular coagulation)
  - liver function abnormality (AST, ALT or total bilirubin > 2x upper limit of normal)
  - adult respiratory distress syndrome (ARDS)
  - generalized erythematous macular rash that may desquamate
- soft tissue necrosis, including necrotizing fasciitis, myositis or gangrene
- meningitis
- GAS pneumonia  NOTE: Pneumonia with isolation of GAS from bronchoalveolar lavage (BAL) when no other cause has been identified should be regarded as a form of severe invasive disease for the purposes of public health management.
- other life threatening conditions (as determined on a case-by-case basis)
- death
Reporting Requirements

1. Physicians, Health Practitioners and others
Physicians, health practitioners and others listed in Sections 22(1) or 22(2) of the Public Health Act shall notify the Medical Officer of Health (MOH) (or designate) by the fastest means possible (FMP) i.e., direct voice communication of all confirmed and probable cases of invasive group A streptococcal disease causing any of the following
• Necrotizing Fasciitis (NF),
• Streptococcal Toxic Shock Syndrome (STSS), and
• Death.

Physicians, health practitioners and others listed in Sections 22(1) or 22(2) of the Public Health Act shall notify the MOH (or designate) of all other confirmed and probable cases in the prescribed form by mail, fax or electronic transfer within 48 hours (two days).

2. Laboratories
All laboratories, including regional laboratories and the Provincial Laboratory for Public Health (ProvLab) shall in accordance with Section 23 of the Public Health Act, report all positive laboratory results to the:
• Chief Medical Officer of Health (CMOH) (or designate) by mail, fax or electronic transfer of the positive laboratory report within 48 hours (two days),
• MOH (or designate) by FMP of all confirmed and probable cases and
• Attending/ordering physician by FMP of all confirmed and probable cases.

Isolates collected from a normally sterile site (i.e., invasive) may be submitted to the National Center for Streptococcus located at the Provincial Laboratory for Public Health in Edmonton, Alberta for passive surveillance of M serotyping and antimicrobial susceptibility trend analysis.

3. Alberta Health Services and First Nations and Inuit Health Branch
• The MOH (or designate) shall notify the CMOH (or designate) by FMP of all confirmed and probable cases of:
  o NF,
  o STSS, and
  o Death caused by invasive GAS.
• The MOH (or designate) of the zone where the case currently resides shall forward the preliminary Notifiable Disease Report (NDR) of confirmed and probable cases to the CMOH (or designate) within two weeks of notification and the final NDR (amendments) within four weeks of notification.
• For out-of-zone cases, the MOH (or designate) first notified shall notify the MOH (or designate) where the client resides by FMP and immediately fax a copy of the positive laboratory report.
• For out-of-zone susceptible contacts requiring follow-up, the MOH (or designate) first notified shall notify the MOH (or designate) where the contact resides as soon as possible with the following information including:
  o name,
  o date of birth, and
  o contact information i.e., address and phone number.
• For out-of-province and out-of-country cases, the following information should be forwarded to the CMOH (or designate) by mail, fax or electronic transfer including:
  o name,
  o date of birth,
  o out-of-province health care number,
  o out-of-province address and phone number,
  o attending physician (locally and out-of-province) and
  o positive laboratory report (faxed).

• For out-of-province and out-of-country contacts, the following information should be forwarded to the CMOH (or designate) by mail, fax or electronic transfer including:
  o name,
  o date of birth,
  o out-of-province health care number,
  o out-of-province address and phone number,
  o attending physician (locally and out-of-province) and
  o positive laboratory report (faxed).
Etiology

Group A streptococcal (GAS) disease is caused by *Streptococcus pyogenes*, a gram positive, non-spore forming, non-motile bacterium. Distinct group A streptococcal serotypes have been identified through *emm* typing and *emm* serotyping. There are over 120 serotypes or genotypes.(1) The M protein, which is encoded by the *emm* gene, is an important virulence factor and is also an epidemiological marker that is used worldwide to characterize GAS isolates. (2) Certain *emm* types are correlated with specific manifestations of group A streptococcus disease. (2)

