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Fact Sheet (vs. 12/2014)

Revision History:

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CASE DEFINITION (CDC 1995) – Invasive, Group A Streptococcus

Clinical Description for Public Health Surveillance:
Any of several clinical syndromes, including pneumonia, bacteremia in association with cutaneous infection (e.g., cellulitis, erysipelas, or infection of a surgical or nonsurgical wound), deep soft-tissue infection (e.g., myositis or necrotizing fasciitis), meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis (i.e., puerperal fever), neonatal sepsis, and nonfocal bacteremia.

Laboratory Criteria for Case Classification:
Isolation of group A Streptococcus (S. pyogenes) by culture, from a normally sterile site (e.g., blood or cerebrospinal fluid, or, less commonly, joint, pleural, or pericardial fluid).

Case Classification:
Confirmed: Case that is laboratory confirmed

CASE DEFINITION (CDC 2010) – Streptococcal Toxic-Shock Syndrome (STSS)

Clinical Description for Public Health Surveillance:
- Hypotension: a systolic blood pressure ≤ 90 mm Hg for adults or ≤ fifth percentile by age for children aged ≤ 16 years.
- Multi-organ involvement characterized by two or more of the following:
  - Renal impairment: Creatinine > 2 mg/dL (≥177 µmol/L) for adults or ≥ twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than two-fold elevation over the baseline level.
  - Coagulopathy: Platelets < 100,000/mm3 (<100 x 106/L) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
  - Liver involvement: Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels > 2x the upper limit of normal for the patient's age. In patients with preexisting liver disease, a greater than two-fold increase over the baseline level.
  - Acute respiratory distress syndrome: defined by acute onset of diffuse pulmonary infiltrates and hypoxemia in the absence of cardiac failure or by evidence of diffuse capillary leak manifested by acute onset of generalized edema, or pleural or peritoneal effusions with hypoalbuminemia.
  - A generalized erythematous macular rash that may desquamate.
  - Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene.

* Clinical manifestations do not need to be detected within the first 48 hours of hospitalization or illness, as specified in the 1996 case definition. The specification of the 48 hour time constraint was for purposes of assessing whether the case was considered nosocomial, not whether it was a case or not.

Laboratory Criteria for Case Classification:
Isolation of group A Streptococcus.

Case Classification:
Confirmed: Case meets the clinical case definition with isolation of group A Streptococcus from a normally sterile site (i.e., blood or cerebrospinal, joint, pleural, or pericardial fluid).

Probable: Case meets the clinical case definition in the absence of another identified etiology for the illness and with isolation of group A Streptococcus from a non-sterile site.
LABORATORY ANALYSIS

- Gram stains and cultures are performed routinely by commercial laboratories.
- Submission of invasive Group A Streptococcus isolates to the Kansas Health and Environmental Laboratories (KHEL) is required by law. (K.A.R. 28-1-18)
- Shipping of isolates: Use Miscellaneous Infectious Disease (IDS) Shipper.
- For additional information and/or questions concerning isolate submission call (785) 296-1620 or refer to www.kdheks.gov/labs/lab_ref_guide.htm.

EPIDEMIOLOGY

Approximately 9,000-11,500 cases of invasive Group A streptococcus (GAS) disease (3.2 to 3.9/100,000 population) occur each year in the U.S.; STSS and necrotizing fasciitis (NF) accounted for approximately 6%-7% of those cases. Over 10 million noninvasive GAS infections (primarily throat and superficial skin infections) occur annually. Worldwide, rates of severe invasive disease (STSS and NF) increased from the mid-1980s to early 1990s. Increases in the severity of disease were associated with increases in prevalence of M-1 and M-3 serotypes (emm types 1 and 3). Rates of invasive disease have been stable over the last 7 years in the United States. Resistance to erythromycin has increased worldwide. Those at highest risk of invasive disease include the elderly, immunosuppressed, persons with chronic cardiac or respiratory disease, diabetes or skin lesions (i.e. children with varicella [chicken pox], persons with penetrating trauma or surgical wounds, intravenous drug users) African-Americans and American Indians. Children (especially elementary school age) are at highest risk of noninvasive disease. Nasal, throat, skin, anal and vaginal carriers of GAS have been responsible for nosocomial outbreaks.

