UK Health Security Agency

UK guidelines for the management of contacts of invasive group A streptococcus (iGAS) infection in community settings

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HSC Public Health Agency

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GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales

Contents

1. Introduction 4
1.1 Purpose of this guidance 4
1.2 Key changes since 2004 interim guidance 4
1.3 Definitions of terminology 5
1.4 Epidemiology of iGAS disease 6
1.6 Microbiological characterisation of iGAS isolates 7

2. Single case of iGAS: risk assessment and identification of contacts 9
2.1 Risk assessment 9
2.2 Identify close contacts 9
2.3 Identify high risk contacts 10
2.4 Antibiotic chemoprophylaxis 14

3. Household settings 17
3.1 Risk assessment 17
3.2 Public health actions: single case of iGAS 17

4. Nurseries, schools and other childcare settings 19
4.1 Risk assessment 19
4.2 Public health actions: single case of iGAS 20
4.3 Public health actions: outbreak of iGAS infection or one case of iGAS AND evidence of ongoing GAS, chickenpox or influenza transmission 21

5. Care home type settings 27
5.1 Risk assessment 27
5.2 Public health actions: single case of iGAS 27
5.3 Public health actions: outbreak of iGAS infection OR one iGAS case and one or more cases of non-invasive GAS infection 29

6. Community settings outside households, care homes and schools or childcare settings 37
6.1 Risk assessment 38
6.2 Public Health Actions: single case of iGAS 38
6.3 Public health actions: generalised rise or outbreak of iGAS cases 39
6.4 Home healthcare 42

7. Reporting of iGAS cases with international travel 45

8. Invasive group C and G streptococcal disease 47

Appendices 48
Appendix 1. SIGN grading system 1999 to 2012 48
Appendix 2. Glossary of acronyms and abbreviations 49
Appendix 3. Contact information and community iGAS working group membership 50
Appendix 4. iGAS factsheets 53
Appendix 5. Letter templates for HPTs to modify to suit local arrangements 57

References 66

About the UK Health Security Agency 78

1. Introduction

1.1 Purpose of this guidance

This guidance is for management of cases and contacts of iGAS infection in community settings and supersedes the 2004 interim guidance (1). This review was undertaken by a multidisciplinary working group convened by Public Health England (the precursor organisation to the UK Health Security Agency) in January 2017. A literature review of available evidence was undertaken in 2014 and repeated in 2021 and considered alongside national surveillance data. All evidence was graded according to SIGN guidelines (2) (Appendix 1) and where insufficient evidence was available, agreement on best practice was reached through consensus. This guidance should be considered in conjunction with guidelines for prevention and control of group A streptococcal infection in acute healthcare and maternity settings (3), guidelines for the management of scarlet fever outbreaks in schools and nurseries (4), and guidelines for the management and prevention of bacterial wound infections in prescribed places of detention (5).

1.2 Key changes since 2004 interim guidance

Amendment to case definition to include further examples of severe GAS infections, where GAS has been isolated from a normally non-sterile site in combination with a severe clinical presentation. Addition of a probable case definition.

The recommendation for administering antibiotics to iGAS close contacts has been extended beyond those who have symptoms consistent with localised GAS infection and mothers and babies in the post-partum period to now include:

- pregnant women from ≥37 weeks gestation
- neonates and women within the first 28 days of delivery regardless of whether either were the index case
- older household contacts (≥75 years)
- individuals who develop chickenpox with active lesions within the time period of 7 days prior to diagnosis[1] of iGAS infection in the index case or within 48 hours after commencing antibiotics by the iGAS case, if exposure ongoing

Antibiotic prophylaxis for eligible close contacts of a single case to commence as soon as possible (within 24 hours, and preferably the same day) but not to commence beyond 10 days of iGAS diagnosis[1] in the index case.

[1] In March 2023 a change was made to use diagnosis date in place of onset date to define close contacts and the 10-day post-exposure period (see p16)

Recommendations for management of cases and outbreaks in care homes, schools and nurseries.

1.3 Definitions of terminology

Case definitions

Confirmed iGAS case

An individual who has an iGAS infection, which is defined as the detection of group A streptococcus[2] (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. For the purposes of these guidelines it also includes severe GAS infections, where GAS has been isolated from a normally non-sterile site such as throat, sputum, vagina or wound in combination with a severe clinical presentation, such as streptococcal toxic shock syndrome (STSS), necrotising fasciitis, pneumonia, septic arthritis, meningitis, peritonitis, osteomyelitis, myositis, and puerperal sepsis.

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

Other terminology and definitions

iGAS diagnosis date

The date at which invasive disease was diagnosed. For confirmed iGAS cases, the diagnosis date is the date that the specimen used to diagnose invasive GAS infection was taken. Where iGAS is confirmed post-mortem, use the date of onset for severe clinical presentation. For probable cases (no microbiological confirmation), use hospital admission date where available, otherwise use date of onset for severe clinical presentation.

Close contact

This is defined as those who have had prolonged contact with the case in a household-type setting during the 7 days before diagnosis of iGAS infection and up to 24 hours after initiation of appropriate antimicrobial therapy in the index case. Examples of 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 dormitory, intimate partners, or university students sharing a kitchen in a hall of residence (6). For a care home, a close contact is defined

[2] GAS refers to *Streptococcus pyogenes*, not *S. dysgalactiae* or any other streptococcal lineage which carries the group A antigen.

as someone sharing a bedroom. For nursery and childcare settings see section 4.1 on risk assessment in these settings.

Close contacts would not normally include (SIGN grading C):

- staff and children attending the same school, class or tutor group (although the risk assessment may allow you to define a group within the setting in which extensive close contact takes place)
- work colleagues
- care home residents (unless sharing a bedroom)
- friends (not co-habiting)
- low-level saliva contact, for example, social kissing (cheek)
- sharing food or drink with the case
- attending the same social function
- travelling in the same plane, bus, train or car unless for prolonged periods of time (for example, a flight ≥8 hours, coach tours over a period of days) (7)

High risk close contact

- older persons (≥75 years)
- pregnant women ≥37 weeks gestation
- women within 28 days of giving birth
- neonates (up to 28 days old)
- individuals who develop chickenpox with active lesions within the time period of 7 days prior to diagnosis in the iGAS case or within 48 hours after commencing antibiotics by the iGAS case, if exposure ongoing

Older person

A person aged 75 years and above.

Care home

A care home is any long-term facility for the nursing or social care of its residents. This includes homes caring for older persons and younger adults and children with mental or physical disabilities.

Outbreak

An outbreak is defined as 2 or more cases of probable or confirmed iGAS infection related by person, place and time. In settings such as care homes, the interval between cases may extend over several months and so no finite time limit can be set.

1.4 Epidemiology of iGAS disease

GAS can cause a range of diseases, from non-invasive manifestations such as pharyngitis, impetigo and scarlet fever to life-threatening invasive disease, such as GAS bacteraemia, necrotising fasciitis, or streptococcal toxic shock syndrome (8). Cases of iGAS infection

primarily occur sporadically, although outbreaks do arise, particularly in institutional care settings (9). Incidence rates in the UK are estimated to be similar to those in many other industrialised countries, in England the rate was 3.9 per 100,000 population in 2019, although longitudinal increases are being observed (10). Asymptomatic throat carriage rates in the healthy adult population are reported to be low, around 2% in high-income countries (11), with most UK studies reporting carriage of less than 1% (12 to 16). Carriage of GAS is higher in children compared to adults (15 to 17), with a recent systematic review and meta-analysis reporting a carriage prevalence of 10.5% in asymptomatic children (11). In a school outbreak transmission study asymptomatic throat carriage of the *S. pyogenes* outbreak strain was found in 9.6%, 26.9% and 24.1% of children in weeks 1, 2 and 3 respectively post outbreak onset; carriage of non-outbreak strains was 2.8% during the study (18). Vaginal GAS carriage is low, with figures of 0.03% to 0.37% reported from research studies and laboratory surveillance (19 to 23). Around 90% of iGAS cases occur in the community (24 to 26), with elevated risk observed for care home residents and the elderly (27, 28). In England in 2019, rates of GAS bacteraemias in the elderly (75+ years) were 14.5 and 15.6 per 100,000 for females and males respectively (10). Infants under 1 year had the second highest rates: 5.5 in females and 7.0 in males (10). Other groups considered to be particularly at risk of iGAS infection are people with co-morbidities such as diabetes, cardiovascular disease, conditions or treatments affecting immunity, influenza or recent chickenpox, neonates and post-partum women in the neonatal period, and people who are homeless or inject drugs (9).

1.5 Legal obligation to notify cases of iGAS infection

Invasive group A streptococcus (iGAS) infection was introduced as a statutorily notifiable disease in England and Wales in 2010 to enable public health actions to prevent and control the spread of infection (29,30). All iGAS cases diagnosed from sterile sites are classified as urgent and should be notified by telephone within 24 hours. In Scotland both necrotising fasciitis and iGAS have been notifiable since 2008 (31). In Northern Ireland iGAS is not currently notifiable (32); suspected or confirmed iGAS is reported by microbiologists and clinicians on a voluntary basis. In addition to these legal requirements, in accordance with these guidelines, clinicians are also requested to notify all severe cases to facilitate urgent public health actions (see case definitions section).

1.6 Microbiological characterisation of iGAS isolates

In England, Wales and Northern Ireland, all iGAS isolates should be sent to the UK Health Security Agency (UKHSA) Staphylococcus and Streptococcus Reference Section, Reference Services Division, as part of ongoing surveillance. In Scotland all iGAS isolates should be sent to the Scottish Microbiology Reference Laboratory, Glasgow Royal Infirmary as part of routine surveillance. Clinical, demographic and risk factor details should be provided on the referral form. Urgent investigations should be marked on the referral form to prioritise testing, preferably with their case management or outbreak identification numbers (in England: HPZone/iLog

numbers) for prioritisation and rapid testing. Currently, *emm* typing remains the molecular gold standard for typing GAS and more than 200 *emm* types have been described globally (33). However, further sub-typing or single-nucleotide polymorphism from whole genome sequencing (WGS) may be required to identify, or more clearly define, a potential outbreak as well as for monitoring during the management and investigation of an outbreak.

At present WGS is not routinely used during outbreak investigations in the UK but it has been used during a number of outbreaks in care homes (34, 35) hospital and maternity settings (36, 37) outbreaks among people who inject drugs or experience homelessness (38) and outbreaks associated with community health services delivered at home (39). The high discriminatory power of WGS has been useful to: (i) confirm that epidemiologically linked cases form a cluster, including those where a long interval exists between cases, (ii) exclude epidemiologically linked cases of the same *emm* type from further investigation if they did not cluster with the other cases (39, 40).

There are some general associations between emm types and particular clinical presentations, both in both broad terms (skin/soft-tissue vs respiratory), and in relation to more specific presentations such as puerperal sepsis (emm28) (41, 42). However, *S. pyogenes* is a versatile pathogen and specific strains can cause an array of clinical presentations of varying severity (43, 44). Teams investigating outbreaks should be vigilant for a range of possible clinical manifestations. Whilst there is some evidence indicating excess risk of death for specific emm types, namely emm3 and emm1, all strains should be regarded as having the potential to cause life-threatening infection (45).

2. Single case of iGAS: risk assessment and identification of contacts

2.1 Risk assessment

Following a notification of iGAS infection, conduct a risk assessment to:

a) establish any potential sources of infection or contact with healthcare within the last 7 days prior to the onset of symptoms consistent with GAS.
b) establish if there are any settings or contexts that may require more detailed risk assessment to establish close contact and possible onward transmission:

- care homes: residents are not usually classified as close contacts unless they share a bedroom; however, a detailed risk assessment should be undertaken, see section 5
- institutional settings where individuals co-habit (for example, custodial institutions, boarding schools, universities, hostels), see section 2.2 and section 6
- nurseries: children attending the same nursery or childcare setting are not normally considered to be close contacts; however, it may be possible to define a group within this setting which fulfils the definition of close contact (for example, a childminder's home), see section 4.1
- long haul travel (8 hours or more), see section 2.2

c) identify close contacts
d) ascertain close contacts at high risk
e) give advice to contacts and arrange antibiotic chemoprophylaxis where appropriate
f) record on case and incident management system: any contacts or settings which may be important if further cases arise; by recording for each single case prospectively, these contexts can be monitored to help identify outbreaks in the community

2.2 Identify close contacts

Individuals meeting the definition of close contacts should be identified (see definition of close contact). Contacts with more than 24 hours of continuous exposure to cases are at highest risk of infection and colonisation (46, 47). If any close contacts with signs and symptoms of GAS infection are identified, they should be clinically assessed and treated with antibiotics as indicated (same as chemoprophylaxis regime, see Tables 1 and 2). Although the NICE guidance advocates scoring systems for deciding on antibiotic use for sore throats, we consider that people who are close contacts of iGAS infection would fall under the category of those at risk of complications, thus benefiting from antibiotic therapy (48).

A detailed risk assessment may elucidate other household-type contacts such as those with prolonged or intimate contact. Public health teams should exercise judgement in defining close contacts for cases who do not reside in the same household as the case. These are people who may have stayed overnight, or where an individual lives in a community institutional environment, for example, in a hostel. Contacts whose profession could pose a particular risk to others should be recorded (for example, doctors, district nurses, midwives and other patient facing health and social care workers) to facilitate subsequent identification of clusters.

Cases in prisons, military and other institutional settings, and whose occupational or recreational activities may pose a particular risk to others by virtue of the closeness of contact or likelihood of skin trauma, such as close contact sports (for example, rugby or wrestling) may require wider contact assessment.

