NATIONAL CLINICAL GUIDELINES

The Diagnosis and Management of Group A Streptococcus (GAS) Infections in Children.

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

وزارة الصحـــــة العامـــــة
Ministry of Public Health
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Abbreviations

AMR	Anti-Microbial Resistance
APSGN	Acute Post-Streptococcal Glomerulonephritis
ARF	Acute rheumatic fever
CDC	Center for Disease Control and Prevention
DALYs	Disability-Adjusted Life-Years
EMS	Emergency Medical Services
GAS	Group A Streptococcus (GAS) disease
GDG	Guideline Development Group
G6PD	Glucose-6-Phosphate Dehydrogenase
HCW	Health Care Worker
IDSA	Infectious Disease Society of America
iGAS	Invasive group A streptococcus infections
IPC	Infection Prevention and Control
IPCT	Infection Prevention and Control Team
MOPH	Ministry of Public Health – Qatar
NAAT	Nucleic Acid Amplification Test
NCGPC	National Clinical Guidelines & Pathways Committee
NICE	National Institute for Health and Care Excellence
PCR	Polymerase chain reaction
PCT	Procalcitonin
PPE	Personal Protective Devices
RADT	Rapid Antigen Detection Test
rDNA	Recombinant DNA
RHD	Rheumatic Heart Disease
SAVES	Surveillance and Vaccine Electronic System
STSS	Streptococcal toxic shock syndrome
UKHSA	UK Health Security Agency
URTI	Upper Respiratory Tract Infection
WGS	Whole Genome Sequencing
WHO	World Health Organization

1 Information about this Guideline

1.1 Objective and Purpose of the Guideline

The purpose of this guideline is to define the appropriate diagnosis and management of 'Group A Streptococcus (GAS) infections in children aged 0-18 years. The objective is to support clinical diagnosis, promote appropriate use of antimicrobials, ensure patient safety and reduce inappropriate referrals to any provider organisation (i.e., hospitals or clinics) in Qatar.

It is intended that the guideline will be used by all healthcare professionals in primary and secondary tertiary healthcare settings, as well as nurses working in schools and childcare settings across Qatar.

1.2 Scope of the Guideline

This guideline covers aspects of care related to GAS infections:

- Presentation and management of the 'Group A Streptococcus (GAS) infections)' in children aged 0-18 years.
- Primary and secondary care management.

Aspects of care not covered in this guideline are:

- Management of complications of GAS infections.
- The guideline does not discuss active surveillance testing.

1.3 Editorial Approach

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH) through a process that aligns with international best practices in guideline development and localization. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology used to develop this guideline has involved the following critical steps:

- Extensive literature search for well-reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group (GDG), comprised of practicing healthcare professionals, subject matter experts and patient representatives from across Qatar.
- Independent review of the guideline by the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH, from amongst stakeholder organizations across Qatar.

Whilst the MOPH facilitates the development of the guideline, the MOPH does not influence the specific recommendations made within it.

This guideline is mainly based on the National Institute for Health and Care Excellence (NICE) Reinstatement of NICE sore throat guidance for children and young people February 2023, The UK Health Security Agency (UKHSA) report released on 2 December 2022, UK guidelines for the management of contacts of invasive group A streptococcus (iGAS) infection in community settings 2023, and Infectious Diseases Society of America (IDSA) Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis 2012.

1.4 Sources of Evidence

The scientific literature has been systematically queried using specially developed, customized, and tested search strings. Search strategies are developed to allow an efficient yet comprehensive analysis of relevant publications for the topic and to maximize the retrieval of articles with certain desired characteristics pertinent to the guideline.

All retrieved publications have been individually reviewed and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals.
3. Published by relevant organizations and societies.
4. Address an aspect of specific importance to the guideline in question.

Further information about the literature search and appraisal process is included in **Appendix A.**

1.5 Evidence Grading and Recommendations

Recommendations made within this guideline are supported by evidence from the medical literature, and where possible, the most authoritative sources have been used to develop this guideline.

To provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of the authoritativeness of the evidence used, where recommendations have been made within this guideline.

The evidence of adopted recommendations of international guidelines and the strongest evidence of more than one resource isgraded.

Level 1 (L1):

- Meta-analysis.
- Randomised controlled trials with meta-analysis.
- Randomised controlled trials.
- Systematic reviews.

Level 2 (L2):

- Observational studies, examples include:
  - Cohort studies with statistical adjustment for potential confounders.
  - Cohort studies without adjustment.
  - Case series with historical or literature controls.
  - Uncontrolled case series.

Level 3 (L3):

- Expert opinion.
- Unpublished data examples include:
  - Large database analyses.
  - Written protocols or outcomes reports from large practices.

To give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used where recommendations are made:

- **Recommendation Grade A (RGA):** Evidence demonstrates at least moderate certainty of a net benefit from the recommendation.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C (RGC):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended based on the clinical experience of the Guideline Development Groupmembers.

1.6 Guideline Development Group Members

The following table lists the Guideline Development Group (GDG) members nominated by their respective organisations and approved by the National Clinical Guidelines & Pathways Committee (NCGPC). The GDG members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

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Dr. Eman Al Maslamani	Senior Attending Paediatric Infectious Disease Medical Director of Infection Prevention & Control Ass. Professor of Clinical Paediatrics	SIDRA Medicine Weill Cornel Medicine-Qatar Qatar University- College of Medicine
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Nehayah Mousa Rababa	(School Health Nurse (Kindergarten Section	Primary Healthcare Corporation
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Table 1: Members of the Guideline Development Group.

1.7 National Clinical Guidelines & Pathways Committee Members

The following table lists members of the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH. The NCGPC members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
Name	**Title**	**Organization**
Ms. Huda Amer Al-Katheeri	Chair of the NCGPC, Director Strategic Planning & Performance Department	Ministry of Public Health
Shk. Dr. Mohammed Hamad J. Al Thani	Co-Chair of NCGPC, Director of Public Health	Ministry of Public Health
Dr. Hani Ben Hassen Al Kilani	Senior Consultant, Executive Director for Corporate Clinical Policy and Guidelines	Hamad Medical Corporation
Dr. Ibtihal Abdelgadir	Lead Clinical Practice Guidelines Committee	Sidra Medicine
Dr. Alshaymaa Mohammed A. M. Al-Motawa	Consultant Family Medicine, Lead Medical Officer (Doha)	QatarEnergy
Dr. Basil Bashqawi	Accreditation Specialist, Dept of Health Professions	Ministry of Public Health
Dr. Abi Khalil Charbel	Associate Professor of Medicine, Consultant Cardiology	Weill Cornell Medicine-Qatar
Dr. Paul Dijkstra	Director of Medical Education	Aspetar
Dr. Mohamed Elrishi	Senior Consultant Endocrine, Diabetes, and Internal Medicine	Al Ahli Hospital
Dr. Dahlia Mustafa Hassan	Senior Consultant Family Medicine	Primary Health Care Corp
Dr. Ghassan Youseph Hommos	Senior Consultant Endocrinology	Al Emadi Hospital
Dr. Marwan Abu-Hijleh	Professor and Acting Dean	College of Medicine, Qatar University