DISEASE OVERVIEW

A. Agent:
   Bacterium, Streptococcus pyogenes, > 100 identified serological types.

B. Clinical Description:
   While GAS is most often associated with streptococcal pharyngitis/tonsillitis and streptococcal skin infections (impetigo or pyoderma), there are several invasive clinical syndromes, including pneumonia, bacteraemia and meningitis. Bacteremia can develop in association with cutaneous infection (e.g., cellulitis, erysipelas, or infection of a surgical or nonsurgical wound), deep soft-tissue infection (e.g., myositis or necrotizing fasciitis), peritonitis, osteomyelitis, septic arthritis, postpartum sepsis, and neonatal sepsis. Potential complications of GAS infections include acute rheumatic fever and glomerulonephritis.

STSS is a severe illness associated with invasive or noninvasive group A streptococcal infection. STSS may occur with infection at any site but most often occurs in association with infection of a cutaneous lesion. Signs of toxicity and a rapidly progressive clinical course are characteristic, and the case-fatality rate may exceed 50%.
C. **Reservoirs:** Humans.

D. **Mode(s) of Transmission:**
   Bacteria are transmitted person-to-person by large droplet spread or by contact with respiratory secretions. Casual contact can result in nasopharyngeal carriage without illness. Those with acute respiratory tract infections (particularly nasal) can transmit noninvasive infection (i.e. upper respiratory infections or pharyngitis). The invasive form of the disease is not transmitted person-to-person it only occurs after the bacteria have infected a person and then get past the immune defenses of the person. Streptococcal pharyngitis has been associated with the ingestion of contaminated food.

E. **Incubation Period:**
   Short, usually 1-3 days.

F. **Period of Communicability:**
   As long as bacteria present in respiratory secretions. Cases treated with appropriate antibiotics are considered noninfectious after 24 hours of treatment.

G. **Susceptibility and Resistance:**
   Immunity develops only against specific strains and/or exotoxins.

H. **Treatment:**
   Treatment depends on type of infection. Penicillin is the drug of choice for uncomplicated infection. Clindamycin and cephalosporins are used as alternatives. For STSS and necrotizing fasciitis, high dose penicillin and clindamycin are recommended. For those with very severe illness, supportive care in an intensive care unit may also be needed. For persons with necrotizing fasciitis, early and aggressive surgery is often needed to remove damaged tissue and stop disease spread. Early, aggressive treatment may reduce the risk of death from invasive group A streptococcal disease. Antimicrobial therapy is usually not indicated for most GAS pharyngeal carriers, except in instances of outbreaks of rheumatic fever or post-streptococcal glomerulonephritis or GAS pharyngitis in a closed or semi-closed community or with families that have history of acute rheumatic fever or multiple episodes of documented symptomatic GAS pharyngitis during a period of many weeks despite appropriate therapy.

**NOTIFICATION TO PUBLIC HEALTH AUTHORITIES**

| Invasive, Group A *Streptococcus* shall be reported within seven days**: |
| **Meningitis cases require immediate notification by phone within 4 hours of the initial report.** |
| 1. Health care providers and hospitals: report to local health jurisdiction |
| 2. Laboratories: report to KDHE - BEPHI |
| 3. Local health jurisdiction: report to KDHE - BEPHI |

**Kansas Department of Health and Environment (KDHE)**
**Bureau of Epidemiology and Public Health Response (BEPHI)**
**Phone:** 1-877-427-7317 **Fax:** 1-877-427-7318
Further responsibilities of state and local health departments to the CDC:
As a nationally notifiable condition, Streptococcal Toxic-Shock Syndrome (STSS) cases require a STANDARD report to the Center of Disease Control and Prevention (CDC).