Risk assessments may present challenges where people are reluctant to disclose complex household arrangements. Other challenges may be cases of iGAS presenting in hostels providing temporary accommodation for the homeless. In such settings it may be appropriate to undertake additional measures (see section 6).

Other settings may need a risk assessment, for example, a long journey in a vehicle or aircraft of 8 hours or more. In these situations, consider: the duration of exposure, ventilation in the vehicle and whether the case was symptomatic during the journey. Where identity of individuals around the case is known (for example, on a coach where case was travelling with friends or known contacts), advice, treatment or prophylaxis for individual contacts may be possible. Following identification of 2 iGAS cases on a coach tour around the Scottish Highland in 2018, contact tracing identified 5 additional symptomatic individuals (49). However, where timely identification of close contacts is not possible (for example, on a plane), consider disseminating warn and inform information to passengers sitting in the same row and 2 rows either side of the case. If the case undertook international travel, regardless of the length of the journey, ensure that the UK International Health Regulations national focal point are notified (see section 7).

2.3 Identify high risk contacts

Identify any close contacts considered high risk and eligible for antibiotic chemoprophylaxis (see Table 1).

2.3.1 Older persons

The incidence of iGAS increases with age (50 to 52) and this risk is significantly elevated for cohabiting persons whose partner or spouse develops iGAS infection (8, 53); in couples over 75 years the secondary household risk of iGAS infection was estimated at 15,000 per 100,000 person-years (53). The working group made a pragmatic decision to recommend antibiotic chemoprophylaxis for all older persons (75 years and above) who are household contacts of an

iGAS case regardless of the nature of the relationship. In a care home setting, only sharing a bedroom with a case is considered analogous to a household.

Offer antibiotic chemoprophylaxis to all older (75 years and above) household contacts of the case.

(SIGN grading D and good practice)

2.3.2 Pregnancy, post-partum period and neonates

Signs of severe sepsis in women ≥37 weeks of pregnancy or with a history of recent childbirth, particularly with confirmed or probable GAS infection, should be regarded as an obstetric emergency (54, 55). A recent systematic review reported a pooled incidence of iGAS infection in pregnancy of 0.12 per 1,000 live births from 9 studies conducted in high income countries (56).

Women with puerperal sepsis acquire their infection from children in the household or other contacts (57, 58). The majority of iGAS infections in the post-partum period are reported in the 28 days after giving birth (85%) and can be severe for both mother and baby (58, 59). A UK study reported that the risk of iGAS is increased by approximately 80-fold within 28 days post-partum as compared to other women aged 15 to 44 (60) and US surveillance data report a 20-fold increase in bacteraemia and developing septicaemia (59). This highlights the importance of suspecting iGAS in a maternity patient presenting with sepsis and providing immediate support, including early administration of intravenous antibiotics.

Babies born to infected or colonised mothers may become colonised at birth (3). Swabbing of ears, nose, and umbilicus should be considered for babies born to iGAS-infected mothers. Maternal and neonatal infection can arise on the same day but the median onset times are 2 days postpartum (interquartile range (IQR) 0 to 5 days) for mothers and 12 days (IQR 7 to 15 days) for neonates (60). Whilst the increased risk within mother-baby pairs is likely due to transmission at birth, a small proportion of these neonates may acquire infection from the household or other close contact rather than the mother in the days following delivery.

Offer antibiotic chemoprophylaxis to all women from ≥37 weeks of pregnancy up to 28 days of giving birth who are close contacts of the case.

(SIGN grading D and good practice)

Offer antibiotic chemoprophylaxis to neonates up to 28 days after birth where the mother or any close contact develops iGAS infection.

(SIGN grading D and good practice)

2.3.3 Chickenpox and influenza

Chickenpox is a risk factor for development of iGAS infection in children, with the highest risk 4 to 5 days after onset of rash (range 2 to 14 days) (61, 62). Evidence suggests that offering antibiotic chemoprophylaxis to a household contact with onset of chickenpox within 7 days prior to diagnosis of iGAS infection in the index case or within the symptomatic period up to 48 hours after commencing antibiotic treatment for iGAS infection in the index case, may reduce the risk (63).

Influenza is also a recognised risk factor for iGAS infection (64 to 67), but as there is limited evidence regarding the impact of influenza on secondary household transmission of iGAS, antibiotic chemoprophylaxis is not currently recommended. Also see section 4.3.2 i).

Although other illnesses and host factors have been associated with an increased risk of sporadic iGAS infection there is limited evidence to recommend antibiotic chemoprophylaxis (68, 69).

Offer antibiotic chemoprophylaxis to a close contact with chickenpox with active lesions in the 7 days prior to diagnosis of iGAS infection in the index case, or in the symptomatic period up to 48 hours after commencing antibiotic treatment for iGAS infection in the index case, if exposure ongoing.

(SIGN grading D and good practice)

Table 1. Summary of public health actions for close contacts of iGAS cases in household settings

Risk assessment of household contact	Defined as	Action required
A) High-risk	• older persons (≥75 years) • pregnant women ≥37 weeks • women within 28 days of giving birth • neonates (up to 28 days old) • individuals who develop chickenpox with active lesions within 7 days prior to diagnosis of iGAS infection in the index case or within 48 hours after commencing antibiotics by the iGAS case, if exposure ongoing	Offer antibiotic prophylaxis only to high-risk contacts. Administer as soon as possible (within 24 hours, and preferably same day) and not beyond 10 days after iGAS diagnosis in the index case. 'Warn and inform' letters for close contacts; letter can also be copied to the contact's GP.
B) Symptomatic: iGAS symptoms*	Symptoms suggestive of iGAS	Urgent medical review
	If 2 or more confirmed or probable iGAS cases are identified in the household	Offer antibiotic prophylaxis to the whole household within a 10-day period of iGAS diagnosis in the index case.
C) Symptomatic: GAS symptoms**	Symptoms suggestive localised of GAS infection	GP assessment and treatment if GAS suspected. 'Warn and inform' letters for close contacts; letter can also be copied to the contact's GP.
D) All other close contacts	Those not reporting symptoms at the time of the risk assessment and not in a high risk group.	Maintain a low threshold of suspicion. A 30-day period of surveillance should be established. Use 'warn and inform' letters to advise all other close contacts to be alert to the signs and symptoms of GAS infection and seek medical attention if they develop a febrile illness or any clinical manifestation of GAS within 30 days of diagnosis in the index case. Letter can also be copied to the contact's GP.

* High fever, severe muscle aches or localised muscle tenderness +/- a high index of suspicion of invasive disease.
** Sore throat, fever, minor skin infections, scarlatiniform rash.

2.4 Antibiotic chemoprophylaxis

2.4.1 Recommended prophylactic antibiotic regimens

Phenoxymethylpenicillin (penicillin V) is the drug of choice for adults and children with no history of penicillin allergy. It has been in use for the prevention of acute rheumatic fever following GAS pharyngitis for over 50 years and has a favourable tolerability, safety and cost profile (70 to 74). To our knowledge there have been no published reports of penicillin-resistant GAS isolates.

For those who are penicillin allergic, macrolides remain the option of choice and where susceptibilities are available, these should be reviewed to ensure the prescribed agent remains active. Clinicians should check for potential significant interactions with other prescribed medications. Due to its long half-life, a 5-day course of once daily azithromycin achieves equivalent total drug exposure to 10 days of shorter acting agents (75). Systematic reviews comparing short course azithromycin to 10 days penicillin V have demonstrated equivalence with regards to clinical response and bacteriological eradication (76 to 79). For those who are penicillin allergic and either pregnant or within 28 days of giving birth, erythromycin is recommended due to more robust safety data for this agent in pregnancy and the post-partum period compared to newer macrolides (80 to 82). For penicillin allergic infants under 6 months of age, clarithromycin is preferred.

2.4.2 Time to clearance following antibiotics

A recent unpublished systematic review and meta-analysis provides evidence that antibiotic treatment achieves a high rate (>90%) of clearance of pharyngeal GAS 24 hours after initiation of therapy (83). This evidence supports the recommendations provided in subsequent chapters, that individuals with GAS pharyngitis should isolate for at least 24 hours after starting antibiotic treatment. The systematic review also found that GAS was cultured from the pharynx of 9% of patients on routine follow-up after completion of antibiotics (83).

Contacts of iGAS cases who have GAS pharyngitis or pharyngeal carriage should isolate for at least 24 hours after starting antibiotic treatment.

(SIGN grading B)

Contacts of iGAS cases who have other presentations of GAS infection should isolate for at least 24 hours after starting antibiotic treatment.

(Good practice)

Table 2. Choice of agent for chemoprophylaxis¥

Group	Drug	Duration
First line		
Child or adult	Phenoxymethylpenicillin (Penicillin V)	10 days
Second line (penicillin allergy)		
Birth to 6 months	Clarithromycin*^	10 days
Non-pregnant adults and children 6 months to 17 years	Azithromycin*^	5 days
	Clarithromycin*^	10 days
Pregnant or postpartum (within 28 days of childbirth)	Erythromycin*^	10 days

¥ Consult British National Formulary for recommended doses.
* Where susceptibilities are available, these should be reviewed to ensure the prescribed agent remains active.
^ Clinicians should check for potential significant interactions with other prescribed medications.

2.4.3 Risk communication and antibiotic chemoprophylaxis

Probable and confirmed cases of iGAS infection should be notified urgently in and out of hours so that public health actions can be taken as soon as possible, ideally within 24 hours. The working group recommend antibiotic chemoprophylaxis is offered promptly to those who need it, without any screening of the contacts. Priority must therefore be given to identifying and assessing close contacts, providing them with ‘warn and inform’ advice and arranging antibiotic chemoprophylaxis to high-risk contacts (Table 1).

Offer antibiotic chemoprophylaxis promptly (within 24 hours, and preferably the same day) to high-risk contacts, without screening.

(SIGN grading D and good practice)

2.4.4 Timing of administration of chemoprophylaxis

The risk to close contacts is highest within 48 hours and elevated for the first 10 days after iGAS diagnosis in the index case (9, 53, 85), although cases have also been reported up to 28 days later (52, 53).

For maximum benefit, chemoprophylaxis should be administered as soon as possible (within 24 hours, and preferably the same day) after eligible contacts are identified and not beyond 10 days after iGAS diagnosis[3] in the index case. Advise GPs to maintain low threshold of suspicion for 30 days in all close contacts.

(SIGN grading D and good practice)

[3] As the existing evidence base comprises studies centred on hospital admission or diagnosis date, rather than exposure date, we use diagnosis date to define the period of highest risk of transmission.

3. Household settings

3.1 Risk assessment

See section 2 for recommendations on risk assessment and identification of contacts.

3.2 Public health actions: single case of iGAS

Transmission of GAS within households is well documented (85 to 87) and the risk is highest in mother-neonate pairs and older couples (8, 53, 88). There is some limited evidence that clusters of iGAS cases are more likely to occur in households with higher numbers of occupants (53). Secondary attack rates in household contacts ranging from 800 to over 5000 per 100,000 person-years at risk have been observered in different countries (9).

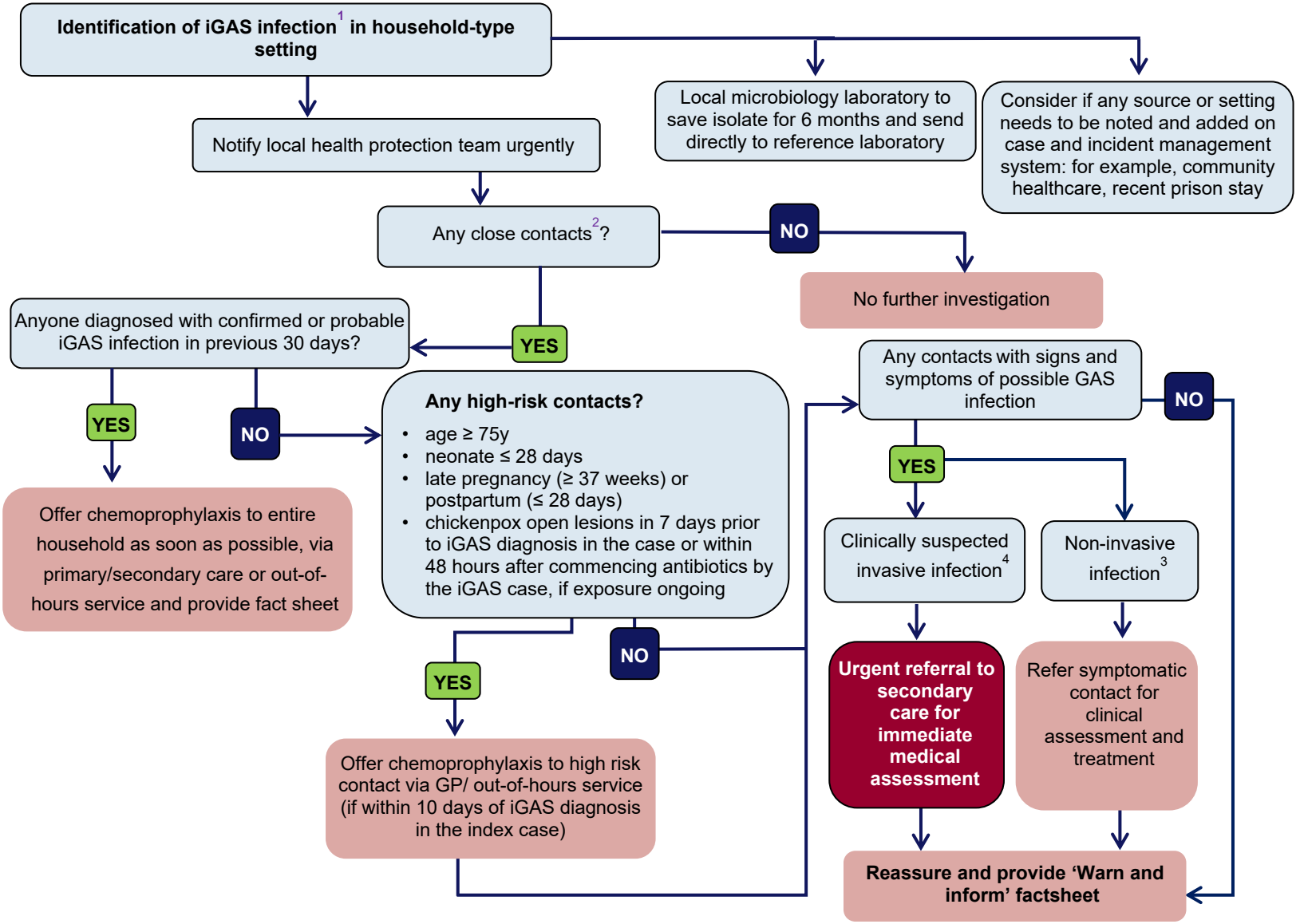
3.3 Public health actions: outbreak of iGAS in household setting

During household outbreaks of iGAS infection, advise chemoprophylaxis for all household members and consider if any environmental cleaning is required.