Clinical Presentation

*S. pyogenes* can cause a variety of invasive and non-invasive infections. The most frequently encountered illnesses caused by *S. pyogenes* are sore throat (strep throat) and skin infections such as impetigo or pyoderma.(1) *S. pyogenes* can also cause scarlet fever, puerperal fever, erysipelas, sepsisemia, cellulitis, mastoiditis, otitis media, pneumonia, peritonitis, wound infections, necrotizing fasciitis and streptococcal toxic shock syndrome. (3)

The symptoms preceding the onset of invasive GAS disease are variable depending on the manifestation or site of infection. Symptoms may be vague and include pain of unusual severity, swelling, fever, chills, flu-like symptoms, generalized muscle aches, generalized macular rash, bullae, nausea, vomiting, diarrhea, malaise or joint pain.(1;3;4)

Streptococcal toxic shock syndrome (STSS) and necrotizing fasciitis (NF) are the most serious manifestation of invasive GAS. STSS is caused by a toxin-producing GAS strain and is characterized by fever and hypotension along with multi-organ involvement. (1) Necrotizing fasciitis can have devastating consequences and symptoms usually include fever and a red, painful swelling of tissue which spreads rapidly. (5). NF is diagnosed when the disease spreads along the layer of tissue that surrounds the muscle (fascia). It is treated by surgical debridement of the infected tissue along with antibiotic therapy. (6)

Diagnosis

The diagnosis of a confirmed case of invasive GAS disease is made by isolating *S. pyogenes* from a normally sterile site. Cultures of blood and focal sites of possible infection including blood, CSF, pleural fluid, and tissues obtained in the operating room or from sites showing evidence of NF or myositis. Positive samples should be submitted by the laboratory to the National Centre for Streptococcus (NCS) for serotyping. The NCS performs M typing and molecular *emm* gene sequencing for *S.pyogenes* for routine surveillance. (7)

Molecular sequencing and susceptibility testing are helpful in characterizing outbreaks, determining disease trends and guiding appropriate clinical management of cases and contacts.

Epidemiology

Reservoir

Humans.(3)

Transmission

Transmission is generally person-to-person by large respiratory droplets or by direct contact with patients or carriers, extremely rarely through indirect contact with objects. (3)
Foodborne outbreaks of pharyngitis have been reported. This is generally a consequence of human contamination of food along with improper food preparation or refrigeration. (1)

**Incubation Period**
The incubation period is not clearly defined and may depend on the route of inoculation. It has been described as short, typically 1-3 days, but may be as long as seven days in cases of non-invasive disease. (3) In cases associated with the accidental subcutaneous inoculation of organisms, such as during childbirth or after penetrating trauma, the incubation period may be as short as 14 hours. (1)

**Period of Communicability**
GAS is communicable for 10 – 21 days in untreated, uncomplicated cases but may last for weeks or months if purulent discharge is present. (3) With adequate treatment, transmissibility is generally terminated within 24 hours. (3)

**Host Susceptibility**
Susceptibility is universal. The development of invasive GAS disease appears to be facilitated by the presence of specific virulent strains, predisposing host factors such as younger or older age, and chronic health stresses such as HIV infection, cancer, cardiovascular disease, diabetes, respiratory disease and alcohol abuse. (7) Factors that increase the likelihood of developing STSS include age (neonates and older adults), diabetes, alcoholism, surgical procedures, penetrating trauma (e.g., insect bites, lacerations, slivers, burns), non-penetrating trauma (e.g., bruise, hematoma, muscle strain) and having varicella disease. (4)

The risk of invasive GAS infection among people living in the same household as a case is estimated to range between 0.66 – 2.94 per 1000. (8-9) Estimates are based on extremely small numbers of subsequent cases, however, the estimated rates are higher than the rate of sporadic disease in the general population. (7)

Immunity only develops against the specific M type of GAS and may last for years. (3)

**Occurrence**

**General**
Worldwide rates of NF and STSS increased from the mid 1980’s to the early 1990’s. Increases in severe disease caused by GAS was due to the increase in prevalence of M-1 and M-3 serotypes (emm types 1 and 3). (5) The World Health Organization concludes that 1.78 million new cases of serious GAS occur and are responsible for over 500,000 deaths worldwide. (10)

Limited information on the frequency of secondary disease transmission is available. Clusters of cases in hospitals, long-term care facilities (LTCF), and households have been reported. (7)