1. STANDARD reporting requires KDHE-BEPHI to file an electronic report for within the next reporting cycle.
   • KDHE-BEPHI will file electronic reports weekly with CDC.
2. **Local public health jurisdiction** will report information requested in the Kansas electronic surveillance system, as soon as possible, ensuring that the electronic form is completed within 7 days of receiving a notification of a report.

INVESTIGATOR RESPONSIBILITIES

1) **Report** all confirmed, probable and suspect cases to the KDHE.
   • Meningitis cases require immediate notification within 4 hours of the initial report by calling the epidemiologist-on-call at 1-877-427-7317.
2) Contact the medical provider to collect additional information and confirm diagnosis using the current case definition.
   • Collect all information requested in **Step 1)** of case investigation.
3) Conduct **case investigation** to collect epidemiological data as required by current surveillance objectives. (Most data can be collected from the medical provider, and the patient will not need to be contacted.)
4) Ensure invasive **Group A streptococcal isolates** were sent to the state laboratory.
5) **Record** data, collected during the investigation, in the KS EpiTrax system under the data’s associated [tab] in the case morbidity report (CMR).
6) As appropriate, use the disease **fact sheet** to notify individuals or groups.

*Note:* Routine contact and/or case investigation are not needed for isolated cases of invasive GAS cases. In most cases, the patient will not need to be contacted. Current surveillance objectives depend on:
   • Laboratory submission of all invasive GAS isolates to the state laboratory.
   • The local health department’s assistance with confirming cases.

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Use the **Investigation Worksheet** to organize and collect important data.

**Case Investigation**

1) Contact the medical provider who reported or ordered testing of the case to obtain the following from the patient’s medical records.
   • Obtain clinical information on:
     – Evidence of invasive disease based on case definition. (Refer to Section 1 and 2 of the Investigation Worksheet for assistance.)
       o For STSS, examine for hypotension and multi-organ manifestations for STSS (Section 4 of the Investigation Worksheet)
     – Illness onset(s) and diagnosis date **[Clinical]**
     – Pregnancy or postpartum situation:
• If pregnant, expected delivery date [Clinical]
• If postpartum, outcomes of and date of delivery or abortion [Notes]
  – Hospitalizations: location and duration of stay [Clinical];
  – Outcomes: survived and date of recovery or date of death [Clinical];
  – Underlying medical conditions prior to illness [Notes];
• Were any of the following contributing/risk factors present [Notes]:
  – Any surgeries 7 days prior to first positive culture? (date and provider)
  – Varicella rash
    o If death resulted directly or indirectly from varicella infection investigate as a varicella related death. (Refer to Varicella Disease Investigation Guideline.)
    – Penetrating trauma
    – Blunt trauma
    – Burn wounds
    – Surgical wound
• Case’s demographic data and contacting information (birth date, county, sex, race/ethnicity, address) [Demographic]
• Hospitalizations: location and duration of stay [Clinical]
• Outcomes: survived and date of recovery or date of death [Clinical]

2) If there is no indication that the isolate has been sent to KHEL, call or send a reminder to the laboratory that performed the testing that they are required by law to submit all invasive Group A streptococcal isolates to the state lab.

3) Investigate epi-links among cases (clusters, household, co-workers, etc).
   • For suspected outbreaks refer to Managing Special Situations.
   • For suspected cases associated to postpartum females or for postsurgical infections refer to Managing Special Situations.

Contact Investigation
Contact investigation is of no practical value for routine situations.

Case Management
• If identified, report on any changes in patient status (i.e., date of death).
• Work with appropriate regulatory agency to assure compliance with any work, school or daycare restrictions.

Contact Management
None required. Symptomatic household members should be instructed to seek medical attention for testing (i.e., throat cultures) to assess the need for treatment.
Isolation, Work and Daycare Restrictions

K.A.R 28-1-6 for Streptococcal disease, hemolytic; including erysipelas, scarlet fever, streptococcal sore throat:

- Each infected person shall remain in isolation for 10 days if untreated or for 24 hours following initiation of antibiotic therapy.