If 2 or more confirmed or probable iGAS cases are identified in the household, offer antibiotic prophylaxis to the whole household within a 10-day period of diagnosis of iGAS infection in the index case.

(Good practice)

Algorithm 1. Management of contacts of a case of iGAS in a household-type setting (an accessible, text-only version is available)



1. Invasive GAS infection (iGAS) is defined through isolation of GAS from a normally sterile body site. GAS isolated from non-sterile site in combination with severe clinical presentation should be managed as per iGAS.
2. Close contact is defined as someone who has had prolonged close contact with the case in a household -type setting during the 7 days before diagnosis of iGAS infection. Examples include those living and/or sleeping in the same household, pupils in the same dormitory, intimate partners, or university students sharing a kitchen in a hall of residence. Consider contacts who provide nursing care (district nurses, health visitors).
3. Symptoms suggestive of non-invasive GAS infection include sore throat, fever, minor skin infections, scarlatiniform rash.
4. Symptoms suggestive of invasive disease include high fever, severe muscle aches or localised muscle tenderness +/- a high index of suspicion of invasive disease. In the absence of a more likely alternative diagnosis then emergency referral to A&E (contact A&E to advise of incoming patient).

4. Nurseries, schools and other childcare settings

Cases of iGAS are rare in children, with children under 10 years of age usually making up 13 to 16% of cases annually (89). A global systematic review and meta-analyses of iGAS infection in pregnant women and young children reported a pooled incidence rate of 0.09 per 1,000 person-years for children aged 0 to 5 years (56). The overall case fatality rate in this age group was 9% (56).

4.1 Risk assessment

If a reported iGAS case attended or worked in a nursery, school or other childcare setting in the 7 days prior to onset of iGAS infection, the health protection team (HPT) should conduct a risk assessment. The threshold for action and communication for nurseries is lower compared to schools with older children as the risk of transmission is higher by nature of the setting and level of mixing amongst younger children. As mentioned in section 2.1, children attending the same nursery or childcare setting are not normally considered to be close contacts but it may be possible to define a group within the setting in which extensive close contact takes place. A risk assessment should therefore:

1. Define the setting of interest:

a) consider if the child spent most time in a single class, or in nursery group or if there is sufficient mixing with the whole nursery
b) if the childcare setting is a childminder's home, the childminder and all the children they care for, should be considered as household contacts

2. Ascertain if, within this setting:

a) there have been any other iGAS cases in the last 30 days or non-invasive GAS cases (for example, scarlet fever, strep throat, impetigo) in the last 7 days
b) there is co-circulating chickenpox, influenza, or other respiratory viruses (2 or more cases contemporaneous to the iGAS case)

If scarlet fever is co-circulating, please also refer to the guidelines for the management of scarlet fever outbreaks in schools and nurseries (4).

If non-invasive GAS infections (for example scarlet fever, impetigo, strep throat), chickenpox or influenza are co-circulating please see section 4.3.

4.2 Public health actions: single case of iGAS

4.2.1 Source of infection

Consider if the infection is more likely to have been acquired in the nursery or school or elsewhere in the wider community by checking for contacts with GAS infection.

4.2.2 Control measures

The HPT should contact the nursery or school to conduct a risk assessment and provide general advice as follows:

a) Establish prospective 30-day surveillance: Add school or nursery context on case and incident management system, so that any linked cases are easily identified by the HPT. Ask school or nursery to report new cases of GAS, iGAS, chickenpox and influenza in the next 30 days. Evidence of ongoing infection, for example, impetigo or scarlet fever and/or chickenpox or influenza in staff or children, should trigger establishment of an Outbreak Control Team (OCT).
b) Swabbing and antibiotic chemoprophylaxis is not routinely recommended for contacts of a single case of iGAS in schools or nurseries; in situations where there is evidence of ongoing GAS transmission and chickenpox or influenza activity, see section 4.3.

4.2.3 Communication

The nursery or school should send a ‘warn and inform’ letter (Appendix 5.3) and question and answer sheet (Appendix 4) to parents and staff within the defined setting to provide reassurance and raise awareness of the signs and symptoms of GAS/iGAS, particularly in vulnerable contacts (immunocompromised, high risk contacts).

For a single case of iGAS in a nursery, childcare or school, the working group recommends:

– establishing if there are other cases of GAS/iGAS or chickenpox or influenza in staff and children
– sending ‘warn and inform’ letters to staff and parents within defined setting to reassure and raise awareness

(Good practice guidelines)

4.3 Public health actions: outbreak of iGAS infection or one case of iGAS AND evidence of ongoing GAS, chickenpox or influenza transmission

Nurseries, schools and other childcare settings have been the focus of clusters of iGAS disease. If, in the context of an iGAS case linked to a nursery or school, the risk assessment conducted by the HPT suggests that there is evidence of ongoing GAS, chickenpox or influenza transmission as well as a case of iGAS, an investigation should be started promptly. An OCT should be set up and the key facts established to inform all subsequent decisions and actions.

Outbreaks of iGAS infection are rare and highly sensitive situations, raising concerns among parents with likely pick up from the media, particularly if there have been one or more deaths. Expert advice on investigation and management should be sought promptly from the national team.

4.3.1 Source of infection

Undertake epidemiological investigations, including review of microbiology and surveillance records for further GAS/iGAS cases usually over previous 6 months. This aims to identify any common source or link between cases if there are 2 or more iGAS cases.

4.3.2 Control measures

a) Convene an OCT

To supervise the investigation and management of the outbreak.

b) Exclusion

As recommended in the current Guidance on Infection Control in Schools and other Child Care Settings (90) staff and parents should be reminded that children and adults with GAS infection should not return to nursery or school until at least 24 hours after starting treatment with an appropriate antibiotic.

c) Personal hygiene

Personal hygiene remains important in preventing infections. Good hand hygiene should be enforced for all pupils and staff and a programme should be put into place that encourages children to wash their hands at the start of the school day, after using the toilet, after play, before and after eating, and at the end of the school day. It is important that hands are washed correctly. Liquid soap via a soap dispenser should be made available and there should be a plentiful supply of paper towels. Children and adults should be encouraged to cover their mouth and nose with a tissue when they cough and sneeze and to wash hands after sneezing and after using or disposing of tissues. Spitting should be discouraged. Breaching the skin barrier provides a portal of entry for the organism, therefore children and staff should be reminded that all scrapes or wounds, especially bites, should be thoroughly cleaned and covered.

d) Environmental cleaning

The environment can play a significant part in transmission as GAS can be found to remain in dust as well as on furniture and equipment (91 to 96). Cleaning of the environment, including toys and equipment, should as a minimum be 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.

i. Hypochlorite at 1,000 ppm of available chlorine, preceded by cleaning if any dirt is visible, is recommended for cleaning of equipment, hard surfaces, hard toys and sleep mats. Horizontal surfaces should be kept clear of unnecessary equipment and ornaments to allow thorough cleaning to occur.
ii. Carpets and soft furnishings should be vacuumed daily. The vacuum cleaner should have a high efficiency filter on its exhaust. Single use cloths or paper towels should be used for cleaning. Where soft toys cannot be avoided, they should be machine washed; hard surface toys are more easily washed and disinfected. Consider replacing low cost items that may be difficult to clean thoroughly, for example, pencils, crayons, play dough and plasticine.
iii. During the terminal clean, carpets and rugs should be cleaned with a washer-extractor. Curtains, soft furnishing covers and all linen should be removed, and washed at the hottest compatible temperature (97). Care should be taken when loading potentially contaminated items into the washing machine as direct contact with surfaces or excessive shaking will increase the risk of contaminating other environmental surfaces. Wash will be most effective where there is plenty of warm or hot water, detergent and mechanical action. This can be increased by reducing the number of laundry items added to load (half to two-thirds full), increasing cycle times or temperatures, and avoiding low water or economy cycles. After laundering, clean items should not be placed in the same laundry basket or container that was used for the uncleaned items. Soft furnishings without removable covers should be steam cleaned taking care to hold the nozzle of the steam cleaner sufficiently close to the surface and for long enough for all surfaces (particularly contact areas) to ensure they heat up thoroughly.

e) Ventilation

Whilst it remains unlikely that long range airborne transmission plays a significant role in the transmission of GAS, a recent study using settle plates successfully detected *S. pyogenes* in elevated locations during the investigation of 2 scarlet fever outbreaks in separate schools (2 out of 12 and 6 out of 12 plates) (18). In both outbreaks the strains detected on the settle plates were identical to those identified in the children affected (18). Specialist ventilation is not routinely required when managing GAS infections but background ventilation (through good design and opening doors or windows where appropriate) brings a variety of health benefits. This includes rapid removal of airborne contaminants which might otherwise cause harm, including co-circulating viruses known to increase the risk of iGAS infection. For this reason, opportunities to improve ventilation should always be considered, as part of a wider strategy to limit indoor transmission of infectious diseases.

f) Seek expert advice

Seek expert advice and ensure local laboratory sends samples to the reference laboratory as soon as possible to enable rapid typing of isolates. Contact AMRHAI@ukhsa.gov.uk to discuss the possibility of performing WGS if further strain discrimination is needed. In Scotland contact ggc.glasgowsmrl@nhs.scot or telephone 0141 201 8663. (Note: no out-of-hours or weekend service.)

g) Swabbing and chemoprophylaxis

Antibiotic chemoprophylaxis aims to eradicate carriage in those who may be at risk of infection or pose a risk to others through onward transmission. Chemoprophylaxis can be considered by the OCT in certain circumstances, based on a risk assessment; factors to be considered include evidence of co-circulation chickenpox or respiratory viral infections alongside GAS infections (for example scarlet fever, impetigo, strep throat). Although mass swabbing of children is not routinely recommended, it can be considered in exceptional circumstances by the OCT. There are scenarios where targeted swabbing may be helpful, for example to identify ongoing transmission or confirm aetiology of clinical reports. Expert advice should be sought from your local public health microbiologist and where needed from the national team (see contact details in the Resources section). The recommended antibiotic regimen is the same as for treatment (see factsheet 2 in Appendix 4).

h) Varicella vaccination

Chickenpox was identified as a risk factor for iGAS infection in anywhere between 15% to 25% of iGAS cases in hospitalised children in a number of different international studies 61, 98 to 100). Sentinel surveillance data for chickenpox and a sero-prevalence study (unpublished data) conducted in England show that by the age of 5, 65% of children will already have had chickenpox. Therefore the majority of children susceptible to chickenpox are in the younger age groups. Chickenpox cases and outbreaks are more likely to occur in nurseries and childcare settings serving children under the age of 5 years. An analysis of chickenpox mortality data from 2001 to 2007 in England and Wales reported 5 deaths where co-infection or secondary infection with GAS was a risk factor and all of these were in children under 5 years (unpublished data).

If chickenpox is co-circulating in a nursery or pre-school setting where an iGAS case has been notified, the OCT could consider post-exposure prophylaxis with varicella vaccine. Advice should be sought from the national team on a case-by-case basis (see contact details in the Resources section). Varicella vaccine administered within 3 days of exposure may be effective in preventing chickenpox (101) and its use has been documented in a number of iGAS outbreaks in this setting (63, 102). Children from 9 months of age and staff with no clear history of chickenpox could be offered 2 doses of varicella vaccine, 4 to 8 weeks apart (103, 104). A Patient Group Direction (PGD) template has been developed by UKHSA to facilitate the deployment of varicella vaccine in outbreaks where chickenpox is co-circulating with GAS infections in a nursery or pre-school setting[4].

[4] Practitioners must not use the PGD template until it has been authorised in Section 2. This is a legal requirement (see Human Medicines Regulations 2012). Practitioners should follow local policy or procedures to access authorised PGD documents.

i) Antivirals and flu vaccination

Influenza has been identified as a risk factor for iGAS disease although there is limited quantitative evidence on this (64 to 67, 105). If flu is suspected or confirmed to be co-circulating in a nursery or school setting where an iGAS case has been confirmed, this provides an opportunity to remind eligible children, including those in clinical risk groups who are at increased risk of severe disease, to take up their offer of flu vaccination. Flu vaccination is not routinely recommended as post-exposure prophylaxis in this context. Two weeks are required for the immune response to vaccination to develop and so this is unlikely to prevent secondary cases.