**Canada**
National surveillance of invasive GAS began in January 2000. (7) Published and unpublished national data between 2000 and 2011 reports an overall incidence of disease from a low of 2.6/100,000 in 2000 to high 4.8/100,000 in 2011, generally following an upward trend. (11)
Alberta

Invasive GAS was put under surveillance in Alberta in 1998. A resurgence of the disease became evident in the province in 1999 and subsequently, invasive GAS was made reportable in August 1, 1999. (12)

The rate of invasive GAS in Alberta from 2000 – 2012 has ranged from a low of 3.8/100,000 in 2003 to a high of 7.6/100,000 in 2007.

Source: Alberta Health Communicable Disease Registry System data pulled by onset date on February 4, 2013. Data not to be used for statistical purposes.
The most common *emm* types in Alberta from 2004-2011 were *emm*1 and *emm*59.

**Key Investigation**

**Single Case/Household Cluster**

- Obtain information on the clinical presentation.
- Determine whether or not specimen was collected from a *normally sterile site*.
- Determine if the case has severe invasive disease.

For the purposes of public health follow-up, **severe invasive disease** will be defined as: A case of STSS, soft tissue necrosis (including NF, myositis or gangrene), meningitis, GAS pneumonia, other life-threatening conditions or a confirmed case resulting in death.(7)

- Identify risk factors/susceptibility for acquiring disease.
- Identify close contacts. Close contacts include household and non-household contacts as well other specified contacts.
  - Household contacts are considered individuals who have spent at least four hours per day, on average, in the previous seven days or 20 hours per week with the case including:
    - persons living in the household, and
children and staff of family dayhomes.

- Non-household contacts are considered individuals who have had exposure to the case during the period from seven days prior to the onset of symptoms to 24 hours after the initiation of antimicrobial therapy in the case AND are identified as:
  - individuals who share the same bed with the case or had sexual relations with the case,
  - persons who have had direct mucous membrane contact with the oral or nasal secretions of the case (e.g., mouth-to-mouth resuscitation, open-mouth kissing but does not include kissing with closed mouth or sharing utensils, water bottles, cigarettes, etc.),
  - persons who have had direct contact with an open skin lesion of the case, or
  - injection drug users who have shared needles with the case.

- Classmates, work colleagues as well as social or sports contacts of a case are not considered contacts unless they meet the criteria for close contacts. Secondary cases in schools (kindergarten and older) and workplaces are rare.
- Child care centre (excluding Family Day Homes) attendees and staff (refer to ANNEX A).
- LTCF residents and staff (refer to ANNEX B).
- Hospital patients and staff (refer to ANNEX C).

**NOTE:** If the case has symptoms that are clinically compatible with the illness, e.g., pharyngitis a few days before diagnosis of invasive GAS, use this symptom onset date as Day 1. If uncertain, consult the MOH.

### Control

**Management of a Case**

- Confirm that the case has received appropriate antimicrobial therapy.
- Contact and droplet precautions should be instituted when caring for hospitalized patients with known or suspected invasive GAS until 24 hours of effective antibiotic therapy is complete.(13)
- The infection control practitioner (or designate) should be notified immediately if a health care worker (HCW) with suspected or confirmed GAS disease (invasive or non-invasive) worked while the infection was communicable or if there is any possibility that the infection might have been occupationally acquired.

**Treatment of a Case**

- Laboratory testing of antimicrobial sensitivity of the GAS strain is useful in determining appropriate antibiotic therapy.
- GAS is treated with antibiotics.
- High-dose parenteral therapy is generally required for severe infections.
- Treatment may continue for 2 – 6 weeks.