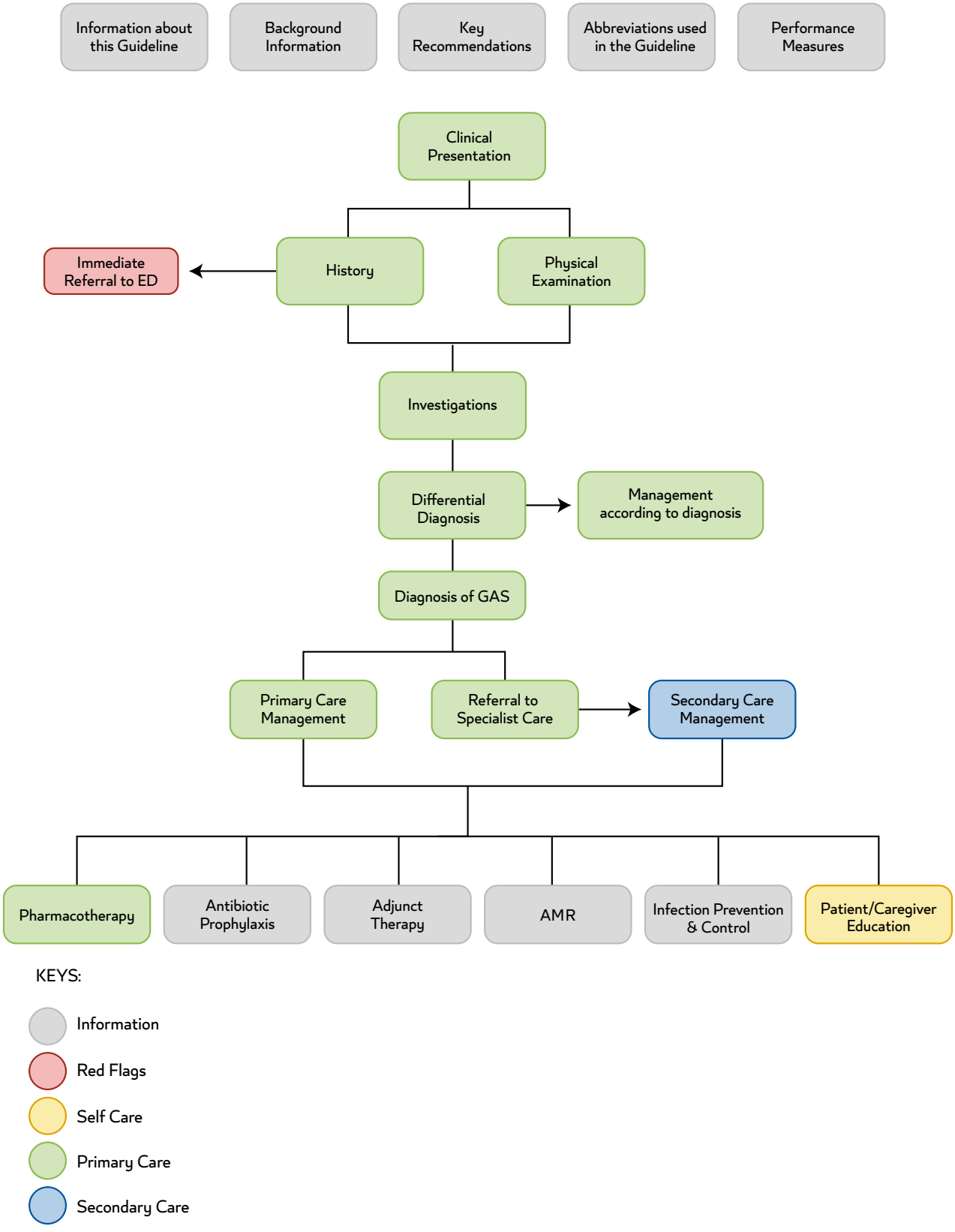
Table 2: Members of the National Clinical Guidelines & Pathways Committee.

1.8 Responsibilities of Healthcare Professionals

This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to consider this guidance when exercising their clinical judgment in the care of patients presenting to them.

The guidance does not override individual professional responsibility to make decisions appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers. They should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2 GAS Infections Pathway



3 Key Recommendations of the Guideline

The key recommendations of this guideline are as follows:

Care Settings (Section 1.1)

- Group A Streptococcus (GAS) infections should be recognised and managed in primary and secondary healthcare settings, tertiary care, and school health clinics **(R-GDG).**

Examination (Sections 7.1)

- Provide a comprehensive clinical assessment for all children presenting with fever to exclude any immediate life-threatening features, including airway compromise, breathing or circulation, and decreased level of consciousness. [8,9] **(L1, RGA**).
- At a minimum, look for temperature, heart rate, respiratory rate, capillary refill time, skin rashes, cervical lymph nodes, tongue and soft palate and any signs of dehydration. [8,9] **(L1, RGA**).
- The Centor and FeverPAIN33 scoring systems can be used to aid clinical decision-making to decide whether the child will benefit from antibiotic treatment [2,10,39] **(L1, RGA).**

Remote Assessment (Section 7.3)

- Remote assessment is not recommended for GAG-suspected cases **(R-GDG).**

Investigations (Section 8)

- Urgent investigations should be carried out for any child presenting with an illness compatible with GAS infection or for close contact cases seen in primary or secondary care settings [4,2,12] **(L1, RGA).**
- Perform a throat swab for Rapid Antigen Test (RAT) to confirm the presence of infection.
- Perform a throat culture if the RADT test is negative [46,47] **(L1, RGA).**
- Send immediate blood cultures before initiating the parenteral antibiotics if the child presents with a severe clinical presentation consistent with *i*GAS infection [4,2,12] **(L1, RGA).**

Primary Care Management (Sections 8, 10, 10.2)

- Perform a throat swab for a Rapid Antigen Test (RAT) for any child presenting with an illness compatible with GAS infection or was recently in contact with a case of GAS infection [2,4,12,46,47] **(L1, RGA).**
- All symptomatic patients should receive antibiotics immediately to limit the further spread of infection and reduce the risk of potential complications [16,32] **(L1, RGA).**
- Clinicians in primary care should maintain a low threshold for prompt referral to secondary care for children presenting with persistent or worsening symptoms of Group A Streptococcal Infection [2,15] **(L1, RGA).**
- Patients and caregivers should be informed to watch for signs of clinical deterioration and when and how to seek further help [2,15] **(L1, RGA**).

Referral to Secondary Care (Sections 6, 10.2)

- Children whose symptoms suggest life-threatening illness should be referred immediately for emergency medical care by the most appropriate means of transport (usually 999 ambulances) Qatar Emergency Medical Services (QEMS) [2,8] **(R-GDG).**
- The following factors should be considered when deciding whether to admit a child to the hospital [8] **(L1, RGA)**.
  - Social and family circumstances.
  - Other illnesses that affect the child or other family members.
  - Parental anxiety and instinct (based on their knowledge of their child).
  - Contacts with other people who have serious infectious diseases.

- Recent travel abroad to tropical or subtropical areas or areas with a high risk of endemic infectious diseases.
- Parents' or caregivers' concern for the child's current illness makes them repeatedly seek healthcare advice.
- If the family has experienced a previous serious illness or death due to feverish illness.
- When a fever has no obvious cause, but the child remains ill longer than expected for a self-limiting condition.

Secondary Care Management (Section 8, 10.2)

- Perform a throat swab for a Rapid Antigen Test (RAT) for any child presenting with an illness compatible with GAS infection or was recently in contact with a case of GAS infection [2,4,12,46,47] (**L1, RGA**).
- All symptomatic patients should receive parenteral antibiotics immediately (after withdrawal of blood cultures) to limit the further spread of infection and reduce the risk of potential complications [16,32] **(L1, RGA).**
- Physicians in secondary care settings need to be vigilant for suspecting GAS complications [15,16] **(L2, RGA).**
- Samples for viral and bacterial throat swabs, blood cultures, and tissue and fluid samples, including pleural aspirates (if applicable), should be sent if the aetiology is uncertain [15,16] **(L2, RGA).**
- Seek a second opinion from the microbiology team if there is a high index of clinical suspicion of iGAS disease whilst the culture-fluid specimens are negative **(L2, RGA)**.

Pharmacological Treatment (Section 10.4.1)

- Use Phenoxymethylpenicillin (Penicillin V) as the first-line management for children with no history of penicillin allergy. Alternatives to penicillin include macrolides, flucloxacillin and cefalexin [2,12,9] **(L1, RGA).**
- The duration of the antibiotics course depends on the type of GAS presentation [2] **(L1, RGA)**.
- Educate parents/caregivers on the importance of compliance with the antibiotic regimen and the possibility of antibiotic resistance in case of non-compliance with the recommended treatment duration, and contact the clinician if they have any concerns or issues related to the medication [9] **(L2, RGA)**.
- In penicillin-allergic patients, if there are concerns about compliance with the antibiotic regimen, consider azithromycin once a day for 5 days **(R-GDG).**
- For children aged 5 years and older, consider prescribing capsules (after assessing the ability of the child to swallow the capsule) and provide education on how to take the capsules [2] **(L1, RGA).**
- Antibiotics are not recommended for GAS carriers but are considered in selected situations **(R-GDG).**

Prophylactic Treatment /Antibiotic Chemoprophylaxis (Section 10.4.2)

- Prophylactic antibiotic treatment may be offered to high-risk groups for developing *i*GAS infection [12,17,1] **(L1, RGA)**.