Detailed recommendations about the use of antiviral neuraminidase inhibitors (that is, 'antivirals') can be found in the guidance on use of antiviral agents for the treatment and prophylaxis of seasonal influenza (106). In keeping with current recommendations by NICE (107) UKHSA recommends the targeted use of antivirals as follows:

1. For treatment of uncomplicated influenza among specific at-risk groups (ideally within 48 hours of onset of symptoms).
2. Treatment of complicated influenza regardless of underlying individual risk factors.

There may be rare outbreak situations when wider use of post-exposure prophylaxis with antivirals in nursery or school settings could be considered, such as in boarding schools. Ideally swabbing of a small number of recent cases should be used to confirm influenza and GAS circulation but may be not be feasible if children are at home. Advice should be sought from the national team on a case-by-case basis (see contact details in the Resources section).

j) Surveillance

After control measures instituted and the outbreak closed on OCT direction, maintain surveillance for an additional 6 months and ensure any laboratory isolates are saved.

4.3.3 Communication

In the event of an outbreak of iGAS, the nursery or school should send a warn and inform letter (Appendix 5.3) and question and answer factsheet (Appendix 4) to parents and staff, to raise awareness of the signs and symptoms of GAS/iGAS, particularly in vulnerable contacts (immunocompromised, high risk contacts). Any additional control measures instigated (for example, antibiotic chemoprophylaxis) would also need to be included here.

If there is co-circulating GAS, chickenpox or influenza, additional relevant information should be included in the letter.

The OCT should also consider sending a letter to local health professionals to alert them of the iGAS outbreak or situation to ensure prompt identification and treatment of cases.

In an outbreak of iGAS, or when there is evidence of ongoing GAS, chickenpox or influenza transmission in a nursery or school setting, the working group recommends:

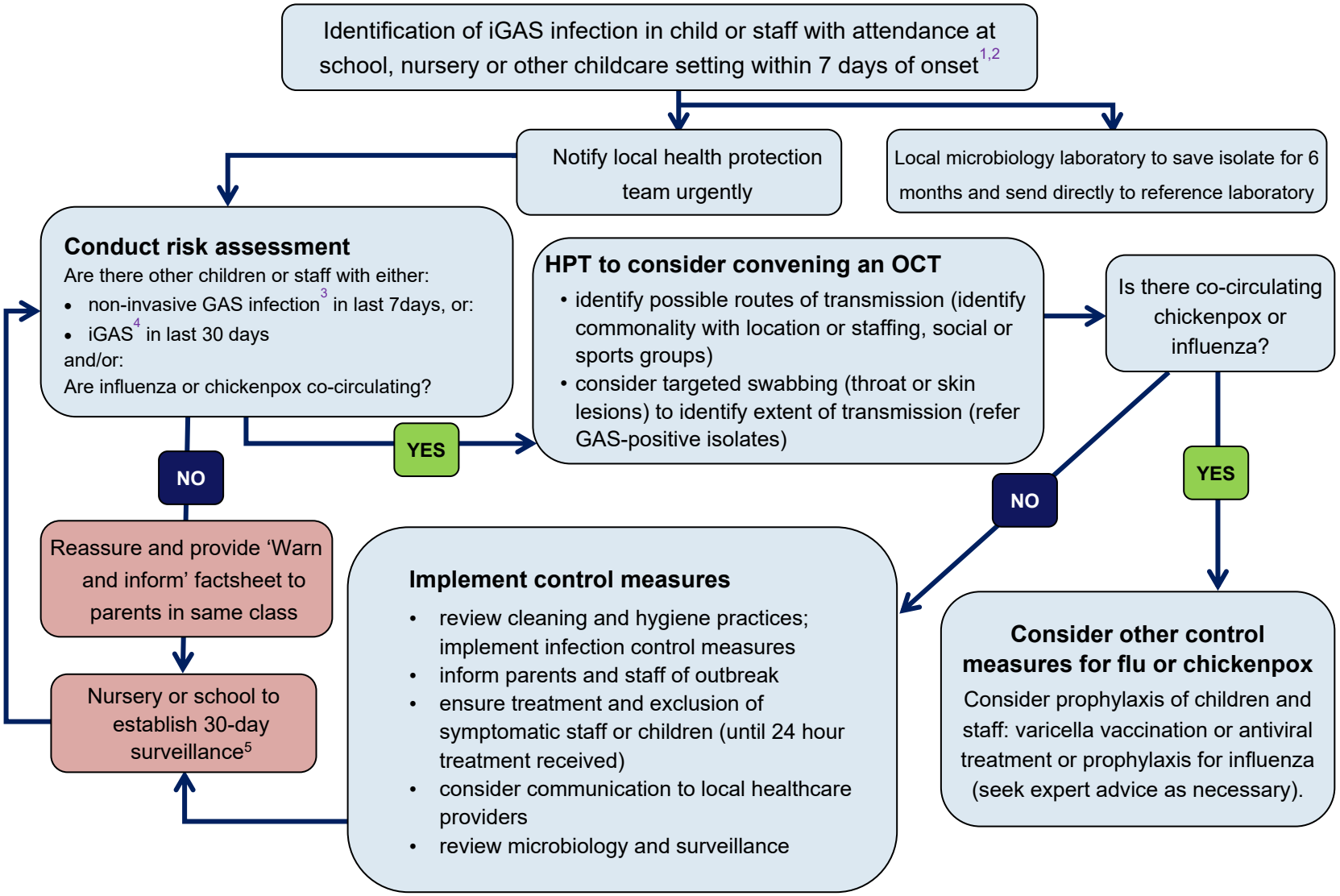
– setting up an OCT

– following principles of outbreak investigation set out above

– seeking expert advice on investigation and management

(Good practice guidelines)

Algorithm 2. Management of iGAS case linked to a nursery, school or other childcare setting (an accessible, text-only version is available)



1. iGAS is defined through isolation of GAS from a normally sterile body site. GAS isolated from non-sterile site in combination with severe clinical presentation should be managed as per iGAS.
2. Where the case hasn't attended the setting in 7 days before onset, it may be necessary to inform the school, for example, if severe illness or death.
3. Symptoms suggestive of non-invasive GAS infection include sore throat, fever, minor skin infections, scarlatiniform rash
4. Symptoms suggestive of invasive disease include high fever, severe muscle aches or localised muscle tenderness +/- a high index of suspicion of invasive disease.
5. Prospective 30-day surveillance for GAS, iGAS, chickenpox and influenza.

5. Care home type settings

Clustering of cases in care home settings is more likely compared to households, and older people with iGAS infection are much more likely to have a fatal outcome. A study of confirmed iGAS cases in England found that long term care home residents aged over 75 years had a higher risk of iGAS (1.7 incidence rate ratio, 95% Confidence Interval 1.3 to 2.1) and death (odds ratio 2.3, 95%CI 1.3 to 3.8) compared to community cases of the same age (25). The overall rate in care home residents above 75 years was 16.1 per 100,000 (25).

A study in the US reported similar findings: iGAS incidence was 6 times higher among long-term care facility residents (≥65 years) than community-based elderly residents (41.0 versus 6.9 cases per 100,000 population) and the long term care home residents were also 1.5 times as likely to die from infection as community-based patients (105). Cases of iGAS infection in residential care and nursing homes may have a mix of presentations, and the interval between cases may vary from over a few weeks or months of each other, although this may extend to one or more years (108, 109). Sources of outbreaks in care homes can include peripatetic staff (for example, district nurses, podiatrists and so on; these could be either permanent, agency or peripatetic) and environmental contamination. Thus, cases in care homes require careful assessment with ongoing surveillance for linked cases.

5.1 Risk assessment

A single case of iGAS infection linked to a care home or similar setting should prompt a detailed risk assessment. The main aims of this are to:

a) ascertain the source of infection
b) minimise the risk of transmission to other residents or staff
c) assess the severity of the situation and establish if there are linked cases

5.2 Public health actions: single case of iGAS

5.2.1 Source of infection

Establish if the infection is likely to have been acquired in the care home by checking for symptomatic staff, residents or visitors. If the resident has spent time in a separate health care facility in the 7 days prior to the onset of symptoms consistent with GAS, manage the case in conjunction with hospital guidelines and ensure hospital infection prevention and control (IPC) team informed.

For cases acquired in the care home, ask the care home if they know of any other cases of iGAS or GAS infection in residents, staff or their families. Check health protection records for any other notifications from the care home within recent years – go back as far as practicable; if further cases identified, go to section 5.3.

Find out from the care home:

- is the case mobile?
- which areas of the home did they spend the most time in?
- were there carers who spent more time with the case?
- has the case been cared for by home healthcare providers (for example, district nurses, podiatrists and so on)? If yes, use the guidance in this section alongside section 6.4

5.2.2 Control measures

a) Infection control

Most cases of iGAS would be transferred to hospital. If the case remains in the care home, follow the healthcare guidelines (3). Table 3 is a checklist of infection control measures that may be used in a care home.

b) Isolation and exclusion

There is inconclusive evidence as to whether the rate of infection or carriage is higher in residents who have close contact with a roommate who is a case or carrier (27). Consider only those sharing a bedroom as 'household contacts' and manage according to algorithm 1. Ensure infected residents still residing in the home have their own dedicated equipment and bathroom where practical (or the bathroom should be thoroughly cleaned after each use). There may be no additional benefit in relocating a roommate as they will already have been exposed to the infection. Exclude staff and advise residents with active symptoms of GAS to remain in their room for 24 hours after starting treatment. Staff should remain away from the workplace for at least 24 hours after starting antibiotics, and/or resolution of symptoms. Undertake treatment of infection in liaison with the individual's GP or healthcare provider. Do not wait for culture results, but ensure antibiotics are appropriate once antimicrobial susceptibility testing results are available. Cases with discharging wounds or ulcers should be isolated until the discharge has ceased and preferably until a swab taken 24 hours after completing antibiotics is negative.

c) Personal hygiene

Check if there are any staff who have had close contact, such as dressing an open infected wound. Suggest review of infection control practices within the care home. Educate care home management to recognise signs and symptoms of GAS and iGAS infection and advise to seek medical attention if staff or any of the residents develop such symptoms.

d) Environmental cleaning, linen and waste disposal

Complete a cleaning of the infected resident's environment as GAS can be found to remain in dust (92 to 96) as well as on furniture and equipment. Keep surfaces clear of unnecessary equipment and ornaments to allow thorough cleaning to occur. As a minimum recommendation, detergent and water followed by hypochlorite at 1,000 ppm of available chlorine or a combined product, should be used for cleaning and disinfection of equipment and hard surfaces, including commodes and hoists (110, 111).

Where possible, hoist slings, patient clothing, towels, bed linen, curtains, carpets and rugs should be cleaned and disinfected using a validated laundry process, in accordance with 'Health Technical Memorandum 01-04 Decontamination of linen for health and social care' (97, 112). HTM 01-04 details consensus on best practice for both routine ('standard process') laundry and infectious ('enhanced process') laundry (97). Whilst a resident is considered infectious, their clothing, linen and waste must be handled as hazardous (110, 111). For linen and other laundry items this means they should be sealed in a dissolvable or soluble seam bag, before being removed from the room, avoiding contamination of surfaces by minimising shaking and not putting contaminated linen down on any environmental surface. Items in dissolvable or soluble seam laundry bags should be loaded directly into a washer-extractor without additional handling or sorting.

e) Swabbing

Recommend swabbing of contacts sharing the same room or bathroom as the index case especially if they have open wounds or ulcers or are symptomatic. Discourage visitors from visiting during the infectious period and advise on preventing transmission (see Appendix 4).

f) Transferring residents

Avoid transferring a resident with GAS to another unit for non-clinical reasons to minimise the risk of cross-infection. If transfer to a healthcare facility for treatment is unavoidable, communicate details of the risk of infection effectively to the ambulance service, the receiving ward or department or facility, the receiving IPC team and the local HPT.

g) Prospective surveillance

Ask care home to report new cases amongst staff and residents in the next 30 days. Add care home (and district nursing where relevant) as a context on case and incident management system, so that any linked cases are easily identified by the HPT for a prospective period of 6 months.

5.3 Public health actions: outbreak of iGAS infection OR one iGAS case and one or more cases of non-invasive GAS infection

As referred to earlier in this guidance, an outbreak is defined as 2 or more cases of iGAS in a facility over several months.

A single case of iGAS infection with one or more cases of non-invasive GAS infection, although not considered an outbreak, may still warrant investigation and ongoing management taking into consideration time interval, number of cases, and epidemiological links. Actions should not wait for results of isolate sequence typing, however checking the antimicrobial susceptibility profile ('antibiogram') may be useful, that is, if isolated susceptibility profiles are very discrepant, they are unlikely to be linked.

The following could be considered:

1. The number of residents and their health problems.
2. The number of staff and their working patterns, including peripatetic staff (for example, district nurses, podiatrists and so on). Check which staff have had close contact, such as dressing an open wound, or evidence of suboptimal infection control practices which could have facilitated transmission. If the cases have been cared for by peripatetic staff, initiate dual investigations of the care home and home healthcare services, using guidance in this section alongside guidance in section 6.4.
3. The size of the care home – the number of buildings or floors, residents on each floor, type of rooms, shared bathrooms and so on.
4. Undertaking a retrospective analysis of microbiology and other available records (such as data stored on case and incident management system) for at least the past 6 months to establish if the new case is sporadic or could be linked to earlier cases of GAS infection.
5. Whether the case shares a bedroom with anyone else – roommates should be managed as 'household' contacts.