**Management of Contacts (7)**

- Educate all close contacts of invasive GAS disease about disease transmission, appropriate personal hygiene, routine practices and contact precautions.
- Educate all close contacts of invasive GAS disease about signs and symptoms of disease and advise to seek medical attention immediately if they develop a febrile illness or another clinical manifestation of GAS within 30 days of diagnosis in the index case.
- Offer chemoprophylaxis to close contacts of cases with **severe invasive disease** (i.e., a case of STSS, soft tissue necrosis [including NF, myositis or gangrene], meningitis, GAS pneumonia, other life-threatening conditions or a confirmed case resulting in death).(7) Recommended chemoprophylaxis is outlined in [Table 1](#).
Chemoprophylaxis is provided to eradicate nasopharyngeal colonization of GAS and prevent secondary cases. Chemoprophylaxis should be administered as soon as possible and preferably within 24 hours of case identification but may be offered up to seven days after the last exposure unless the exposure occurred after the case has completed 24 hours of appropriate antibiotic therapy. Refer to ANNEX A for management in child care attendees and staff. Refer to ANNEX B for management in Long Term Care Facility (LTCF) residents and staff. Refer to ANNEX C for hospital patients and staff. Consult with the MOH for unusual situations that do not fall under the above scenarios. Antibiotics for chemoprophylaxis are listed in the table “Chemoprophylaxis for Invasive Group A Streptococcal Disease”.

Preventive Measures
- Educate the public and HCW about the modes of transmission.
- Maintain appropriate infection control practices.
- Transmission is most effectively prevented by strict adherence to good hand hygiene and other routine practices.
- Offer varicella vaccine as per the current Alberta Immunization Policy. Universal varicella immunization could potentially prevent up to 15% of all pediatric invasive GAS disease. (14)
### TABLE 1

Chemoprophylaxis for Invasive Group A Streptococcal Disease(7)

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<tr>
<td>First generation Cephalosporins:</td>
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<tr>
<td>Cephalexin</td>
<td>Children and adults: 25 to 50 mg/kg/day, to a maximum of 1g/day, in 2 – 4 divided doses x 10 days.</td>
<td>First Line</td>
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<td>Recommended for pregnant and lactating women.</td>
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<td></td>
<td>Should be used with caution in patients with allergy to penicillin.</td>
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<td>Use of cephalosporins with nephrotoxic drugs (e.g., aminoglycosides, vancomycin) may increase the risk of cephalosporin-induced nephrotoxicity.</td>
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<td>Erythromycin</td>
<td>Children: 5 – 7.5 mg/kg every 6 hours or 10 – 15 mg/kg every 12 hours (base) x 10 days. (Not to exceed maximum of adult dose) Adults: 500 mg every 12 hours (base) x 10 days.</td>
<td>Second Line</td>
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<td>Erythromycin estolate is contraindicated in persons with pre-existing liver disease or dysfunction and during pregnancy.</td>
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<td>Sensitivity testing is recommended in areas where macrolide resistance is unknown or known to be &gt; 10%.</td>
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<td>Clarithromycin</td>
<td>Children: 15 mg/kg/day in divided doses every 12 hours, to a maximum of 250 mg twice daily x 10 days. Adults: 250 mg twice daily x 10 days.</td>
<td>Second Line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contraindicated in pregnancy.</td>
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<tr>
<td></td>
<td></td>
<td>Sensitivity testing is recommended in areas where macrolide resistance is unknown or known to be &gt; 10%.</td>
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<tr>
<td>Clindamycin</td>
<td>Children: 8 – 16 mg/kg/day divided into 3 or 4 equal doses x 10 days. (Not to exceed maximum of adult dose) Adults: 150 mg every 6 hours x 10 days.</td>
<td>Second Line</td>
</tr>
<tr>
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<td></td>
<td>Contraindicated in pregnancy and lactation.</td>
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<tr>
<td></td>
<td></td>
<td>Alternative for persons who are unable to tolerate beta-lactam antibiotics.</td>
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ANNEX A: Child Care Centre Attendees and Staff (7)

Key Investigation
Investigation may be warranted if one case of invasive GAS disease with severe invasive disease* occurs in a child care centre. Consideration should be taken as to:

- the nature of the facility (e.g., type of centre including size and physical structure, number and ages of children, interaction of children),
- the characteristics of the case (e.g., secondary to varicella infection),
- the potential for a source of infection within the centre including:
  - whether there has been any known streptococcal infections (e.g., other cases of invasive GAS, pharyngitis, impetigo), and
  - potential of a point source of infection.
- the presence of varicella cases within the centre in the previous two weeks, and
- the potential for a source of infection from outside the centre (e.g., exposure to a family member with GAS infection).

Management of Contacts
Chemoprophylaxis is generally not recommended when one case of invasive GAS is identified in a child care centre.