Adjunctive Therapy (Section 10.4.3)

Analgesic/antipyretic may be prescribed to treat symptoms and control fever associated with GAS infections [4, 9] **(L1, RGA).**

- Corticosteroid is not recommended (4) **(L1, RGC).**
- Avoid Aspirin (4) **(L1, RGC).**

Anti-Microbial Resistance (AMR) Considerations (Section 10.4.4)

- Throat swabs targeted CRP testing, and clinical scores are effective measures to rule out GAS infection in patients with acute respiratory infections and reduce unnecessary antibiotic prescriptions. [27,38] **(L1, RGA).**

Infection Prevention and Control (Sections 10, 11)

- Establish and implement Infection Prevention and control (IPC) measures when dealing with cases of GAS infections [1,19,16,18] **(L1, RGA)**.
- All confirmed and/or suspected cases should be notified to the (MOPH) Via Surveillance and Vaccine Electronic System (SAVES) **(R-GDG)**.
- School nurses must register each student with GAS infection to the Cerner (Electronic student file) and notify MOPH **(R-GDG)**.

Patient /Caregiver Education (Sections 10.4.1, 12)

- Educate patients/caregivers on the importance of compliance with the Antibiotic regimen and the possibility of antibiotic resistance in case of non-compliance with the recommended duration of treatment [9] (**L2, RGA**).
- Patients and caregivers should be informed to watch for signs of clinical deterioration and when and how to seek further help [2,15] (**L1, RGA**).

4 Background Information

4.1 Definitions

GAS infections

GAS infections are:(1, 2, 3)

- A diverse range of clinical presentations is caused by Group A Streptococcus bacterium, which can colonise the throat, skin and anogenital tract.
- GAS infections range from mild or moderate to severe disease.
  - Mild/moderate presentations include respiratory tract infections, tonsillitis, pharyngitis, scarlet fever, Impetigo skin and soft tissue infections.
  - Severe diseases include pneumonia, bacteremia, streptococcal toxic shock syndrome (STSS), and necrotizing fasciitis).
  - Post-streptococcal immunological sequelae such as acute rheumatic fever and acute glomerulonephritis.

Invasive GAS infections (iGAS): Severe disease condition when the bacteria is isolated from a normally sterile body site, such as the blood, joints, or the lungs, resulting in life-threatening infections such as necrotizing fasciitis and streptococcal toxic shock syndrome [2,51].

Close contacts: Those who have had prolonged contact with the case in a household-type setting during the 7 days before the onset of symptoms (at least 4 hours/day on average or 20 hours/week) and up to 24 hours after initiation of appropriate antimicrobial therapy in the index case. Such contacts would be those with an overnight stay in the same household (including extended household if the case has stayed at another household), pupils in the same dorm, intimate partners, or university students sharing a kitchen in a hall of residence [12,62].

Probable iGAS case: An individual who has a severe clinical presentation consistent with iGAS infection, such as STSS, necrotising fasciitis, myositis, and puerperal sepsis, in the absence of microbiological confirmation of GAS and either: a) the clinician considers that GAS is the most likely cause b) there is an epidemiological link to a confirmed GAS case [12].

Confirmed iGAS case: An individual who has an iGAS infection, which is defined as the detection of group A streptococcus (GAS), by culture or accredited molecular methods (such as PCR), from a normally sterile body site, such as blood, cerebrospinal fluid, joint aspirate, pericardial peritoneal, pleural fluids, bone, endometrium, deep tissue or deep abscess at operation or post-mortem [12].

4.2 Aetiology

Streptococcus pyogenes, also known as Group A Streptococcus, is a group of Gram-positive bacteria. GAS is responsible for a wide range of community-associated infections. Group A Streptococcus is in the top 10 pathogens globally, causing morbidity and mortality in children.

Group A Streptococcus causes 20% to 30% of sore throats in children [4,5,6,18]

4.3 Mode of transmission

Group A strep bacteria are very contagious. Generally, people spread the bacteria to others through respiratory droplets and direct contact. Transmission occurs by close contact with an infected person and can be passed on through coughs, sneezes, or contact with a wound. [18, 59]

Casual contact (as in school) and household items (like toys) rarely play any role in spreading the bacteria.

GAS infections are transmitted by both direct and indirect method and includes [6,45]:

- Direct person-to-person transmission through respiratory droplets can also occur through contact with secretions, such as saliva, wound discharges, or nasal secretions, from an infected person.
- Although rare, the spread of Group A strep infections may also occur via food. Foodborne outbreaks of group A strep have occurred due to improper food handling [7].
- Environmental Transmission of Group A strep may be possible, although it is likely a less common route of transmission.
- Both an asymptomatic carrier and an infectious state may lead to transmission, but the risk increases when a person is in an infectious state.

4.4 Risk factors and high-risk groups

Risks of GAS infections include [6,23,45, 52]:

- Household setting that leads to exposure to an individual with GAS (crowded house).
- Mother- neonate pairs.
- Institutional settings such as hospitals, schools, and childcare settings.
- Children younger than 5 years.
- Poor access to primary healthcare.
- Family history of Acute Rheumatic Fever (ARF)
- Children with a previous diagnosis of eczema are at risk for GAS skin infection.
- Household setting that provides exposure to individuals with GAS.

*Group A strep pharyngitis is most common among school-aged children (5-15 years of age); it is rare in children younger than 3 years of age [44].

The following are considered a high risk for close contact [8]:

- Neonates (less than 28 days old)
- Children who develop chickenpox with active lesions within the period of 7 days prior to onset or within 48 hours after commencing antibiotics of iGAS case if the exposure is continuing.

4.5 Complications

Common potential complications of GAS infections include [9,3,4,11,24,29,30,36,45]:

- Peritonsillar and retropharyngeal abscesses.
- Acute rheumatic fever (ARF).
- Rheumatic heart disease (RHD).
- Glomerulonephritis.
- Bacteraemia.
- Endocarditis.
- Meningitis.
- Sepsis.
- Streptococcal toxic shock syndrome (STSS).
- Necrotizing fasciitis.
- Thrombocytopenia.
- Hemolyticanemia.
- Henoch-Schönlein purpura.
- Arthritis.
- Uveitis (eye inflammation).
- Guttate psoriasis.
- Erythema nodosum.

*Rare complications include hepatitis, gallbladder hydrops or splenomegaly.

The following are at high risk for developing GAS complications (iGAS infections) (44):

- Children with disruption of the cutaneous barrier, such as burns, ulcers, wounds, recent surgery or other medical procedures, viral infections such as Varicella or fungal skin infections.
- Children with a previous history of cellulitis.
- Children with venous insufficiency.
- Children with chronic edema or impaired lymphatic drainage of the limbs.
- Children with obesity.
- Children who undergo frequent injections.
- Children with chronic illnesses such as diabetes and cirrhosis.
- Systemically or locally immunocompromised children.

The use of non-steroidal anti-inflammatory drugs (NSAIDs) may also increase risk; evidence for this is limited, and further research is needed.

5 Presentation

Group A Streptococcus (GAS) presented in a diverse range of clinical presentations that include [1,2, 3,5,11,18]:

5.1 Streptococcal pharyngitis/tonsillitis/Sore throat

Typical presenting features of tonsillitis include [10]:

- Fever.
- Headache.
- Malaise.
- Nausea and occasionally vomiting - especially in children.
- Severe throat pain.
- White spots on the tonsils.
- Enlarged lymph nodes (Commonly anterior cervical nodes (jugulodigastric in particular) may also occur in the abdomen, particularly in children.

In children with recurrent episodes of pharyngitis associated with laboratory evidence of GAS pharyngitis, consider that the patient may be a chronic pharyngeal GAS carrier who is experiencing repeated viral infections [4]

For management of tonsillitis, please Refer to the National Clinical Guideline: The Diagnosis and Management of Tonsillitis in Adults and Children available at Ministry of Public Health – Clinical Guidelines (moph.gov.qa).