5.3.1 Source of infection

Undertake epidemiological investigations, including review of microbiology and surveillance records for further GAS/iGAS cases over past 6 months. The aim of this is to try to identify commonalities between cases in the source or exposures in the 7 days prior to onset to inform public health actions to prevent further transmission. These include common exposures to staff (including peripatetic healthcare staff, hairdressers and so on), common floors, social contacts, healthcare needs (for example, attending outpatient appointments such as GP dressing clinics), and shared bathrooms. Early assessment of case movements within the home (for example, if the individual is bed-bound) will provide important insight into potential routes of transmission. Consider active symptoms of GAS in staff and visitors of the cases.

5.3.2 Control measures

a) Convene an OCT

Convene an OCT including local health protection team, public health microbiologists, Clinical Commissioning Groups, representative Directors of Public Health, communications and local public health colleagues as appropriate. The OCT should supervise the overall management and oversee the immediate implementation of control measures.

b) Follow all control measures for a single case

Undertake additional measures in proportion to the number, time interval and severity of cases (Table 3). Advise the care home to isolate new cases and enforce enhanced cleaning measures.

c) Advise closure the facility

Advise closure the facility to admissions and transfers (see section 5.3.3).

d) Expert advice

Seek expert advice and ensure local laboratory sends samples to the reference laboratory as soon as possible to enable rapid typing of isolates, both retrospective and prospective isolates. However, treatment and control measures should not await typing results. If different *emm* types are detected, this does not exclude that that there is an issue as heavy environmental contamination may occur with more than one type. Contact AMRHAI@ukhsa.gov.uk to discuss the possibility of performing WGS.

e) Swabbing and chemoprophylaxis

There is limited evidence on the most effective intervention (27, 113). Actions range from a strategy of surveillance swabbing and targeted prophylaxis to immediate implementation of mass prophylaxis throughout the home. Maintain records of numbers of cases, numbers investigated and those treated. In some situations, consider surveillance swabbing of care home residents and staff, including kitchen staff and community health care workers, for ongoing assessment of the outbreak (but not visitors). The aim of swabbing is to identify routes of transmission that could inform the public health response. Mass swabbing could help guide subsequent actions where targeted treatment is used and may identify which individuals require repeat sampling at least 24 hours post-treatment. Swabs should be taken from the throat and from sites of broken skin integrity such as wounds and ulcers, new piercing sites, and from exfoliating skin lesions such as eczema and psoriasis. Samples from dry skin lesions should be taken with a swab moistened with sterile fluid. However, swabbing may miss some carriers if carriage is on sites other than those sampled or where only small numbers of GAS are present, so caution must be exercised in interpreting negative results. Ensure referral of isolates for microbiological typing. If further cases arise, the OCT could consider further swabbing, including at additional intervals post-treatment. In certain scenarios where local epidemiology links to a particular individual but swabs are negative, swabs from additional sites (for example, vagina, perineum) may be considered.

Decisions to use mass prophylaxis for staff and residents should include an assessment of benefits versus risks. Mass prophylaxis can provide treatment for those asymptomatically colonised from developing infection, and/or could remove carriage state, or reduce transmission from carriers. Synchronise treatment as far as possible to maximise impact. There can be unwanted secondary effects including allergic reactions or, in individuals colonised with *C. difficile*, the risk of precipitating overt disease. The decision to administer antibiotics should be the result of an individual risk assessment.

Staff who were previously positive should be re-swabbed to check for clearance, as per the acute healthcare guidelines (3). If they are still positive, risk assess to consider alternative antibiotics and initiate investigation of household contacts. Staff who have then been identified as persistent carriers should engage with occupational health services as they may need further clearance swabs (depending on the OCT) and should not return to the workplace, or alternatively be deployed away from patient care, until they have been shown to be cleared of infection by negative clearance swabs (one sample).

Organising mass administration of antimicrobials in care homes can be challenging and the working group therefore recommend a simple approach consistent with the regimens outlined in Table 2. If this is not successful, alternative regimens may be required and should be prescribed following consultation with a local microbiologist or infectious disease specialist. Lack of compliance with treatment regimens can occur among both staff and residents. For residents who lack capacity to consent and adhere to oral chemoprophylaxis, for example those with dementia, discuss with local microbiologist whether alternative regimens are available and could be administered, with appropriate delegated consent. Before eradication can be achieved, treatment of chronic skin conditions may also be required. Where appropriate, decolonisation to aid clearance of GAS from colonised lesions, and prevent shedding of colonised skin scales into the environment may also be tried although there is little evidence for this approach. There are no specific recommendations for GAS skin decolonisation. Routine MRSA decolonisation antiseptic washes may be applied (for example, 4% chlorhexidine or octenidine hydrocholoride washes – the latter may be more gentle for sensitive or damaged skin).

f) Environmental sampling

If, despite enhanced cleaning, re-colonisation of individuals appears to be taking place, undertake relevant environmental sampling after careful re-examination of possible reasons for re-occurrence, such as lack of compliance in staff or residents, and the possibility of hidden reservoirs, such as ring pessaries, pets or laundry facilities (114). Sampling should concentrate on those items that are in direct or indirect close contact with sequential susceptible people; thus would depend on epidemiological review. There are likely to be multiple routes of transmission; some may be long-term fomites, others transiently contaminated fomites. It is pertinent not to treat positive samples as the sole source; they may well only indicate one of many sources.

5.3.3 Declaration of the end of an outbreak

As initial control measures are not always successful and given the potentially long intervals between cases (108, 109, 115) on-going surveillance is required for at least 6 months. The home can be re-opened to admissions and transfers when:

- all control measures have been implemented
- those previously found to be carriers are shown to be clear
- a terminal clean has been performed
- there have been no new cases for 2 weeks (the 2-week timeframe is a pragmatic, rather than evidence-based, decision)

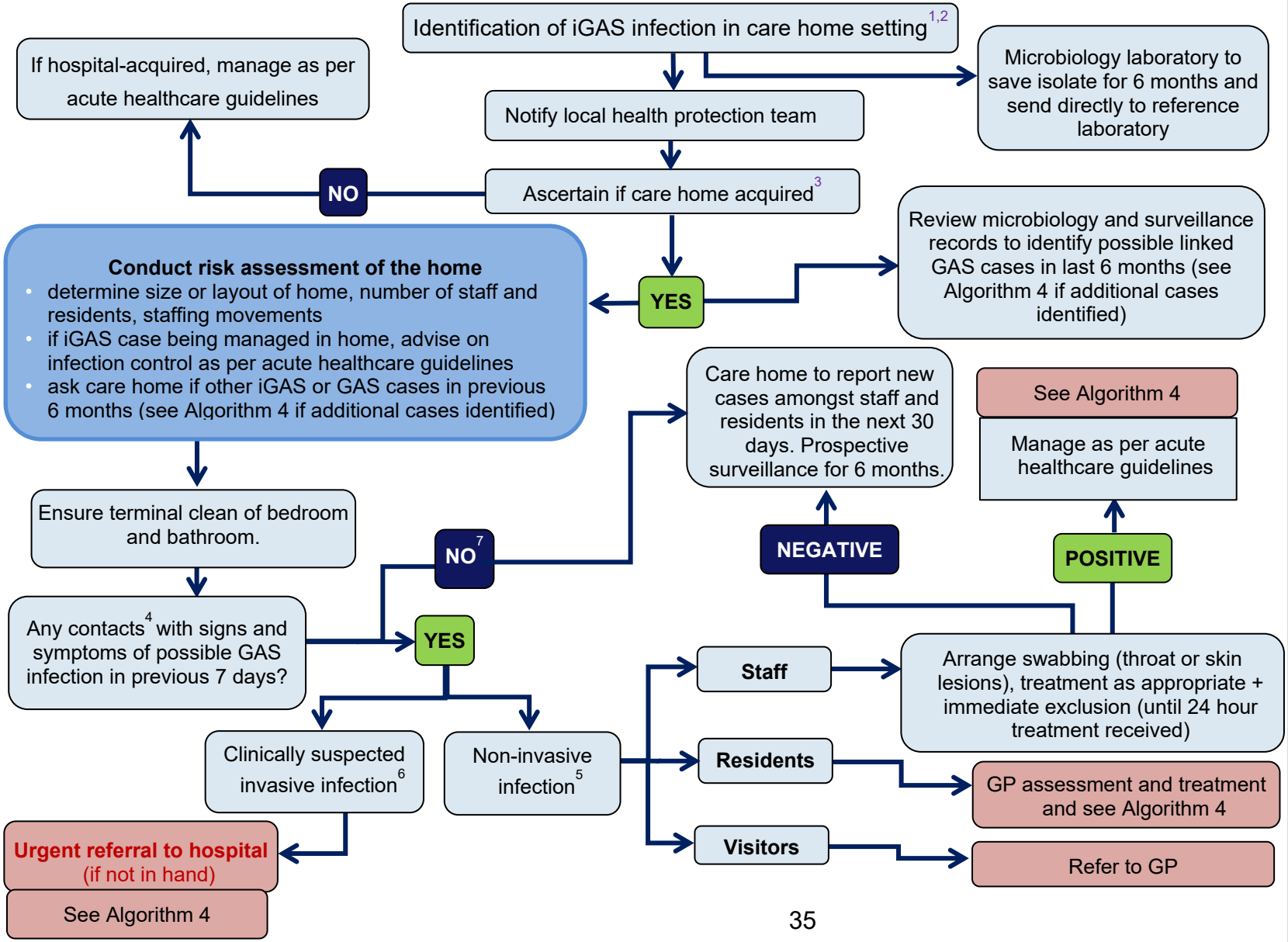
Staff who were initially identified as symptomatic or positive on screening can return to work after at least 24 hours of antibiotic therapy and resolution of symptoms.

Table 3. Infection control measures for care homes (adapted SIGN D) (113, 116)

Indication for use	Control measures	Strength of evidence
Single case of iGAS	• strengthen hand hygiene • review sick leave policy so staff not encouraged to work while ill • review IPC practices on site • check if any staff or residents have signs or symptoms of GAS (pharyngitis, skin conditions such as impetigo or erysipelas) or chronic skin conditions such as eczema or psoriasis which could increase GAS carriage on damaged skin • store isolates for further typing for at least 6 months and send isolates to Streptococcal Reference Service at UKHSA for typing • use appropriate personal protective equipment for staff and visitors in contact with the cases until after 24 hours antibiotics, as per prevention and control of group A streptococcal infection in acute healthcare and maternity settings in the UK (3) • implement enhanced surveillance for GAS infection • carry out hand hygiene audits and education • restrict staff movement where possible • educate patients, staff and visitors by distribution of GAS information leaflet • carry out full terminal clean of bedroom and bathroom to reduce possible environmental reservoir of GAS • provide education on transmission-based precautions	Common, well-accepted
Further cases of GAS/iGAS identified	• halt new admissions to home or defer routine clinic and radiology appointments where possible • consider screening all residents for GAS in throat and wounds • screen staff (throat swab and open skin lesions, for example, eczema) who are symptomatic or are epidemiologically linked to cases (for example, have had contact with cases) • isolate or cohort patients with GAS • trigger for further investigation (>=2 cases of iGAS/GAS) • consider targeted versus mass antibiotics	Unproven but unlikely to harm

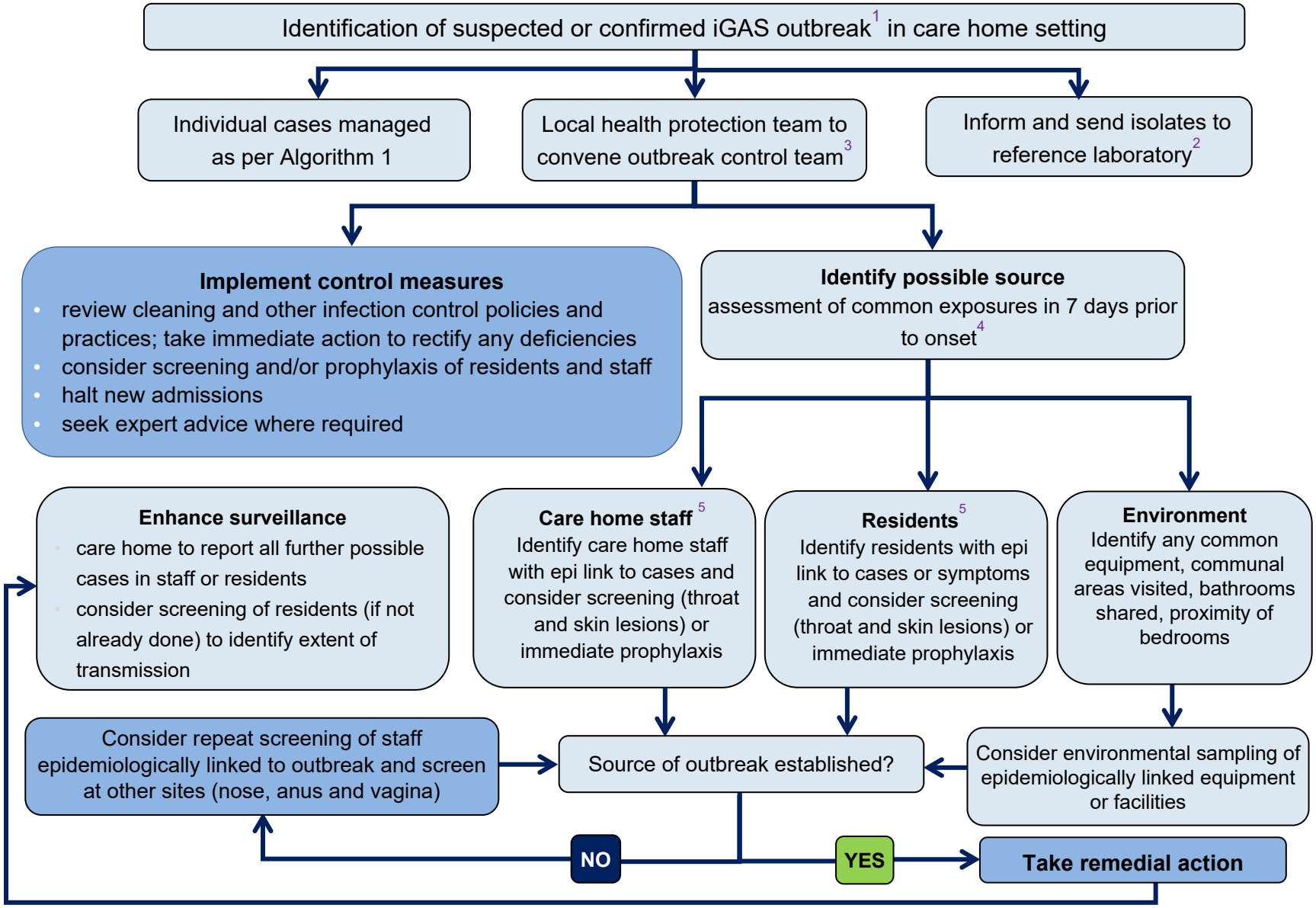
Indication for use	Control measures	Strength of evidence
Outbreak prolonged, consider further measures	• role of re-screening • consider further antibiotics • consider environmental involvement • optimum cleaning protocol	Needs further evidence