- When one case of invasive GAS is identified in a child care centre:
  - alert parents/guardians to the signs and symptoms of invasive GAS and advise them to seek medical attention should the child develop a febrile illness or any other clinical manifestation of GAS.
  - Screening of attendees and staff is not required.
  - Staff should notify public health if further cases of invasive GAS infection occur within 1 – 2 months.
  - Appropriate specimens can be taken for culture to rule out GAS when suspected infections are detected during this period, however, routine screening of attendees is not recommended.
  - Chemoprophylaxis may be recommended in situations where one case of invasive GAS with severe invasive disease occurs AND
    - a subsequent confirmed case of invasive GAS occurs in children or staff of the child care centre within one month
    - there is a concurrent varicella outbreak in the child care centre.
- Isolates from cases occurring more that one month apart should be tested to determine strain relatedness.
  - Consultation with the microbiologist on-call is recommended.
- If a case of varicella has occurred in the child care centre within the two weeks before onset of symptoms in the index case, all attendees should be assessed for varicella vaccination history.
  - Varicella vaccination should be recommended for those without a history of prior varicella infection or vaccination as per the current Alberta Immunization Policy.
- A test of cure is not required for persons (children or staff) receiving chemo prophylaxis.

*severe invasive disease includes; case of STSS, soft tissue necrosis (including NF, myositis or gangrene), meningitis, GAS pneumonia, other life-threatening conditions or a confirmed case resulting in death.(7)
ANNEX B: Long Term Care Facility (LTCF) Residents and Staff (7)

Residents of LTCF are at increased risk of morbidity and mortality due to invasive GAS disease because of their older age and/or higher prevalence of underlying conditions. When a confirmed case of invasive GAS occurs in a LTCF, there is 38% likelihood that a second positive blood culture-confirmed case of the same strain will be detected in the facility within six weeks.

Key Investigation
When a confirmed case of invasive GAS disease occurs in a LTCF, the facility should:

- Report the case to the MOH.
- Conduct a retrospective chart review of the entire facility’s residents over the previous 4 – 6 weeks for culture confirmed cases of GAS disease and suggested cases of non-invasive or invasive GAS infection, including skin and soft tissue infections (e.g., pharyngitis and cellulitis) and excluding pneumonia and conjunctivitis not confirmed by culture.

Management of Contacts

- Chemoprophylaxis is recommended for close contacts when there is invasive GAS and the case has severe invasive disease.
- Persons who share a room with a case are not considered contacts unless they meet the criteria of close contacts i.e., the roommate has had direct mucous or non-intact skin contact with respiratory tract secretions or skin lesions of the case.
  - Contacts should be assessed on a case-by-case basis.
- HCWs are not considered contacts unless they meet the criteria of close contact i.e., infection control practices are breached, or direct contact of mucous membranes or non-intact skin with fluid from the nose, mouth or wound of a case as described above has occurred (e.g., direct mouth to mouth resuscitation).
  - Referral of the exposed staff to their Occupational Health Department would be appropriate.

An excess of GAS infection (or a LTCF outbreak) is defined as:

- an incidence rate of confirmed invasive GAS infection of >1 per 100 residents per month OR
- at least two cases of confirmed invasive GAS infection in one month in LTCF with fewer than 200 residents
  OR
- an incidence rate of suggested invasive or non-invasive GAS infections of >4 per 100 residents per month.

If an excess of GAS infection is identified, following actions should be considered:

- All patient care staff should be screened for GAS with throat, nose and skin lesion cultures.
  - In LTCF with fewer than 100 beds, all residents should be screened for GAS.
  - In LTCF with 100 beds or greater, screening can be limited to all residents within the same care unit as the infected case and contacts of the case if necessary, unless patient and care staff movement patterns or epidemiologic evidence (e.g., from the chart review) suggest that screening be conducted more broadly.
- Anyone colonized with GAS should receive chemoprophylaxis.
- Non-patient care staff should be asked about possible recent GAS infections. Those with a positive history should be screened for GAS and those who are positive should be treated with antibiotics as per the recommended regimen.
- All GAS isolates should have further typing.
Culture for a test of cure is recommended for individuals found to have the outbreak-related strain, particularly if there is epidemiologic evidence indicating that the contact with the individual is significantly related to illness.