5.2 Scarlet fever

Scarlet fever typically presents with [9,2]:

- High fever (over 38.3°C or 101° F).
- Erythematous sore throat.
- Strawberry-like tongue.
- Headache.
- Nausea and vomiting.
- A sandpaper-like rash usually originates in the groin and spreads up the trunk to the axilla; at 7–10 days, the rash spreads to the extremities and desquamates on the palms and soles, not the trunk.
- Swollen nodes in the neck.
- Feeling tired and unwell.
- Flushed red face, but pale around the mouth*.

*Signs of upper respiratory infection are not common in children with scarlet fever.

*The rash may be harder to spot in more darkly pigmented skin than on children with lighter skin, even though the 'sandpaper' feel should be present.

5.3 Pneumonia

If the child presents with fever and any of the following signs, consider pneumonia [8]:

- Tachypnoea (respiratory rate more than 60 breaths per minute, age 0 to 5 months; more than 50 breaths per minute, age 6 to 12 months; more than 40 breaths per minute, age older than 12 months).
- Crackles in the chest.
- Nasal flaring.
- Chest indrawing.
- Cyanosis.
- Oxygen saturation of 95% or less when breathing room air (be aware that some pulse oximeters can underestimate or overestimate oxygen saturation levels, especially if the saturation level is borderline; overestimation has been reported in people with dark skin).

5.4 Skin and Soft Tissue Infections

For the management of skin and soft tissue infections, please refer to National Clinical Guideline: The Diagnosis and Management of Skin and Soft Tissue Infections. Available at: Ministry of Public Health – Clinical Guidelines (moph.gov.qa) (20).

6 History

Children presenting with fever or symptoms that suggest GAS infections should be offered a detailed assessment. In addition to the child's clinical condition, consider the following factors when deciding whether to admit a child with a fever to the hospital (8) (**L1, RGA**):

- Social and family circumstances.
- Other illnesses that affect the child or other family members.
- Parental anxiety and instinct (based on their knowledge of their child).
- Contacts with other people who have serious infectious diseases.
- Recent travel abroad to tropical or subtropical areas or areas with a high risk of endemic infectious diseases.
- Parents' or caregivers' concern for the child's current illness makes them repeatedly seek healthcare advice.
- If the family has experienced a previous serious illness or death due to feverish illness.
- When a fever has no obvious cause, but the child remains ill longer than expected for a self-limiting condition.

Reported parental perception of a fever should be recognised and taken seriously [8] (**L1, RGA**).

7 Examination

7.1 General Examination

The general examination is recommended in all children presented with fever and should be extended according to symptoms. Perform a comprehensive clinical assessment to identify any immediate life-threatening features, including compromise of the airway, breathing or circulation, and decreased level of consciousness.

At a minimum, routine assessment should look for the following [8,9] (**L1, RGA**):

- Temperature (In children older than 6 months, do not use body temperature alone to decide the seriousness of the illness).
- Heart rate
- Respiratory rate.
- Capillary refill time (Capillary refill time of 3 seconds or longer is an intermediate-risk group marker for serious illness 'amber sign')
- Skin rashes on the trunk and the medial surfaces of elbows, or desquamation of the palms.
- Anterior cervical nodes enlargement.
- Enlarged papillae on the tongue (strawberry tongue) and/or petechiae on the soft palate.

- Signs of dehydration, such as:
  - Prolonged capillary refill time.
  - Abnormal skin turgor.
  - Abnormal respiratory pattern.
  - Weak pulse.
  - Cool extremities.
- Symptoms or signs that indicate possible sepsis.
- Symptoms and signs can be used to predict the risk of serious illness using the" traffic light system" a clinical tool used to identify the risk of serious illness in children with fever.

* In children with learning disabilities, take the individual child's learning disability into account when interpreting the traffic light table).

The Centor and FeverPAIN33 scoring systems can be used to help determine clinically whether the child will benefit from antibiotic treatment. Higher scores suggest more severe symptoms and likely bacterial (streptococcal) cause [2,10,39] (**L1, RGA**).

Under the Centor system, one point is awarded for each of the following [12]:
- Tonsillar exudate.
- Tender anterior cervical lymph nodes.
- History of fever.
- Absence of cough.

Interpretation of scores:
- Score of 3-4 suggests a 40-60% likelihood of GABHS.
- Score of 1-2 indicates infection with GABHS is unlikely.

Bear in mind that Centor scoring system [12]:
- Is not a diagnostic tool but can aid management.
- Is not valid for children younger than age 3 years.
- This may result in high antibiotic use due to its low specificity for bacterial infection.

If the heart rate or capillary refill time is/are abnormal, measure the blood pressure using the appropriate cuff size (covers 3 thirds of the arm).

7.2 Risk groups for serious illness

Recognise that children with any of the following symptoms or signs are in a high-risk group for serious illness [8] (**L1, RGA**):
- Pale/mottled/ashy/blue skin, lips, or tongue.
- No response to social cues/or stimuli.
- Appearing ill to a healthcare professional.
- Does not wake up or, if woken up, does not stay awake.
- Weak, high-pitched, or a continuous cry.
- Grunting.
- Respiratory rate greater than normal range (age-specific).
- Moderate or severe chest indrawing.
- Reduced skin turgor.
- Bulging fontanelle (for infants).

Recognise that children with any of the following symptoms or signs are in an intermediate-risk group for serious illness [8] (**L1, RGA**):
- Pallor of skin, lips or tongue reported by parent or caregiver.
- Not responding normally to social cues/stimuli.
- No smile.
- Wakes only with prolonged stimulation.
- Decreased activity.
- Nasal flaring.
- Dry mucous membranes.

- Poor feeding in infants.
- Reduced urine output.
- Rigors.

Recognise that children who have all the following features and none of the high or intermediate risk features, are in a low-risk group for serious illness [8] (**L1, RGA**):

- Normal color of skin, lips, and tongue.
- Responds normally to social cues/stimuli
- Contents or smiles.
- Stays awake or awakens quickly
- Strong normal cry or not crying/comfortable not crying
- Normal skin and eyes normal skin and eyes
- Moist mucous membranes.

7.3 Remote assessment

Remote assessment refers to situations in which a child is assessed by a healthcare professional who cannot examine the child because the child is geographically remote from the assessor, such as telephone calls or virtual clinics [8].

Although it is commonly practiced, remote assessment is not recommended for GAS-suspected cases. **(R-GDG).**

8 Investigations

If the child presented with an illness compatible with GAS infection or was recently in contact with a case of GAS infection, urgent investigations should be made, including [4,2.12] (**L1, RGA**):

- Throat swab and testing for GAS pharyngitis by rapid antigen detection test (RADT) and/or culture should be performed. A throat culture should confirm the negative RADT tests.
- Immediate blood cultures before initiating the parenteral antibiotics (if the child presented with a severe clinical presentation consistent with iGAS infection).
- If culture is negative in fluid specimens, consider the use of molecular diagnostics, such as GAS-specific like Polymerase Chain Reaction (PCR) or 16S rDNA PCR, in consultation with microbiology specialists.
- The M protein gene (emm typing) remains the molecular gold standard for typing GAS.
- Further sub-typing or single-nucleotide polymorphism from Whole Genome Sequencing (WGS) may be required to identify or more clearly define, a potential outbreak and monitor the management and investigation of an outbreak.

*According to National data for Qatar emm-1 and emm-12 M proteins are the most commonly responsible for iGAS in Qatar.

- Anti-streptococcal antibody titers are not recommended for the routine diagnosis of acute pharyngitis as they reflect past but not current events [4] (**L1, RGB**).
- Testing for GAS pharyngitis usually is not recommended for a child with acute pharyngitis along with clinical and epidemiological features that strongly suggest a viral etiology (e.g., cough, rhinorrhea, hoarseness, and oral ulcers [4,13] (**L1, RGB**).
- Don't test children under the age of 3 years for Strep A (unless there is a household member with GAS Pharyngitis). Acute rheumatic fever is rare, and the incidence of streptococcal pharyngitis and the classic presentation of streptococcal pharyngitis are uncommon in this age group [4,13] (**L1, RGB**).