Kansas Food Code 2005:

- Food handlers diagnosed with streptococcal disease are subject to the isolation measures specified in K.A.R. 28-1-6 and are excluded\textsuperscript{\dagger} from work during the isolation period.
- Food handlers symptomatic with sore throat and fever must be restricted\textsuperscript{\ddagger} from handling food, or be excluded\textsuperscript{\dagger} from work if they serve high risk groups\textsuperscript{\pi}. (Unless medical documentation is provided by an approved medical provider that they are free of the infectious agent of concern.)
- Food handlers symptomatic with lesions containing pus or an infected wound that is open and draining that cannot be covered or kept dry are restricted\textsuperscript{\ddagger} from handling food. (Unless medical documentation\textsuperscript{\S} is provided by an approved medical provider that they are free of the infectious agent of concern. (i.e. \textit{S. pyogenes} or \textit{S. aureus}))
- Reinstate restricted\textsuperscript{\ddagger} individuals (that were never diagnosed) after they are symptom free for 24 hours and have not been associated with food borne illness.
  - If they have been associated with foodborne illness, reinstate after symptom free and with written medical documentation\textsuperscript{\S} that they are free of the infectious agent of concern.
- Reinstate excluded\textsuperscript{\dagger} individuals after they provide medical documentation\textsuperscript{\S} that they are free of the infectious agent of concern.
- Workers in schools, residential programs, daycare and healthcare facilities, who feed, give mouth care or dispense medications to clients, are subject to the same restrictions as food handlers.

\textsuperscript{\S} Written medical documentation would include information that the patient has been on antibiotics for 24 hours for \textit{S. pyogenes}, has at least one negative throat culture for \textit{S. pyogenes} or is free of the infectious agent of concern.

\textsuperscript{\dagger} Exclusion is not allowing the employee to work at the food establishment. Restriction is not allowing the employee to work with food; to clean equipment, utensils or linens; or to un-wrap single-use articles in the food establishment.

\textsuperscript{\ddagger} A highly susceptible population is more likely to experience foodborne disease because they are immunocompromised or older adults and in a facility that provides health care or assisted living services, such as a hospital or nursing home; or preschool age children in a facility that provides custodial care, such as a daycare center.

\textsuperscript{\pi} Refer to Managing Special Situation for cases in School and Childcare.

- Universal, droplet and contact precautions are recommended for all medical care personal taking care of patients with invasive disease.
Education
If cases or contacts call the health department to ask questions, instruct them to:
• Practice basic hygiene with an emphasis on proper hand washing technique.
• Avoid sharing food, beverages, cigarettes or eating utensils.
• Concerned contacts should also be instructed that
  − Invasive disease is not spread person-to-person;
  − Antibiotic treatment is not an effective way to protect contacts exposed to a meningitis case caused by bacteria other than N. meningitidis or H. influenzae; and
  − Medical attention should be sought immediately if they begin to exhibit signs and symptoms of illness.

MANAGING SPECIAL SITUATIONS

A. Outbreak Investigation:
Settings and/or locations that require prompt public health action includes:
• Clusters in military institutions, hospitals or long-term care facilities;
• Outbreaks of invasive disease in childcare and/or school settings
2. Case finding will be an important part of any investigation.
3. Additional data collected on section 2 and 3 of the Investigation Worksheet may be required for the investigation of invasive cases.
4. Utilize CDC’s Investigating Clusters of Group A Streptococcal Disease, as needed. (www2.cdc.gov/ncidod/dbmd/abcs/calc/calc_new/index.htm)