Culture for a test of cure is not necessary for individuals infected with a strain of GAS not related to the outbreak.

- All GAS positive residents and staff should be re-screened, including throat and skin lesions 14 days after chemoprophylaxis has been started.
  - This should be followed by screening at two weeks and at four weeks after the first re-screening.
  - If the person is found to be positive, a second course of chemoprophylaxis should be offered.
  - If the person is still colonized after the second course, discontinue chemoprophylaxis unless the facility has an ongoing problem with GAS infection.

- Active surveillance for GAS infection should be initiated and continued for 1 – 2 months.
- Appropriate specimens should be taken for culture to rule out GAS when suspected infections are detected by active surveillance.

If no excess is identified, especially if there is evidence of an outside source of infection for the index case, then active surveillance alone for 2 – 4 weeks to establish the absence of additional cases is warranted.

*Severe invasive disease* includes; case of STSS, soft tissue necrosis (including NF, myositis or gangrene), meningitis, GAS pneumonia, other life-threatening conditions or a confirmed case resulting in death.(7)
ANNEX C: Hospital Patients and Staff (7)

Most cases of nosocomial invasive GAS are sporadic. It is important to recognize clinical presentations compatible with invasive GAS and institute additional precautions while waiting for confirmation.

Key Investigation
- Active surveillance for early identification of outbreaks may also be effective in preventing some cases.
- Prevention of a hospital outbreak of GAS infection requires very rapid investigation and intervention once a single hospital-acquired case has been identified.
- If, within one month of a confirmed invasive GAS case, one or more possibly linked invasive or non-invasive cases are identified in patients or staff, the situation should be treated as an outbreak.

Management of Cases and Contacts
- Contact and droplet precautions should be implemented when caring for patients with known or suspected invasive GAS until 24 hours of effective antimicrobial therapy is complete.

Management of HCW Exposed to GAS
- An occupational exposure of a HCW is defined as secretions from the nose, mouth, wound or skin of the infected person coming into contact with the mucous membranes or non-intact skin of the HCW within 7 days before the onset of GAS until 24 hours after effective antibiotic therapy.
- If the appropriate personal protective equipment was worn, there was no occupational exposure of the HCW.
- The risk of an exposed HCW developing GAS infection and the efficacy of prophylaxis is unknown.
- HCW who have an occupational exposure to patient with severe invasive disease* may be offered chemoprophylaxis.
- HCW who have an occupational exposure to any case of GAS should be counseled about symptoms associated with GAS and advised to seek care immediately if symptoms develop within 21 days of exposure.
- No screening, treatment, modifications of work practices or work restrictions for HCW in contact with a patient with GAS infection are required when there has not been an occupational exposure.

Management of HCW Colonized or Infected with GAS
- There are no modifications to work practices or work restrictions for HCW who are colonized with GAS and are asymptomatic if they are not epidemiologically linked to patient transmission.
- Asymptomatic colonized HCW who are epidemiologically linked to transmission of GAS to patients resulting in invasive or non-invasive disease should be offered chemoprophylaxis and should be excluded from care duties until 24 hours after the start of treatment with an effective antibiotic therapy.
- HCW with symptomatic GAS infection (invasive or non-invasive) should be offered therapy and should be excluded from patient care duties until 24 hours after the start of antibiotic therapy.
• HCW with symptomatic GAS infection and colonized HCW linked epidemiologically to an outbreak should be informed of the potential for transmission of GAS within households and be advised that symptomatic family members should seek medical evaluation.

Management of Possible or Confirmed GAS Outbreaks in Hospitals
• Detailed information on the management of possible or confirmed GAS outbreaks in hospitals can be found at [http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/32s2/index.html](http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/32s2/index.html)

*Severe invasive disease includes; case of STSS, soft tissue necrosis (including NF, myositis or gangrene), meningitis, GAS pneumonia, other life-threatening conditions or a confirmed case resulting in death.(7)
References


(11) Public Health Agency of Canada. Canadian Notifiable Disease Surveillance System Tables, 2009-2011: National Number and Rate (Per 100,000 Population/ Per 100,000 Live Births) Of Reported Cases By Age Group and Sex. 2012.