Consider taking a throat swab where there is diagnostic uncertainty or concerns regarding antibiotic resistance [2] (**L1, RGA**):

- Rapid Antigen Tests RAT are recommended for children seen in either primary or secondary care settings to confirm the infection and aid in reducing antibiotics prescriptions, symptomatic patients should receive antibiotics [46,47] (**L1, RGA**).
- Use Centor scoring system to decide which patients need to be tested for GAS (RADT). Patients with modified Centor (McIsac) scores 3 or more with very high sensitivity (90%), specificity (95%) and negative prediction (95%) do not need throat culture after a negative RADT test unless there is a strong suggestion of bacterial infection(**R-GDG**).

* Discuss the issue of testing and empiric treatment of household contacts of patients with recurrent or severe invasive infections (Bing bong transmission) (**R-GDG**).

- Targeted CRP testing and the use of clinical scores are likely to be the most cost-effective approach to ruling out GAS infection [27] (**L1, RGA**).
- Evidence shows uncertainties around the adoption of point-of-care tests in primary and secondary care settings. Although sensitivity and specificity estimates are promising, further research is needed to understand the test accuracy of point-of-care [35] (**L1, RGB**).

9 Differential Diagnosis

The differential diagnosis of GAS disease includes:

- **Viral Acute Respiratory Tract Infections**

Many of the presenting symptoms associated with scarlet fever are similar to those caused by other common respiratory tract infections in children, such as infection with Epstein-Barr virus, adenovirus or other respiratory viruses. Upper Respiratory Tract Infection (URTI) is usually manifested by cough, rhinorrhea, hoarseness of voice, and oral ulcers [4,9]:

- **Measles & Rubella**

Measles and rubella sometimes show similar rashes, they need to be differentiated from scarlet fever. The primary characteristic differentiating scarlet fever from measles and rubella is that there are no rashes or clear findings of upper respiratory inflammation, except that the area around the mouth becomes pale and both cheeks are red and the appearance of Pastia lines in scarlet fever, which is with the linear petechial haemorrhages where the erythema does not disappear when the axillary region, inguinal area, and antecubital fossa are compressed [9,14].

- **Kawasaki syndrome**

Kawasaki syndrome is an acute febrile illness of unknown cause that primarily affects children younger than 5 years of age. It shows some clinical signs similar to signs of scarlet fever [55,58]:

A summary of clinical features for differential diagnosis of GAS infections is listed in the table below.

Differential Diagnosis	Clinical Manifestations
Viral acute respiratory tract infections	• Cough. • Rhinorrhea. • Hoarseness. • Oral ulcers.
Measles	• High fever (may spike to more than 104°). • Dry cough. • Runny nose (coryza). • Sore throat. • Red, watery eyes (conjunctivitis). • Tiny white spots with bluish-white centers on the inner lining of the cheek (Koplik spots) may appear 2-3 days after symptoms begin. • Flat red spots that appear on the face at the hairline and spread downward to the neck, trunk, arms, legs, and feet (Measles Rash) may appear 3-5 days after symptoms begin.
Rubella (German Measles)	• Low-grade fever. • Headache. • Mild pink eye (redness or swelling of the white of the eye). • General discomforts. • Swollen and enlarged lymph nodes. • Cough. • Runny nose.

Kawasaki syndrome	Diagnosis of classic Kawasaki Disease is based on the presence of a fever lasting ≥ five days and ≥ four of the following: • Polymorphous rash. • Cervical lymphadenopathy in ≥ 1 node ≥ 1.5 cm at least cm in diameter. • Bilateral conjunctival infection. • Oral mucosal changes (strawberry-like tongue). • Peripheral extremity changes (diffuse erythema of the palms and soles and/or indurative edema of the hands and feet).

Table 3: Clinical Features for Differential Diagnosis of GAS Infections.

10 Management

Management of GAS infections aims to [53]:

- Relieve the symptoms.
- Prevent suppurative and non-suppurative sequelae.
- Reduce transmission of the infection.
- Appropriate use of antibiotics/reduce AMR.

10.1 Primary Care Management

If the child is seen in a primary healthcare setting with an illness compatible with GAS infection or was recently in contact with a case of GAS infection, the following are essential [2,4,12,46,4715] (**L1, RGA**):

- Throat swab and testing for GAS pharyngitis by rapid antigen detection test (RADT) and/or culture should be performed. A throat culture should confirm the negative RADT tests.
- Antibiotics should be prescribed for cases presenting with GAS infections (consider the local antimicrobial profile).
- Patients and parents should be made aware of features suggestive of secondary bacterial infection, such as clinical deterioration, and when and how to seek further help.

All symptomatic patients should receive antibiotics immediately to limit the further spread of infection and reduce the risk of potential complications [16,32] **(L1, RGA).**

Given the unusually high level of GAS in the community, clinicians in primary care should maintain a low threshold for prompt referral to secondary care of any children presenting with persistent or worsening symptoms.

Early signs and symptoms of invasive Group A Streptococcal infection include [2,15] (**L1, RGA**):

- High Fever
- Severe muscle aches
- Localised muscle tenderness
- Pain in one area of the body
- Redness at the site of a wound
- Rash

*GAS infections are notifiable to MOPH.

10.2 Referral for Secondary Care

Clinicians in primary care should maintain a low threshold for prompt referral to secondary care of any children presenting with persistent or worsening symptoms [2] (**L1, RGA**).

Children whose symptoms or combination of symptoms suggest life-threatening illness should be referred immediately for emergency medical care by the most appropriate means of transport (usually 999 ambulances) [2,8] Qatar Emergency Medical Services (QEMS) (**L1, RGA**).

Life-threatening features include [8]:

- Compromise of the airway, breathing or circulation.
- Decreased level of consciousness.
- Symptoms or signs that indicate possible sepsis.

*Invasive Group A streptococcus (iGAS) is a rare disease but severe illness that needs urgent referral to secondary care.

10.3 Secondary Care Management / Specialist Management

If the child is seen in a secondary healthcare setting, recommendations for primary care mentioned in Section 10.1 apply, in addition to the following [15,16] (**L2, RGA**):

- Physicians in secondary care settings need to be vigilant in considering GAS complications, especially if the child is presenting with an illness compatible with GAS infection or was recently in contact with a case of GAS infection or if GAS was recently isolated.
- Prompt initiation of appropriate antibiotics in order to limit the further spread of the infection and reduce the risk of potential complications.
- Relevant clinical samples should be sent if the aetiology is uncertain, including:
  - Viral and bacterial throat swabs.
  - Blood cultures.
  - Tissue and fluid samples, including pleural aspirates (if applicable).
- When required, diagnostic imaging with aspiration/drainage remains important in diagnosing and managing suspected or confirmed empyema.
- Discuss with the microbiology team if there is a high index of clinical suspicion of iGAS disease while the culture-fluid specimens are negative.

10.4 Pharmacological Treatment

10.4.1 Antibiotics

Given the potential for severe presentations of GAS infections in children, prompt antimicrobial therapy should be initiated to limit further spread and reduce the risk of potential complications [16,32] (**L1, RGA**).

- Beta lactam antibiotics are the preferred treatment for GAS infection. Phenoxymethylpenicillin (Penicillin V) is the drug of choice for children with no history of penicillin allergy.
- Penicillin outperforms cephalosporins and macrolides in treating GAS infections due to its clinical efficacy, safety record, low cost, and narrow spectrum [12,9] (**L1, RGA**).
- Use Phenoxymethylpenicillin as the first line of management in the event of non-availability, amoxicillin, macrolides, flucloxacillin and cefalexin are alternative agents [2] (**L1, RGA**).

*According to the annual Antibiogram data for Qatar 2021 & 2020, GAS is 100% susceptible to Penicillin and Ceftriaxone (third generation cephalosporin).

- The duration of phenoxymethylpenicillin depends on the type of GAS presentation [2] (**L1, RGA**).
- Consider the antibiotic management regimen of GAS infections in both penicillin-allergic and non-penicillin allergic children described in table numbers [4,5, and 6].
- In the event of the non-availability of phenoxymethylpenicillin, alternative antibiotics should be made available. If there is a known reason why a patient cannot have one of the alternatives, this should be added to the prescription [2] (**L1, RGA**).
- There is uncertainty related to the differences in symptom resolution when comparing cephalosporins and macrolides with penicillin in the treatment of GAS tonsillopharyngitis and with the use of azithromycin in a single dose versus amoxicillin [25] (**L1, RGB**).
- For children aged 5 years and older, consider prescribing capsules (after assessing the ability of the child to swallow the capsule) and provide education for the parent on how to open the capsule and mix it with liquid or soft food (such as yogurt) if the child is unable to swallow the capsules [2] (**L1, RGA**).
- The use of antibiotics in children with pharyngitis to prevent Acute Rheumatic Fever (ARF) is controversial. GAS carriers with acute viral infections may unnecessarily receive antibiotics [21] (**L1, RGC**).
- If the prevalence of GAS detection approaches the asymptomatic carriage rate (around 6-11%), there may be little benefit from antibiotic treatment as most culture-positive patients are likely carriers [21] (**L1, RGC**).