B. School or Child Care Settings for Group A Streptococcus:
• Coordinate activities with school nurse and/or administration.
• Cases are excluded from school for 10 days if untreated or for 24 hours following initiation of antibiotic therapy.
• Parents of children who are in the same classroom as the case should be notified (preferably in writing) of the occurrence of GAS disease in the facility. The notice should advise parents to:
  o Watch their children carefully for a 5-day period for signs of illness, especially fever, and seek medical care if illness should occur.
  o Children with signs of GAS disease should be tested and if positive for GAS shall be excluded from school for 10 days if untreated or 24 hours following initiation of antibiotic therapy.
• Outbreaks of streptococcal pharyngitis occur in these settings but the risk of secondary transmission after a single case of mild or even severe invasive GAS infection remains low. Chemoprophylaxis for contacts after GAS infection in child care facilities generally is not recommended.
• Providers are advised to consult with the health department when high rates of streptococcal infection occur in child care facilities.
C. Postpartum or post-surgical group A streptococcal (GAS) infection:
- A single case of postpartum or post-surgical group A streptococcal (GAS) infection calls for a timely investigation to assure that an asymptomatic carrier is not causing nosocomial infection(s).
- Coordinate with infection control personnel.
- Utilize Section 3 of the Investigation Worksheet, as needed.

DATA MANAGEMENT AND REPORTING TO THE KDHE

A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the [Administrative] tab.

B. Organize and collect data.
- The Investigation Worksheet is provided to assist the investigator but does not have to be submitted to CDC or KDHE.
- Investigators can collect and enter all required information directly into EpiTrax [Investigation], [Clinical], [Demographics], and [Epidemiological] tabs without using the paper forms.
- During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.

C. Report data collected during the course of the investigation via EpiTrax.
- Verify that all data requested in Step 1) has been recorded on an appropriate EpiTrax [tab], or that actions are completed for a case lost to follow-up as outlined below.
- Some data that cannot be reported on an EpiTrax [tab] may need to be recorded in [Notes] or scanned and attached to the record.
- Paper report forms do not need to be sent to KDHE after the information is recorded in EpiTrax. The forms should be handled as directed by local administrative practices.

D. If a case is lost to follow-up, after the appropriate attempts:
- Indicate ‘lost to follow-up’ on the [Investigation] tab with the number of attempts to contact the case recorded.
- Record at least the information that was collected from the medical records.
- Record a reason for ‘lost to follow-up’ in [Notes].

E. Once the investigation is completed, the LHD investigator will click the “Complete” button. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
- The LHD Administrator will then “Approve” or “Reject” the CMR.
- Once a case is “Approved” by the LHD Administrator, BEPHI staff will review the case to ensure completion before closing the case.

Notes on EpiTrax:
1) Invasive Streptococcal Group A cases are initially entered as “Streptococcal Disease, Invasive, Group A”.
2) Clinical manifestations of Toxic Shock Syndrome (i.e., signs of toxicity with rapid progression of disease) that are identified and reported during the local investigation will result in the case event being changed to “Toxic Shock Syndrome (streptococcal).”
3) Deaths identified during the investigation of “Streptococcal Disease, Invasive, Group A” that are related to Varicella infections should also be reported and investigated as “Varicella (Chicken pox)” with the patient’s death information provided. Refer to the Varicella Disease Investigation Guideline for more information.
   • Varicella Death (1998 CDC Case Definition): probable or confirmed case of varicella which contributes directly or indirectly to acute medical complications which result in death

ADDITIONAL INFORMATION / REFERENCES
D. Case Definitions: www.cdc.gov/nndss/
E. Kansas Regulations/Statutes Related to Infectious Disease: www.kdheks.gov/epi/regulations.htm
F. Additional Information (CDC): www.cdc.gov/health/default.htm

ATTACHMENTS
To view attachments in the electronic version:
  1. Go to <View>; <Navigation Pane>; <Attachments> – OR – Click on the “Paper Clip” icon at the left.
  2. Double click on the document to open.
**Invasive Group Strep A Infections Investigation Worksheet**

*(Please refer to the Disease investigation Guideline for additional guidance.)*

### Type(s) of infection:

- [ ] UNKNOWN
  - (Or check all that apply)
  - [ ] Bacteremia without focus
  - [ ] Meningitis
  - [ ] Peritonitis
  - [ ] Osteomyelitis
  - [ ] STSS (*)
  - [ ] Cellulitis
  - [ ] Pericarditis
  - [ ] Empyema
  - [ ] Necrotizing fasciitis
  - [ ] Otis media
  - [ ] Epiglottis
  - [ ] Septic abortion
  - [ ] Endocarditis
  - [ ] Puerperal sepsis
  - [ ] Pneumonia
  - [ ] Abscess (not skin)
  - [ ] Chorioamnionitis
  - [ ] Endometritis
  - [ ] Septic shock
  - [ ] Other (Specify):