Algorithm 3. Management of a single case of iGAS infection in a care home setting (an accessible, text-only version is available)



1. Patient resided in a care home in 7 days prior to onset
2. Invasive GAS infection (iGAS) is defined through isolation of GAS from a normally sterile body site. GAS isolated from non-sterile site in combination with severe clinical presentation should be managed as per iGAS.
3. Consider care home acquired if symptoms or signs of infection not present on entry to care home and no other possible source of transmission identified, such as from recent hospital stay.
4. Carers, peripatetic staff, visitors, other residents with direct contact or close proximity to case.
5. Symptoms suggestive of non-invasive GAS infection include sore throat, fever, minor skin infections
6. Symptoms suggestive of invasive disease include high fever, severe muscle aches or localised muscle tenderness +/- a high index of suspicion of invasive disease. In the absence of a more likely alternative diagnosis then emergency referral to A&E (contact A&E to advise of incoming patient).
7. Consider whether asymptomatic staff contacts should be screened. Indications may include strong epidemiological link, absence of alternative potential source and/or where recent transmission of GAS within the home suspected.

Algorithm 4. Management of suspected or confirmed iGAS outbreak in care home (an accessible, text-only version is available)



1. Two or more cases of confirmed or probable iGAS infection related by person or place. These cases will usually be within a month of each other but the interval may extend to several months.
2. Clearly label isolates sent to the reference laboratory as being part of a suspected outbreak to prioritise processing. Epidemiological investigations and preventive measures should not await results of typing.
3. Outbreak control team may include care home manager, consultant microbiologist, occupational health adviser, local GP, local commissioning lead and communications adviser.
4. Assess possible sources according to case's movements or contacts in the home 7 days prior to onset. Carers, other residents, equipment and the environment are possible sources of outbreaks. Develop time lines and network analyses to identify common exposures (2 or more cases).
5. Carers, peripatetic staff (hairdressers, podiatrists, GPs, district nurses etc), visitors, other residents with direct contact or close proximity to case within 7 days prior to diagnosis. Consider kitchen staff.

6. Community settings outside households, care homes and schools or childcare settings

Clustering of iGAS cases in community settings outside households, care homes and childcare settings present distinct challenges for public health response. Community settings fall into 2 categories: those that involve healthcare services, for example, district nursing, and those that do not, which can include a wide variety of settings and contexts, including military establishments, prisons, universities, people who play close contact sports such as rugby or wrestling, people who inject drugs (PWID) and people who experience homelessness (PEH). Reports of iGAS outbreaks in military camps (16, 117, 118) and among American football (119) and rugby players (120), indicates that there is a higher risk of transmission in environments with close physical contact (121).

Several studies have found that marginalised populations such as PEH and PWID are disproportionately affected by iGAS (122 to 125). These populations often overlap with each other and with those in prison settings. A number of factors are thought to place PWID at increased risk of iGAS including their injecting practices, for example engagement in sharing of injecting equipment and/or groin injection, and their increased risk of skin lesions (122, 126 to 128). In addition, poor access to hygiene facilities, malnutrition and comorbidities increase risk for PWID and PEH alike (129). Data from the Unlinked Anonymous Monitoring Survey of people who have ever injected psychoactive drugs (PWID) in England, Wales and Northern Ireland (130) found that in 2020 over 1 in 3 PWID reported a skin or soft tissue infection in the last year. Of these, less than half reported accessing treatment or attempting to self-treat their infection during the previous year.

Globally there have been several instances of periodic increases in iGAS in recent years, with a number of outbreaks in Canada (131 to 134), the United States (123, 124, 135), and the United Kingdom (122, 136). Recent investigations into a Canadian outbreak where iGAS cases more than quadrupled between 2015 and 2017 found that over half of the cases reported drug injection or homelessness risk factors (131). This is supported through an analysis of US surveillance data (123) which found PEH were over 50% more likely to have an iGAS infection than the general population. Increased skin breakdown among PWID and PEH was noted through an analysis of US hospitalisation data (124), where the proportion of cases with IDU and homeless risk factors more than doubled between 2013 and 2017 and over 80% of cases with these risk factors reported skin breakdown in the last month. This is of concern as skin breakdown could offer an entry point for GAS infection (122) with a recent study into an outbreak in a homeless shelter in Canada finding residents with a diagnosed skin condition had 56 times the odds of acquiring GAS (134).

In England, there has been a general increase in iGAS infection notifications among PWID, PEH and individuals in prison since 2018 (122). Surveillance data (137) for England and Wales indicate that the number of iGAS isolates with a PWID risk factor has increased from 4 cases to 234 cases over the period 2013 to 2019. An investigation into a recent outbreak in North West England (122) found PWID and PWID experiencing homelessness carried a significant burden of these cases and noted differences in the *emm* type distribution between PWID and PEH groups when compared with non-risk groups.

Stigma, marginalisation, and criminalisation of injecting drug use are a challenge to effective engagement with PWID and presents challenges for outbreak response control measures. It is important to keep this in mind when responding to any increase in cases among this population.

6.1 Risk assessment

For iGAS cases in community settings involving healthcare services, use the home healthcare guidance found in section 6.4 in conjunction with hospital guidance to inform staff risk assessment.

For iGAS cases in other community settings not involving healthcare services, follow the guidance detailed in section 2 for recommendations on risk assessment and identification of contacts. Among homeless and injecting populations, it is important to identify contacts with open wounds or lesions, as they present a higher risk for transmission. Contact tracing may be challenging among some groups who inject drugs as individuals may not be willing to provide contact information for their peers. It is important to stress that you are asking for contact details for healthcare purposes and that their details, and those of their contacts, will remain confidential to the outbreak response team. It is also important to identify whether each case has been linked to sheltered accommodation, a drug service or specific injecting network, military base or prison setting in the 7 days prior to onset of symptoms. When giving advice to contacts of cases with injecting risk factors, use this opportunity to provide advice and information on wound care and safer injecting practices.

6.2 Public Health Actions: single case of iGAS

6.2.1 Source of infection

Consider if the source of iGAS infection is likely to be from close contact through living in close proximity (on a military base, sheltered accommodation, prison and so on), through employment, social contact or injecting related behaviours (peer networks and so on).

6.2.2 Control measures

If an iGAS case is linked to a setting which is not a private residential setting or care home (for example, sheltered accommodation, military base, team changing room or prison) or is part of

an organised group (for example, a sports team), the HPT should follow the household setting guidance in section 3 of this document, contact the setting or group to conduct a risk assessment and follow the additional actions outlined below:

a) Prospective surveillance

Initiate surveillance for 30 days in order to identify any further probable or confirmed cases of iGAS. All probable and confirmed cases should be notified urgently in and out of hours so that public health actions can be taken as soon as possible, ideally within 24 hours.

b) Environmental cleaning

Ensure any bedding, sleeping bags, blankets, pillows, curtains, towels and/or clothing used by the case are washed at a high temperature using detergent. Clean all hard surfaces and touch-points in rooms regularly used by the case (that is, bedrooms, bathrooms and so on) using a cleaning solution containing hypochlorite at 1,000ppm of available chlorine. Ensure thorough decontamination of rooms used by the case after they have vacated a room and/or between residents.

c) Communication

It is important to provide educational resources on, and stress the importance of, good hygiene, wound care, and safer injecting practices, as applicable, to all close contacts. Refer to guidance on wound awareness among PWID.

6.3 Public health actions: generalised rise or outbreak of iGAS cases

If the risk assessment conducted by the HPT suggests evidence of ongoing GAS transmission in the community an investigation should be started promptly. An investigation should also be initiated where *emm* typing suggests a possible cluster or genomic assessment has confirmed an outbreak. An OCT should be formed and key facts established to inform future action.

6.3.1 Source of infection

Undertake epidemiological investigations, including review of microbiology and surveillance records for further GAS/iGAS cases that have occurred over previous 6 months. This aims to identify any common source or link between cases if there are 2 or more iGAS cases. Investigate symptomatic contacts or contacts with wounds or lesions through contact tracing. Consider investigation of carriage in people and the environment through swabbing. Define the risk group or setting and relevant case definitions.

6.3.2 Control measures

a) Convene an OCT

Convene an OCT to supervise the investigation and management of the outbreak. If the case is among PWID or PEH, consider including representatives from local drug service providers

and/or organisations working with PEH in the OCT. Engaging with PWID can be difficult so please obtain expert advice from the national team if required.

b) Surveillance

Establish enhanced surveillance for 30 days to identify those at risk, including care workers and prison staff where appropriate.

c) Seek expert advice

Seek expert advice and ensure microbiological assessment of all available isolates: refer isolates for typing to the UKHSA Streptococcal Reference Service or your national reference service, with a unique ID. Consider requesting WGS to be conducted on all confirmed GAS cases. Contact AMRHAI@ukhsa.gov.uk to discuss further.

d) Swabbing and chemoprophylaxis

Consider chemoprophylaxis in exceptional circumstances, especially in situations where there is a defined group in a closed setting. The recommended antibiotic regimen is the same as for treatment (see factsheet 2 in Appendix 4). For some groups where there is a risk of them leaving before treatment completion or of low adherence to oral regimens (for example, PEH and PWID) discuss with a local microbiologist whether alternative regimens are available, such as a single oral, intravenous or intramuscular dose. A number of studies indicate a reluctance to engage with healthcare and a low compliance to oral antibiotic regimens among these groups (133, 138 to 140). It is hypothesized that reduced healthcare engagement among military trainees may be linked to the impact that attending healthcare may have on training completion (138). Similarly, compliance to oral regimens could be impacted by fear that side effects would impact physical performance (138).

It is suggested that a single dose of intramuscular or oral chemoprophylaxis may be more effective among PWID and PEH since ensuring completion of an oral regimen may be difficult for these underserved groups (133, 141). During an outbreak of iGAS *emm*26.3 among PEH in Alaska, a 1g single oral dose of azithromycin was administered to 391 persons; baseline and post-intervention colonisation surveys showed a drop in the colonisation rate with this *emm* type, from 4% to 1% (142). Before administering chemoprophylaxis, advice should be sought from the national team (see contact details in the Resources section).

e) Personal hygiene

Good personal hygiene remains important in preventing infection. If the outbreak is in a closed setting (for example, prison, homeless shelter and so on), showers or washing facilities with clean towels should be available to each individual. Education around the importance of hand hygiene should be encouraged with liquid soap and paper towels provided. Individuals should be encouraged to cover their mouth and nose with a tissue when they cough and sneeze and to wash hands or use alcohol gel after sneezing and after using or disposing of tissues. Spitting should be discouraged. As skin breakdown increases the risk for GAS transmission (125), it is vitally important that all wounds are cleaned and covered hygienically. For outbreaks among PWID, wound clinics can be established providing medical care, wound packs containing

dressings and so on to be taken away and used in future, injecting equipment, and information on wound care. Educational materials aimed at both PWID and those working with this population are essential to raise awareness of the importance of wound care and the increased risk of GAS infection among this group (124). It is also important to investigate if there have been any prior infestations at the site, that is, of lice, bedbugs, scabies, as these infestations and any topical treatment may cause additional damage to the skin (134, 135).

f) Environmental cleaning, linen and waste disposal

The environment can play a significant part in transmission as GAS can be found to remain in dust as well as on furniture and equipment (91 to 96). During an outbreak in closed settings such as hostels, prisons or military establishments, cleaning of the environment should as a minimum be carried out daily 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.

i. Hypochlorite at 1,000ppm of available chlorine, preceded by cleaning if any dirt is visible, is recommended for cleaning of equipment, hard surfaces and bed frames. Horizontal surfaces should be kept clear of unnecessary equipment and ornaments to allow thorough cleaning to occur.
ii. Carpets and soft furnishings should be vacuumed daily; the vacuum cleaner should have a high efficiency filter on its exhaust. Single use cloths or paper towels should be used for cleaning. Consider replacing low cost items that may be difficult to clean thoroughly.
iii. Rooms should be thoroughly cleaned and bedding changed between persons.
iv. Individuals should be provided with their own towels and toothbrushes.
v. During the terminal clean, carpets should be cleaned with a washer-extractor. Curtains, soft furnishing covers and all linen should be removed, and washed at the hottest compatible temperature (97). After this they should not be placed in the same laundry basket or other container that was used for the uncleaned items. Soft furnishings without removable covers should be steam cleaned, taking care to hold the nozzle of the steam cleaner sufficiently close to the surface and for long enough for all surfaces (particularly contact areas) to ensure they heat up thoroughly.

g) Additional measures for prison settings

Further guidance outlining the measures that should be taken in the event that incidents or outbreaks of iGAS are reported in prisons or prescribed places of detention has been published (143).