- It is important to inform the parents/caregivers that the child must complete the prescribed course of antibiotics and contact the clinician if they have any concerns or issues related to the medication to minimise the likelihood of discontinuation leading to antibiotic resistance [9] (**L2, RGA**).
- In penicillin allergic patients, if there are concerns related to compliance with the antibiotic regimen, consider azithromycin once a day for 5 days (**R-GDG**).

GAS carriers do not require antimicrobial therapy; they are at low risk for developing suppurative or non-suppurative complications or spreading GAS infection to their close contacts [4,48] (**L1**)(**R-GDG**).

Antibiotics are not recommended for GAS carriers but considered in selected situations such as (**R-GDG**):
- Certain population groups where the incidence of ARF is high/ community outbreak of ARF.
- Family or personal history of ARF.
- Patients with Acute Post-Streptococcal Glomerulonephritis (APSGN).
- Household over-crowding.
- The carrier is epidemiologically linked to GAS transmission in the healthcare setting.
- Outbreak of streptococcal pharyngitis in a closed community
- When tonsillectomy is considered only because the patient is a chronic carrier.

The following tables summarize the first, second and third-line antibiotic management of GAS infections in both penicillin allergic and non-penicillin-allergic children via the oral route [56,57,59,60,61]:

N.B: If the child is systemically unwell, unable to take oral antibiotics and/or there is no improvement in 48 hours from starting antibiotics, parenteral antibiotics should be considered (referral to secondary care or Paediatric Emergency) [56,57].

Penicillin V

• For acute sore throat: 5–10-day course.
• For Scarlet fever: 10-day course.
  • Children aged 1-11 months: 62.5mg four times a day.
  • Children aged 1-5 years: 125mg four times a day.
  • Children aged 6-11years: 250mg four times a day.
  • Children aged 12 years and above 500mg four times a day.

Amoxicillin

• For acute sore throat: 5–10-day course.
• For Scarlet fever: 10-day course.
  • Children aged 1-11 months: 125mg three times a day.
  • Children aged 1-4 years: 250mg three times a day.
  • Children aged 5-11years: 500mg three times a day.
  • Children aged 12 years and above: 500mg three times a day.
 	
*In case of poor adherence to the medication due to an unpleasant taste that can negatively impact patient outcomes, the 24-hour dose of Amoxicillin can be divided into two equal doses (two times a day instead of three times a day).

Flucloxacillin

• For acute sore throat: 5–10-day course.
• For Scarlet fever: 10-day course.
  • Children aged 1-23 months: 125mg four times a day.
  • Children aged 2-4 years: 250mg four times a day.
  • Children aged 5-9years: 250mg four times a day.
  • Children aged 10 years and above: 500mg four times a day.

Co-amoxiclav

• For acute sore throat: 5–10-day course.
• For Scarlet fever: 10-day course
  • Children aged 1-11 months: 0.5ml/kg three times a day.
  • Children aged 1-5 years:
  • 125mg/31mg per 5ml: 5ml three times a day.
  • 250mg/62mg per 5ml: 2.5ml three times a day.
  • Children aged 6-11 years:
  • 250mg/62mg per 5ml: 5ml three times a day.
  • 125mg/31mg per 5ml: 10ml three times a day.
  • Children aged 12 years and above:250mg/125mg tablets: 1 tablet three times a day.

Table 4: First line treatment with oral antibiotics for children with no history of penicillin allergy.

Clarithromycin

• For acute sore throat:5-day course only.
• For Scarlet fever:10-day course.
  • Children aged 1 month - 11 years:
  • Body weight 8-11kg: 62.5mg twice a day.
  • Body weight 12-19kg: 125mg twice a day
  • Body weight 20-29kg: 187.5mg twice a day
  • Body weight 30-40kg: 250mg twice a day
  • Children aged 12 years and above (weight >40kg) 500mg twice daily.

Erythromycin

• For acute sore throat: 5-day course only.
• For Scarlet fever: 10-day course.
  • Children aged 1-23 months: 125mg four times a day.
  • Children aged 2-7 years: 250mg four times a day.
  • Children aged 8 years -11 years: 500mg four times a day.
  • Children aged 12 years and above 500mg four times a day.

Azithromycin
• For acute sore throat: 12 mg/kg once (max = 500 mg), then 6 mg/kg (max=250 mg) once daily for the next 4 days. • For Scarlet fever 12 mg/kg once daily (max = 500 mg) for 5 days.

Table 5: First-line treatment with oral antibiotics in penicillin-allergic child or second-line when 1st line options are not available.

Cefalexin

• For acute sore throat:5-10-day course.
• For Scarlet fever: 10-day course.
  • Children aged 1-11 months: 125mg twice a day.
  • Children aged 1-4 years: 125mg three times a day.
  • Children aged 5-11years: 250mg three times a day.
  • Children aged 12 years and above 500mg three times a day.

Co-trimoxazole contraindicated in (Glucose-6-Phosphate Dehydrogenase) G6PD deficient patients and patients with hypersensitivity to sulfa-containing drugs).

• For acute sore throat: 5-day course.
• For Scarlet fever:10-day course.
  • Children aged 6 weeks-5 months: 120mg twice a day.
  • Children aged 6 months- 5 years: 240mg twice a day.
  • Children aged 6-11 years: 480mg twice a day.
  • Children aged 12 years and above: 960mg twice a day.

Table 6: Second line treatment with oral antibiotics in penicillin-allergic children or third-line when second line options are not available.

10.4.2 Prophylactic Treatment (Antibiotic Chemoprophylaxis)

Offer antibiotic chemoprophylaxis to the following risk groups for iGAS infection [12,17,1] (**L1, RGA**):

- All women from ≥37 weeks of pregnancy up to 28 days of giving birth who are in close contact with GAS cases.
- Neonates up to 28 days after birth when the mother or any close contact develops iGAS infection. It very important that, these neonates be followed and be under observation.
- Mother and baby, if either develops, suspected, or confirmed GAS disease in the neonatal period (first 28 days of life).
- Eligible household contacts of a single case: it is essential to commence as soon as possible (within 24 hours, and preferably the same day) but not to commence beyond 10 days of iGAS index case onset.
- Healthcare workers who sustain a needlestick injury or direct contamination of mucous membranes or breaks in the skin with potentially infectious material.

Prophylactic antibiotic regimen includes [41]:

- Phenoxymethylpenicillin (penicillin V) if the child or adult has no history of penicillin allergy.
- Macrolides for (penicillin allergic persons).
- Erythromycin for penicillin allergic ladies who are either pregnant or within 28 days of giving birth.
- Clarithromycin for infants below 6 months (penicillin allergic).

The table below summarizes the prophylactic antibiotic regimen:

Group	Drug and duration
First line	
Child or Adult with no history of penicillin allergy	Phenoxymethylpenicillin (Penicillin V) for 10 Days
Second line (penicillin allergic)	
Birth to 6 months	Clarithromycin for 10 Days
Non-pregnant ladies, adults and children 6 months to 17 years	Azithromycin for 5 days **or** Clarithromycin for 10 days
Pregnant or postpartum ladies (within 28 days of childbirth)	Erythromycin for 10 days

Table 7: Choice of agent for chemoprophylaxis.

*Adapted from UK guidelines for the management of contacts of invasive group A streptococcus (iGAS) infection in community settings Version 2.0 March 2023.