6.3.3 Communication

In the event of an outbreak of iGAS infection in a closed setting, the setting should send a warn and inform letter (Appendix 5.3) and question and answer factsheet (Appendix 4) to staff and those residing at the setting in order to raise awareness of the signs and symptoms of GAS/iGAS, particularly in vulnerable contacts (immunocompromised, high risk contacts). Any additional control measures instigated (for example, antibiotic chemoprophylaxis) would also

need to be included here. Posters highlighting the symptoms of iGAS and the importance of wound care and good hygiene should also be displayed to further raise awareness. Refer to guidance on wound awareness among PWID.

For community outbreaks among PWID and PEH, targeted communications and educational resources can be supplied via needle exchanges, drug and alcohol services and services for the underhoused in order to raise awareness.

The OCT should also consider sending a letter to local health professionals to alert them of the iGAS outbreak or case increase to ensure prompt identification and treatment of cases.

6.4 Home healthcare

Home healthcare (HCC) refers to provision of medical or nursing care within a patient's home, including include district nursing, general practitioners, podiatry (chiropody), community midwifery, hospital outreach and palliative care. For cases and outbreaks associated with HCC, use this guidance in conjunction with acute healthcare (and maternity) guidance to inform staff risk assessment.

The first reported HHC-associated outbreak in England was in 2013 (144). Since then, the number of reported iGAS outbreaks associated with home healthcare has increased, from 2 in 2014 to 6 in 2019 (39). While the reasons for this are unclear, the following are thought to have a played a role: increased awareness and reporting, changes to community nursing, a significant reduction of qualified district nurses since 2010 and an increased reliance on the charitable, social enterprise and private sectors (39).

Identification of HCC-associated outbreaks is difficult for several reasons: first, patients receiving home healthcare usually have many points of healthcare contact; second, it was previously not routine for health protection teams to ask about healthcare exposures when undertaking routine follow-up of community-acquired iGAS infection; third, care networks are often complex and links between cases may be difficult to ascertain (39).

Infection control in the home environment is challenging. Unlike in acute healthcare settings, there are limited facilities to decontaminate hands and equipment and a lower quality of environmental cleaning. Published data on infections associated with HHC is scarce but one secondary data analysis study of HCC patients in the United States reported that 3.2% of patients become infected and require hospitalisation or emergency care, with wound infections being the most reported (144).

6.4.1 Outbreak characteristics

A PHE-led review of 10 iGAS outbreaks linked to HHC services from January 2018 to September 2019 found that delays in recognition are common; for 9 outbreaks where this data

was available, a median of 4.5 iGAS cases (range 2 to 11) and 40 days (range 3 to 517) had occurred before the outbreaks were declared (39, 146). The reasons cited for the delays included those concerning *emm* typing: delays in *emm* typing results, no standardised recording and review of *emm* types and outbreaks being caused by common *emm* types. Overlap with residential care also caused delays in outbreak identification because the residential care initially formed the focus of the investigation. Finally, long delays between cases and lack of routinely collected data on HCC exposures meant that epidemiological links were missed. The complex nature of care networks, together with the issues cited above around delays in recognition of outbreaks mean that they can last a long time. For the 10 outbreaks studied in England, the median duration was 199 days (range 3 to 517) (39, 146).

As the cases are predominantly elderly people with limited mobility and complex healthcare needs, these outbreaks often have high mortality rates. The PHE-led review of 10 HHC-associated outbreaks reported a case fatality rate of 29% (146).

6.4.2 Source and mode of transmission

Investigation of HHC-associated outbreaks are complex, making it difficult to definitively establish a source. Indeed, no definitive source was identified in any of the HHC-associated outbreaks in England, 2018 to 2019 (39, 146). The common hypothesis was that GAS was transmitted between colonised or infected patients and healthcare workers and that numerous transmission events caused each outbreak, following lapses in infection control. The complexity of HHC-outbreaks is illustrated by the finding that during outbreaks in England, home healthcare workers visited up to 20 patients per day and several home healthcare workers might see the same patient each week (146). While the role of fomites in transmission remains unclear, GAS are known to persist on inanimate surfaces for up to 4 months (147) and challenges with decontamination in the home environment may provide opportunities for contamination to occur. It is likely that transmission occurs via a combination of carriage, transient contamination of home healthcare workers, equipment or other fomites.

6.4.3 Recommendations

The working group endorses the following selected recommendations, as outlined in the PHE-led review of iGAS outbreaks linked to home healthcare services (39):

1. All community iGAS cases, including those occurring in nursing or residential homes, should be investigated for links to home healthcare.
2. Any identified links to home healthcare should be recorded on a case and incident management system.
3. HPTs should systematically record and regularly review the *emm* types of all iGAS cases in their locality to allow early detection of potential outbreaks.
4. The OCT should consider a site visit to the home healthcare base, both to identify breaches in infection control and to build a relationship with the home healthcare team.

5. All screening swabs which culture GAS should be sent for typing, and WGS if they are of the same *emm* type as the related outbreak. A positive screening swab is highly suggestive of transmission.
6. A member of the OCT (or delegated appropriately experienced professional) should visit the home healthcare site in person if antimicrobial prophylaxis is considered. They should explain the rationale for this, together with the limited risk of isolates developing antimicrobial resistance and HCW should be given written information regarding this to promote compliance.

7. Reporting of iGAS cases with international travel

WHO member states are required to report events of public health concern in accordance with the International Health Regulations (IHR) (2005). These are an international, legally binding instrument whose purpose is to prevent, protect against, control, and provide a public health response to the international spread of disease. Their aim is to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide (148). Communication with other countries and with WHO under the IHR (2005) is carried out through the UK IHR National Focal Point (NFP).

The UK IHR NFP, should be notified promptly by email (ihrnfp@ukhsa.gov.uk) of all likely (probable) or confirmed iGAS cases who:

a) have travelled on an aircraft (for any length of time and including domestic travel abroad) or other international travel during their infectious period
b) were infectious whilst abroad
c) are likely to have acquired their infection abroad
d) have close contacts abroad that may need follow-up

The IHR NFP inbox is only manned Monday to Friday 9am to 5pm. Outside of these hours an IHR duty consultant oversees the mailbox. Email is preferred but the team is also contactable on +44 (0) 20 8327 6260.

For countries where the case had resided or travelled through or to whilst infectious, the national public health institutes will require information about the case, for example addresses where they stayed and any institutions or gatherings attended in that country.

Please send the following information for each likely iGAS case to the UK IHR NFP at UKHSA Colindale: ihrnfp@ukhsa.gov.uk. Please complete as far as practicable:

1. Case details

- case name
- case contact information (address, telephone, email)
- date of birth
- onset of symptoms
- is the likely case microbiologically confirmed? (Please give test results and date where available)
- did the case undertake international travel during the infectious period?

2. Travel details

- date of travel
- airline
- flight number
- start and end destinations
- seat number of case if available
- country or countries of travel
- name and address of accommodation
- date of arrival and departure
- details of any close contacts, for example, phone number, email address, place of residence

Further information can be found in the International Health Regulations 2005: UK National Focal Point (149).

The UK IHR NFP may also be contacted by foreign authorities with information regarding:

- UK-based travellers who have been diagnosed with iGAS while travelling abroad but were infectious prior to their departure
- UK-based travellers who may have been exposed to iGAS (and other infectious diseases) while travelling abroad
- confirmed cases of iGAS from other countries who travelled within the UK whilst infectious prior to returning to their country

In these circumstances the information will be passed on to the relevant HPTs who will be requested to follow up as per their usual protocol.

8. Invasive group C and G streptococcal disease

There is no published evidence that cases of invasive group C or G streptococcus pose the same risk to household contacts as GAS infection. For a case acquired in a hospital or maternity setting, the Guidelines for prevention and control of group A streptococcal infection in acute healthcare and maternity settings in the UK should be followed.

Prophylaxis and warn and inform information is not routinely recommended for community contacts of invasive cases of group C or G streptococcus.

In certain situations, initiate follow up of the case, discuss with expert opinion and consider referral of isolates to the reference laboratory for typing if the person notifying the HPT raises significant issues. These situations include:

a) any suspicion of a cluster or outbreak, irrespective of setting
b) severity of infection (that is, STSS or necrotising fasciitis)
c) unusual age (that is, in children of nursery age)

Appendices

Appendix 1. SIGN grading system 1999 to 2012

Levels of evidence

Level	Definition
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case control or cohort or studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, for example, case reports, case series
4	Expert opinion

Grades of recommendations

Grade	Definition
A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+

Good practice points

Recommended best practice based on the clinical experience of the guideline development group.

Appendix 2. Glossary of acronyms and abbreviations

Acronym	Definition
BNF	British National Formulary
GAS	Group A streptococci
HHC	Home healthcare
HPT	Health protection team
iGAS	Invasive group A streptococci
IHR	International Health Regulations
IPC	Infection Prevention and Control
IQR	Interquartile Range
NFP	National Focal Point
NICE	The National Institute for Health and Care Excellence
NIS	National Infection Service
OCT	Outbreak control team
PEH	People experiencing homelessness
PHE	Public Health England
PO	Per oral
PWID	People who inject drugs
RCT	Randomised control trial
SIGN	Scottish Intercollegiate Guidelines Network
STSS	Streptococcal toxic shock syndrome
UKHSA	UK Health Security Agency
WHO	World Health Organization

Appendix 3. Contact information and community iGAS working group membership

Contact information

Name	Title and Affiliation	Contact details
AMRHAI	Antimicrobial Resistance and Healthcare Associated Infections Unit (AMRHAI)	AMRHAI@ukhsa.gov.uk
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Colin Brown	Deputy Director, HCAI, Fungal, AMR, AMU and Sepsis Division
Vicki Chalker	Head, RVPBRU, UKHSA
Meera Chand	Consultant Medical Microbiologist, Reference

Name	Title and Affiliation
	Microbiology Services, UKHSA
Juliana Coelho	Clinical Scientist, Head of the Staphylococcus and Streptococcus Reference Section, Reference Services Division, UKHSA
Rebecca Cordery (lead: household subgroup)	Consultant in Health Protection, UKHSA London
Amelia Cummins	Consultant in Health Protection, UKHSA East of England
Valérie Decraene (chair)	Principal Epidemiologist, Field Services, UKHSA
Srilaxmi Degala	Senior Scientist, Field Services, UKHSA
Michael Devine	Consultant in Health Protection, Health Protection Service Northern Ireland
Androulla Efstratiou	Professor/Head, WHO Collaborating Centre for Reference and Research on Diphtheria and Streptococcal Infections
Georgina Fletcher	UKHSA Communications Team
Brendan Healy	Public Health Wales Microbiology, Cardiff
Karen Johnson	Team Administrator, Field Service, UKHSA
Theresa Lamagni	Head of Gram Positive Section, HCAI, Fungal, AMR, AMU and Sepsis Division, UKHSA
Doreen Cartledge	The Lee Spark Necrotising Fasciitis Foundation
Jim McMenamin	Consultant Epidemiologist, Public Health Scotland
Rachel Mearkle	Consultant in Health Protection, UKHSA South East
Sally Millership (lead: care home subgroup)	Consultant in Microbiology, The Princess Alexandra Hospital, Essex
Marina Morgan	Consultant Microbiologist, Royal Devon and Exeter Hospital
Oluwakemi Olufon	Senior Health Protection Nurse Specialist, UKHSA London
Anjali Pai (Secretariat, developed and drafted guidance)	Consultant in Health Protection, UKHSA South East
Derren Ready	Consultant in Public Health Infection, Field Services, UKHSA
Vanessa Saliba (lead: schools / nursery subgroup)	Consultant Epidemiologist, Immunisation Division, UKHSA

Name	Title and Affiliation
Shiranee Sriskandan	Professor of Infectious Diseases, NIHR HPRU in HCAI and AMR, Imperial College London; Lead, British Infection Association, Streptococcal Infections
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Peter Hoffman (specialist input on environmental sampling)	Consultant Clinical Scientist, Reference Microbiology Services, UKHSA
Heather Lewis (review)	Registrar, Public Health Wales
Emma McGuire (table and text on chemoprophylaxis regimens)	Clinical Fellow in Infectious Diseases and Microbiology, HCAI, Fungal, AMR, AMU and Sepsis Division, UKHSA
Karren Staniforth (specialist IPC input)	Consultant Clinical Scientist – IPC Specialist Advisor, HCAI, Fungal, AMR, AMU and Sepsis Division, UKHSA
Vicky Watts (literature review, referencing and proof reading)	Senior Scientist, Field Services, UKHSA

Organisations

British Infection Association (BIA)

UK Health Security Agency, Health Protection Teams, Field Services, Immunisation Division, and Healthcare Associated Infection & Antimicrobial Resistance Division

Public Health Scotland, Health Protection Teams

Public Health Wales, Health Protection Teams

Public Health Agency Northern Ireland, Health Protection Teams

Royal College of General Practitioners (RCGP)

Royal College of Obstetricians and Gynaecologists (RCOG), Guidelines Committee

Royal College of Paediatrics and Child Health (RCPCH)

Appendix 4. iGAS factsheets

Factsheet 1. Invasive group A streptococcal infection (iGAS)

Factsheet 2. Invasive group A streptococcal infection (iGAS) – information for people who inject drugs

Factsheet 3. Summary of public health actions and chemoprophylaxis regimes

Table 1. Summary of public health actions for close contacts of iGAS cases in household settings

Risk assessment of household contact	Defined as	Action required
A) High risk	• older persons (≥75 years) • pregnant women ≥37 weeks • women within 28 days of giving birth • neonates (up to 28 days old) • individuals who develop chickenpox with active lesions within 7 days prior to diagnosis of iGAS infection in the index case or within 48 hours after commencing antibiotics by the iGAS case, if exposure ongoing	Offer antibiotic prophylaxis only to the high risk contact. Administer as soon as possible (within 24 hours, and preferably same day) and not beyond 10 days after iGAS diagnosis in the index case. 'Warn and inform' letters for close contacts; letter can also be copied to the contact's GP.
B) Symptomatic: iGAS* symptoms	Symptoms suggestive of iGAS	Urgent medical review
	If 2 or more confirmed or probable iGAS cases are identified in the household	Offer antibiotic prophylaxis to the whole household within a 10-day period of iGAS diagnosis in the index case.
C) Symptomatic: GAS symptoms^	Symptoms suggestive of localised GAS infection	GP assessment and treatment if indicated. 'Warn and inform' letters for close contacts; letter can also be copied to the contact's GP.

Risk assessment of household contact	Defined as	Action required
D) All other close contacts	Those not reporting symptoms at the time of the risk assessment and not in a high risk group.	Maintain a low threshold of suspicion. A 30-day period of surveillance should be established. Use ‘warn and inform’ letters to advise all other close contacts to be alert to the signs and symptoms of GAS infection and seek medical attention if they develop a febrile illness or any clinical manifestation of GAS within 30 days of diagnosis in the index case. Letter can also be copied to the contact’s GP.

* High fever, severe muscle aches or localised muscle tenderness +/- a high index of suspicion of invasive disease.
^ Sore throat, fever, minor skin infections, scarlatiniform rash.

Table 2. Choice of agent for chemoprophylaxis¥

Group	Drug	Duration
First line		
Child or adult	Phenoxymethylpenicillin (Penicillin V)	10 days
Second line (penicillin allergy)		
Birth to 6 months	Clarithromycin*^	10 days
Non-pregnant adults and children 6 months to 17 years	Azithromycin*^	5 days
	Clarithromycin*^	10 days
Pregnant or postpartum (within 28 days of childbirth)	Erythromycin*^	10 days

¥ Consult British National Formulary for recommended doses.
* Where susceptibilities are available, these should be reviewed to ensure the prescribed agent remains active.
^ Clinicians should check for potential significant interactions with other prescribed medications.

Appendix 5. Letter templates for HPTs to modify to suit local arrangements

5.1 Letter to GP for case

Ref number, HPzone number, or equivalent

Dear Dr xx,

Re: Severe group A streptococcal infection in a patient registered with you

Case:	DOB:
NHS number	Address
Contacts:	DOBs:
NHS numbers	Address

The above patient registered with your practice has recently had invasive group A streptococcal disease (iGAS). iGAS infection is defined as an infection associated with the isolation of GAS from a normally sterile site or non-sterile site with a clinically severe presentation.

Studies suggest that there may be an increased risk of iGAS infection in close contacts of a case but this risk is low. A close contact is defined as a person who has had prolonged close contact with the case in a household-type setting during the 7 days before diagnosis of iGAS infection in the index case.

The following is recommended for close contacts of iGAS infection.

1. Provide close contacts of a case of iGAS disease with information about symptoms of iGAS (leaflet enclosed) << We have already sent this to close contacts of this case>>.
2. Close contacts should be referred to A&E if they develop symptoms suggestive of invasive disease, for example, high fever, severe muscle aches/localised tenderness within 30 days of diagnosis in the index case. <<We have already advised close contacts of this>>
3. Close contacts with symptoms suggestive of localised GAS infection (sore throat, skin infection, fever) within 30 days of diagnosis in the index case should be offered antibiotic treatment. Refer to table below for choice of agent. <<None of the identified close contacts have symptoms currently / please prescribe antibiotics for the following contacts: XX >>
4. Certain individuals are advised to have antibiotic prophylaxis even if asymptomatic: For households with a) those who are pregnant ≥37 weeks and within 28 days of giving birth, b) elderly individuals aged 75 years and above, c) children with open chickenpox lesions, in the 7 days before diagnosis of iGAS infection in the index case (and/or in the period up to 48 hours after antibiotic treatment has commenced), d) neonates within 28 days of giving birth, different advice applies. Please contact the HPT on << Phone number>> in these circumstances.

5. If further cases of iGAS occur in the group of close contacts within a 30 day period, additional measures will be necessary. Please contact us in these circumstances.

Choice of agent for treatment and chemoprophylaxis ¥

Group	Drug	Duration
First line		
Child or adult	Phenoxymethylpenicillin (Penicillin V)	10 days
Second line (penicillin allergy)		
Birth to 6 months	Clarithromycin*^	10 days
Non-pregnant adults and children 6 months to 17 years	Azithromycin*^	5 days
	Clarithromycin*^	10 days
Pregnant or postpartum (within 28 days of childbirth)	Erythromycin*^	10 days

¥ Consult British National Formulary for recommended doses.
* Where susceptibilities are available, these should be reviewed to ensure the prescribed agent remains active.
^ Clinicians should check for potential significant interactions with other prescribed medications

If you have any queries, please contact the health protection team on << Phone number>>
Thank you for your assistance with this.

Yours sincerely,

<< >>

Health Protection Nurse or Consultant in Health Protection employee.email@ukhsa.gov.uk

5.2 Letter to GP for contacts

00 month 20XX

Dear Dr
Re: Contacts of invasive group A streptococcal disease
Our ref:

Name	Date of birth

We have been notified that the above patients, registered with your practice, are close contacts of a case of invasive group A streptococcal infection (iGAS). A close contact is defined as someone who has had prolonged close contact with the case in a household-type setting during the 7 days before the diagnosis of iGAS infection. Studies suggest that there may be an increased risk of GAS in close contacts of cases but this risk is low.

We have sent the above contacts information about the symptoms of GAS and asked that they attend the surgery should they experience symptoms suggestive of localized group A streptococcal infection (sore throat, skin infection, fever) within 30 days of diagnosis in the index case. Close contacts with these symptoms should be offered antibiotic treatment.

Certain individuals are advised to have antibiotic prophylaxis even if asymptomatic: For households with a) those who are pregnant ≥37 weeks and within 28 days of giving birth, b) elderly individuals aged 75 years and above, c) child with chickenpox, in the 7 days before diagnosis of iGAS infection in the case, and/or in the period up to 48 hours after antibiotic treatment has commenced d) neonates within 28 days of giving birth, different advice applies.

Please contact the health protection team on XXXXXXXX in these circumstances.

Choice of agent for chemoprophylaxis¥

Group	Drug	Duration
First line		
Child or adult	Phenoxymethylpenicillin (Penicillin V)	10 days
Second line (penicillin allergy)		
Birth to 6 months	Clarithromycin*^	10 days
Non-pregnant adults and children 6 months to 17 years	Azithromycin*^	5 days
	Clarithromycin*^	10 days
Pregnant or postpartum (within 28 days of childbirth)	Erythromycin*^	10 days

¥ Consult British National Formulary for recommended doses.
* Where susceptibilities are available, these should be reviewed to ensure the prescribed agent remains active.
^ Clinicians should check for potential significant interactions with other prescribed medications

If none of these antibiotics are suitable a medical microbiologist should be consulted. If you suspect any more cases of invasive group A streptococcal infection, please inform us without delay.

Note: It remains the responsibility of the registered healthcare professionals supplying or administering medicines to check the medicine is appropriate for the patient and be aware of potential side effects. This may include checking doses, contraindications and drug interactions and communicating to the patient about potential adverse effects.

We have advised close contacts to seek urgent medical attention if they develop symptoms suggestive of invasive disease, for example, high fever or severe muscle aches or localised tenderness.

Please do not hesitate to contact us if you have any further queries.

Yours faithfully,

Name
Title
Health Protection Team
Email

5.3 School or nursery letter

00 month 20XX

Dear parent or guardian,

A child who attends your child's school or nursery has developed invasive group A streptococcal infection. Group A streptococcus are bacteria that can be found in the throat and on the skin. People may carry group A streptococcus and have no symptoms of illness or may develop infection.

This letter gives you some information about the disease, including the signs and symptoms to look out for. There is no reason to make any changes in the school or nursery routine and no reason for children to be kept at home if well.

The most common group A streptococcal infections are mild: sore throats (strep throat), mild fever and minor skin infections (impetigo, scarlet fever). If your child has any of these symptoms in the next 30 days we advise that you take them (along with this letter) to see their GP. Their GP can arrange for the child to be tested if necessary and then treated with antibiotics if the GP thinks they have a group A streptococcal infection. If the GP thinks that the child has group A streptococcal infection, the child will need to remain off school or nursery for 24 hours following the start of the antibiotics.

In very rare cases, for example when chickenpox infection is also present, group A streptococcal infection can be more serious and cause more severe and even life-threatening diseases known as invasive group A streptococcus. Although the risk of another case of invasive disease in the school or nursery is very small, it is important to be aware of the signs and symptoms of invasive group A streptococcal infection, which are detailed below:

- high fever
- severe muscle aches
- localised muscle pain
- increasing pain, swelling or redness at the site of a wound
- unexplained diarrhoea or vomiting

If someone in your family or household becomes ill with some of these signs or symptoms, please immediately attend A&E (with this letter) for emergency assessment.

We have enclosed a factsheet on infections with group A streptococcus for your information. Further information is also available online.

Yours sincerely

Author's name
Position and title
employee.name@email.com

Enc- iGAS fact sheet

5.4 Letter to care home staff

To all staff members of XXXXXX Care Home
Recipient's name
Position, company
Street name
Town
County or country
Postcode

00 month 20XX

Dear staff member,

Re: Cases of group A streptococcus infection at XXXX care home

The XXX XXX health protection team has been notified that there are cases of a bacterial infection caused by group A streptococcus at XXXXX. *All are being treated with antibiotics and are stable or recovering well.

Group A streptococcal infections commonly cause mild illnesses, such as a sore throat or skin infection. On rare occasions however, the bacteria can cause more severe and even life-threatening diseases known as invasive group A streptococcus (or iGAS). The elderly are considered to be particularly vulnerable. We are working with the care home management and community health services to ensure measures are in place to reduce the risk of the infection developing in anyone else at the home.

The risk to people who have been in contact with someone with the infection is low. However, as a precautionary measure, close contacts of these residents (both residents and staff within the home) have been identified and will receive a precautionary course of antibiotics. This has been arranged for you. The antibiotic course will be provided for you within the home and should be started immediately. If for any reason you think you may be allergic to this antibiotic, please do not take it and discuss the matter with Dr XXXXX straight away so that he can provide you with a suitable alternative. We also request that you inform your own GP about receiving this medication. You can use this letter to explain the rationale for this action at the home. Visitors to the care home do not require antibiotics as it is very unlikely that the infection could be passed on to them.

If you develop any symptoms of a possible mild group A streptococcal infection (for example, sore throat, fever, skin infection) even after you have started your antibiotics, you should:

- inform the care home manager (who will seek advice from the HPT)
- stay away from work whilst symptomatic

- consult your GP and show them this letter

In the unlikely event that you develop any symptoms suggestive of a possible iGAS infection in the next 30 days (for example, high fever, severe muscle aches or localised muscle tenderness- see attached factsheet), you should immediately attend A&E (with this letter) for emergency assessment. The same applies to any resident should they develop any of these symptoms.

As a further precautionary measure, we are advising the home to heighten their usual infection control procedures, especially around environmental cleaning and hand hygiene.

We have enclosed a factsheet on infections with group A Streptococcus for your information.

You can also access further information online:

- Group A streptococcal infections: guidance and data
- The Lee Spark NF Foundation

We are very grateful for your co-operation at this time.

Yours sincerely,

Consultant in Health Protection

Enc- iGAS fact sheet

5.5 Letter to care home residents and next of kin

To all residents and relatives or next of kin of residents in XXX Care Home
Address

00 month 20XX

Dear resident and relative,
Cases of group A streptococcus infection at XXX care home

The XXX XXX health protection team has been notified that there are cases of a bacterial infection caused by group A streptococcus at XXXXX. These residents are receiving antibiotic treatment and are stable or recovering well.

GAS infections commonly cause mild illnesses, such as a sore throat or skin infection. On rare occasions, however, the bacteria can cause more severe and even life-threatening diseases invasive group A streptococcus. The elderly are considered to be particularly vulnerable. We are working with the care home management and community health services to ensure measures are in place to reduce the risk of the infection developing in anyone else at the home.

The risk to people who have been in contact with someone with the infection is low. However, as a precautionary measure, close contacts of these residents (both residents and staff within the home) have been identified and will receive a precautionary course of antibiotics. This has been arranged for XXX. Visitors to the care home do not require antibiotics as it is very unlikely that the infection could be passed on to them.

As an added precaution, we have advised the home manager to keep the residents who have symptoms isolated from other residents until they have received antibiotics for a minimum of 24 hours. We are also advising the home to heighten their usual infection control procedures, especially around environmental cleaning and hand hygiene.

We have enclosed a factsheet on infections with group A streptococcus for your information. You can also access further information online at:

- Group A streptococcal infections: guidance and data
- The Lee Spark NF Foundation

We are very grateful for your co-operation at this time.

Yours sincerely,

Consultant in Health Protection / Health Protection Specialist

Enc- iGAS factsheet

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