10.4.3 Symptom Control/Adjunctive Therapy.

- An adjunct to the antibiotic analgesic/antipyretic may be prescribed, such as paracetamol or ibuprofen, for the treatment of symptoms and control of high fever associated with GAS infections [4, 9] (**L1, RGA**)
- Corticosteroid is not recommended [4] (**L1, RGC**)
- Avoid aspirin [4] (**L1, RGC**)
- Impetigo:
  - Fusidic acid 2% cream was applied 2-3 times/day for 5 days as a first-line topical antibiotic to treat non-bullous impetigo [63] (**L1, RGA**).
  - Mupirocin 2% cream in case of suspected or confirmed resistance [63] (**L1, RGA**).
  - If available, Retapamulin or Ozenoxacin 1% cream can be used as alternate options. [37,64, 65] (**L1, RGA**).
  - Consider referral or specialist advice for children with bullous impetigo, particularly in infants ≤1 year of age, or with impetigo that recurs frequently [63] (**L1, RGA**).

NB: Hydrogen peroxide 1% solution as a topical antiseptic should only be applied under the supervision of a healthcare practitioner (**R-GDG**).

10.4.4 Anti-Microbial Resistance (AMR) Considerations

Consider the following to minimize the likelihood of AMR [2]:

- Take a throat swab in case of diagnostic uncertainty or concerns regarding AMR (**L1, RGA**).
- Rapid antigen detection test (RADT) or culture should be considered in patients with modified Centor scores of 3 or more.
- In the event of the sudden death of a child potentially due to GAS infection, liaise with microbiology and histopathology teams to ensure post-mortem clinical specimens are taken.
- A viral infection usually causes pharyngitis. Microbiological confirmation and clinical scores are used to identify who requires antibiotics for pharyngitis however, they have limitations [27].
- The microbiology culture method is a gold standard to identify who requires antibiotics, however, specimens pre-exposed to antibiotics will yield negative; Nucleic Acid Amplification Test (NAAT) can be used to confirm the results [48].
- Relying on CRP testing alone would result in high levels of antibiotic prescriptions for sore throats [27].
- Procalcitonin (PCT) level can be used to guide antibiotic therapy and monitor response to antibiotics. Further research is needed on the clinical application of PCT in specific patient groups such as infants, children, adolescents, adults, the elderly, pregnant women, intensive care patients, immunodeficiency patients, transplant recipients, cancer patients, and patients on anti-inflammatory drugs to evaluate the clinical value of PCT to determine the safety and effectiveness of PCT-guided antibiotic therapy for all types of suspected or confirmed infections [49] (**L1, RGB**).
- Targeted CRP testing and clinical scores are likely to be an effective approach to ruling out GAS infection and reducing unnecessary antibiotics prescriptions in patients with acute respiratory infections [27,38] **(L1, RGA).**

11. Infection Prevention and Control

GAS pharyngitis and scarlet fever incubation period is approximately 2 to 5 days. Patients with GAS pharyngitis treated with an appropriate antibiotic are generally non-infectious after the first 24 hours of treatment. When dealing with cases of GAS infections, the following are essential [1,19,16,18] **(L1, RGA):**

- Establishment and implementation of Infection Prevention and control (IPC) measures.
- Appropriate hand hygiene, especially after coughing or sneezing and before preparing foods or eating. General personal hygiene can help control transmission, but hand hygiene remains the most important step in preventing such infections.
- In addition to using Standard Precautions, contact and droplet precautions are applied. Patients should be preferably placed in isolation in a single room with en-suite facilities for a minimum of 24 hours of appropriate antibiotic therapy.
- Healthcare workers (HCWs) should wear Personal Protective Devices (PPE), including disposable gloves and aprons' when in contact with the child or his/her equipment and the immediate surroundings.
- The isolation room, furniture, and equipment should be cleaned with detergent and water followed by hypochlorite at 1000 ppm daily (or combined detergent hypochlorite product).
- Shared facilities such as baths, bidets and showers should be cleaned and decontaminated between all patients' especially in high-risk areas.
    - Patients should be isolated until the culture is negative: patients with necrotising fasciitis.
    - Cases with the significant discharge of potentially infected body fluids or high risk of shedding.
    - Mothers and neonates on maternity units.
    - Patients in burns units.
- Pathology team should be notified when tissue from a case of necrotising fasciitis is sent for investigation.
- Pregnant women infected or colonized with GAS prior to admission should be treated and have this clearly documented in the maternity notes.
- Investigation of potential sources of infection is warranted.
- All iGAS cases and/or suspected cases should be notified to the (MOPH) Via Surveillance and Vaccine Electronic System (SAVES).
- Breaks in the skin must be covered with a waterproof dressing.
- Fluid-resistant gown surgical masks and face shield or googles must be used at operative debridement/change of dressings of necrotizing fasciitis and for procedures where droplet spread is possible.
- HCWs must adhere to a strict hand hygiene policy.
- Use disposable or dedicated patient care equipment (e.g., stethoscopes) and clean and disinfect equipments before use on other patients.
- While the patient is considered infectious, linen and waste must be handled as hazardous.

- Visitors should be offered suitable information and relevant PPE facilities to enable them to follow the standard infection control practices, including good hand hygiene.
- Effective handover between healthcare teams should ensure communication about the patient with iGAS infection and their close personal contacts. This should be consistent, accurate and documented.
- Only transfer the child if unavoidable or essential for the patient's care.
- If transfer is a must, details of the risk of infection must be effectively communicated to the ambulance service, the receiving facility, and the Infection Prevention and Control Team (IPCT). Instruct the patient to wear a mask and follow respiratory etiquette when transport is necessary.
- HCWs working with a patient who is infectious without appropriate PPT should be advised about the signs and symptoms of GAS infection for 30 days after exposure or diagnosis in the index patient, and if the HCW is symptomatic to seek urgent medical advice, such exposures should be referred to occupational health, IPC or relevant department.
- HCWs who are in contact with a case of healthcare-associated GAS should be considered for screening if they have suffered a sore throat or skin infection, or have had skin lesions/dermatitis/eczema, vaginitis, or pruritus within seven days of the onset of the infection in the patient.
- Postexposure prophylaxis and work restrictions are unnecessary for healthcare personnel exposed to group A Streptococcus, and antibiotics should not be routinely administered to all contacts of GAS cases [62].
- In the event of death, the hospital mortuary staff should be informed of the risk of infection and transmission routes.

The following IPC measure are important for schools and nurseries [17,31,45] (**L1, RGA**):

- Schools and nurseries should report cases of scarlet fever to MOPH.
- School nurses must register each student with GAS infection to the Cerner (electronic student file) by making CDC notification and fill the transfer notification form.
- GAS infections can spread through close contact between children and staff through shared contact with physical space and surfaces. A policy should be in place that children and adults with scarlet fever should not return to nursery or school until at least 24 hours after starting treatment with an appropriate antibiotic.
- Close observation for the contact students.
- Health education for the students about hand hygiene and cough etiquette.
- Children who engage in contact sports, share personal items such as towels, or have poor hygiene practices are at higher risk of contracting GAS infections.
- If the infection is more likely to have been acquired in the nursery, school, or elsewhere in the wider community, consider checking for contacts with GAS infection (**L1, RGA**).
- Liquid soap via a soap dispenser should be made available and there should be enough supply of paper towels.
- Children should be encouraged to cover their mouth and nose with a tissue when they cough and/or sneeze and to wash hands after sneezing and after using or disposing of tissues. They may be trained to use their elbows to cover their nose when they sneeze or mouths when they cough.
- Spitting should be discouraged.
- Children and staff should be reminded to thoroughly clean and cover all scrapes or wounds, especially bites.
- Cleaning of the environment, including toys and equipment should be as a minimum carried out daily during the outbreak and a very thorough terminal clean should be undertaken when the outbreak is declared over.
- Touch points such as taps, toilet flush handles, and door handles, should be cleaned regularly throughout the day.
- Hypochlorite at 1000 ppm of available chlorine, preceded by cleaning if any dirt is visible, is recommended for cleaning equipment, hard surfaces, hard toys, and sleep mats.
- Awareness of perianal streptococcal disease among healthcare professionals; Group A Streptococcus has been associated with a perianal infection.
- Health workers at schools and nurseries must be aware of perianal streptococcal disease (Perianitis), often initially confused with conditions such as irritant or allergic dermatitis, pinworm infestation, and child abuse.
- Task-sharing approaches may be implemented to improve access to evidence-based interventions, school nurses could be engaged in screening for GAS pharyngitis in high-risk groups (primary prevention) [33] (**L1, RGA**).

The World Health Organization (WHO) cites Strep A sore throat as one of the preferred clinical indications for vaccines. Estimating the disability-adjusted life-years (DALYs) caused by all Strep A clinical manifestations could provide evidence for the importance of Strep A sore throat as a clinical indicator for vaccines. Few prototype vaccines have been investigated in humans [28,29] (**L1, RGB**).

View Pathway

12. Patient and Public education / Parent and care giver education.

Educate the patient/care giver and public on the following [16]:

- What GAS infections are and how to protect yourself or your child.
- What the symptoms are and how you/your child can get it.
- Who is most at risk.
- How GAS infection is diagnosed and treated.
- The potential complications of GAS infections.
- When the child can return to school or nursery (24 hours after you take the 1st dose of antibiotics) [53]
- Appropriate use of antibiotics like, right dose, frequency of dosing (time interval), expected side effects.
- Completing the full course of antibiotics and the risk of AMR is important.
- The missed dose.
- Drug-drug/food/disease interactions.
- Appropriate preparation and storage of medication.

National-level interventions to reduce inappropriate use of antibiotics such as education campaigns for healthcare professionals and the public can be effective. However, more evidence is needed on the long-term sustained impacts of these interventions [42, 43] **(L1, RGB)**

Close contacts of iGAS cases should receive [1]:

- Written information on signs and symptoms of GAS infection and to watch for these signs and symptoms for 30 days after the diagnosis in the index patient.
- Clear advice to seek urgent medical advice if they develop GAS symptoms within this specific time.

13 Key Considerations for Patient Preferences

Patient preferences refer to patient perspectives, beliefs, expectations, and goals for health and life, and to the steps employed by individuals in assessing the potential benefits, harms, costs, and limitations of the management options in relation to one another.

Patients may have preferences when it comes to defining their problems identifying the range of management options, and selecting or ranking the outcomes used to compare these options.

It is important for healthcare professionals to develop an understanding of the patient as an individual and the unique way in which each person experiences a condition and its impact on their life.

The following recommendations are therefore made for physicians and other healthcare professionals regarding general principles of patient care in Qatar:

- **Respect Patients:** Treat the children and their parents or guardian with respect, kindness, dignity, courtesy, and honesty regardless of the patient's dress or appearance. Ensure that the environment is conducive to discussion and that the patient's privacy is respected, particularly when discussing sensitive, personal issues. Ask the patient how they wish to be addressed and ensure that their choice is respected and used.
- **Maintain Confidentiality:** Respect the patient's right to confidentiality and avoid disclosing or sharing patients' information without their informed consent. In this context, students and anyone not directly involved in the delivery of care should first be introduced to the patient before starting consultations or meetings, and let the patient decide if they want them to stay.
- **Clarify Third-Party Involvement:** Clarify with the patient at the first point of contact whether and how they would like their partner, family members or caregivers to be involved in key decisions about their care or management and review this regularly. If the patient agrees, share information with their partner, family, or caregivers.
- **Obtain Informed Consent:** Obtain and document informed consent from patients, in accordance with MOPH policy and guidance.
- **Encourage Shared Decision Making:** Ensure that patients are involved in decision making about their own care or their dependent's care, and the t factors that could impact the patient's participation in their own consultation and care including physical or learning disabilities, sight, speech or hearing impairments and problems with understanding, reading or speaking English are addressed especially for parents with low health literacy & parents who have language barrier.
- **Disclose Medical Errors:** Disclose errors when they occur and show empathy to patients.
- **Ensure Effective Communication:** Explore ways to improve communication including using pictures symbols or involving an interpreter or family members. Avoid using medical jargon. Use words the patient will understand and confirm understanding by asking questions.
- **Ensure Continuity of Care:** Provide clear and timely sharing of patient information between healthcare professionals especially at the point of any transitions of in care.

14 Performance Measures

A list of performance measures is shared in the table below. Healthcare organisations are encouraged to monitor service performance using the indicator definitions below.

Number	Numerator	Denominator
GASC01	The lab confirmed Strep A isolated during the measurement period	Total number of suspected Strep A. during the measurement period
GASC02	Number of people who had Strep A isolated during the measurement period	The number of people at risk of becoming ill from Strep A during the measurement period

Table 8: Performance Measures

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Appendix A: Description of the Literature Search

PubMed databases, Google Scholar, and Cochrane Library were searched using the terms "Group A Streptococcus infections". The following Filters were applied: **Free full text, Guidelines, Meta-Analysis, Randomized Controlled Trial, Systematic Review, English, Child: birth-18 years, from 2018/1/1 - 2023/3/15**, to investigate any emerging evidence in the management of Group A streptococcus infections.

Other relevant sources and websites of relevant organisations and societies were searched, including the Center for Disease Control and Prevention (CDC), the World Health Organization (WHO), the Infectious Disease Society of America (IDSA), National Institute for Health and Care Excellence (NICE), MOPH NCGs, UK Health Security Agency (UKHSA) report relevant Guidelines.

All existing references were evaluated and, where necessary and applicable, were used to write this guideline.

The included publications were identified using the term "Group A streptococcus infections" and specified with the following terms in combinations:

guidelines, disease, treatment, emergency, referral, antibiotic, antibiotic sensitivity, corticosteroids, paracetamol, ibuprofen, group A streptococcus, rapid antigen test, infection prevention, complications, children, infectious diseases.

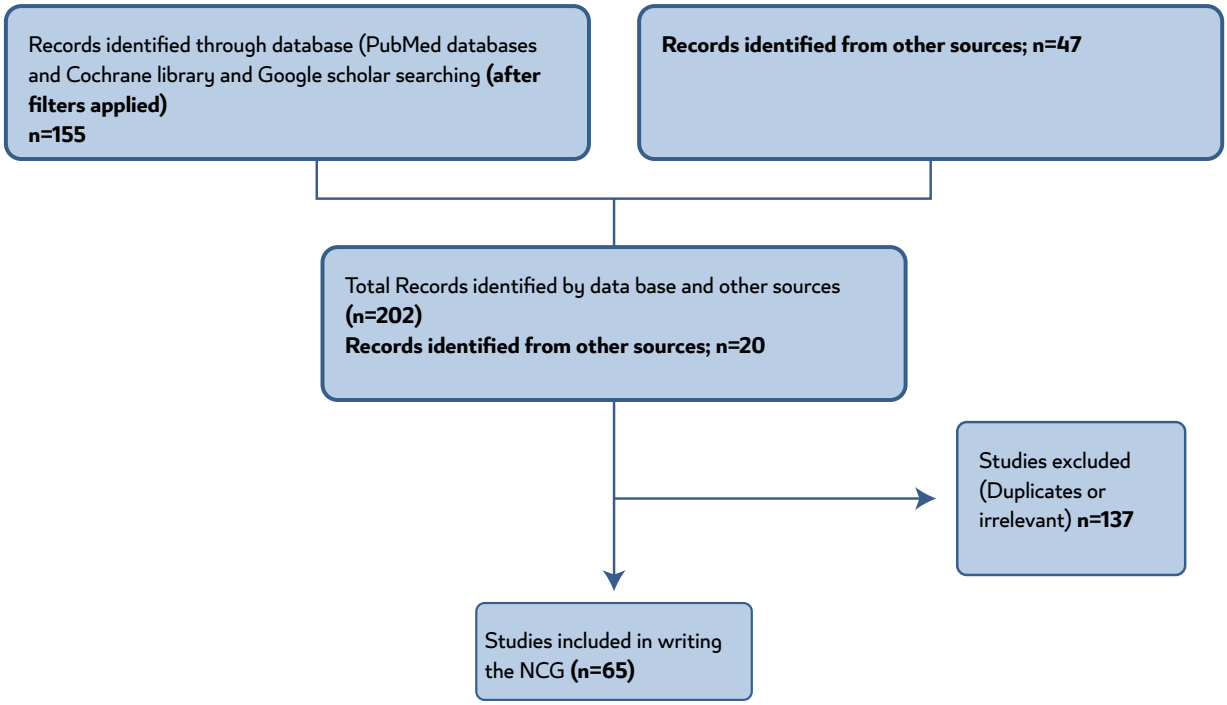

Fig A.1: Flow diagram for Literature search results to develop the NCG for GAS infections in children.

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