*Report as Toxic Shock Syndrome, Streptococcal in KS-EDSS. Refer to the second page for data that will assist in classifying.*

### Review of Laboratory Culture Reports:

#### Date first positive culture obtained:

- [ ] Blood
- [ ] CSF
- [ ] Pleural fluid
- [ ] Peritoneal fluid
- [ ] Joint
- [ ] Bone
- [ ] Muscle
- [ ] Other sterile sites:

#### Sterile Site from which isolated:

- [ ] Blood
- [ ] Pericardial fluid
- [ ] Joint
- [ ] Bone
- [ ] Muscle
- [ ] Other sterile sites:

#### Other bacteria isolated from sterile sites:

- [ ] Internal body site:
- [ ] Other sterile site:

### Additional epidemiological data for special situations and possible outbreak situations:

- At time of positive culture, was the patient: [ ] Pregnant
- [ ] Postpartum
- [ ] Neither
- [ ] Unknown

  If postpartum, what was the outcome of fetus:
  - [ ] Survived, no apparent illness
  - [ ] Abortion/stillbirth
  - [ ] Live birth, but neonatal death
  - [ ] Induced abortion
  - [ ] Unknown

  Date of delivery or abortion:
  
  Birth weight/gestational age:
  
  If pregnant, what was the gestational age of the fetus at the time of the first positive culture:

- If hospitalized, date of admission:
- Date of hospital discharge:

- Did the patient survive the infection?: [ ] Yes [ ] No

  If NO, date of death:

- Did the patient have surgery 7 days before first positive culture?: [ ] Yes [ ] No

  If YES, date of surgery:

  Surgery provider:

- Did the patient have any of the following risks:

  - [ ] Varicella rash
  - [ ] Penetrating trauma
  - [ ] Blunt trauma
  - [ ] Burn wound(s)
  - [ ] Surgical wound (Post-operative)

### Underlying Causes or Prior Illnesses:

- [ ] NONE
- [ ] Unknown, chart unavailable

  *(Or check all that apply)*

  - [ ] Current Smoker
  - [ ] Multiple Myeloma
  - [ ] Sickle Cell Anemia
  - [ ] Splenectomy/Asplenia
  - [ ] Immunoglobulin Deficiency
  - [ ] Immunosuppressive Therapy
  - [ ] Leukemia
  - [ ] Hodgkin’s Disease/Lymphoma
  - [ ] Bone Marrow Transplant (BMT)
  - [ ] Solid Organ Malignancy
  - [ ] Solid Organ Transplant
  - [ ] Diabetes Mellitus
  - [ ] Nephrotic Syndrome
  - [ ] Renal Failure/Dialysis
  - [ ] HIV Infections
  - [ ] AIDS or CD4 count <200
  - [ ] Systemic Lupus
  - [ ] Erythematous (SLE)
  - [ ] Cirrhosis/Liver Failure
  - [ ] Alcohol Abuse
  - [ ] IVDU
  - [ ] Obesity
  - [ ] CSF Leak
  - [ ] Deaf/Profound Hearing Loss
  - [ ] Asthma
  - [ ] Emphysema/COPD
  - [ ] Heart Failure/CHF
  - [ ] Atherosclerotic Cardiovascular Disease (ASCVD)/CAD
  - [ ] Cerebral Vascular Accident/Stroke
  - [ ] Complement Deficiency
  - [ ] Chronic Skin Breakdown
  - [ ] Premature (Gestational age (wks): [ ]
  - [ ] Other (specify):
### Additional data to evaluate Streptococcal Toxic Shock Syndrome (STSS):

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<th>Onset of initial illness:</th>
<th>AM / PM</th>
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<tbody>
<tr>
<td>Onset of first manifestation (<strong>as listed below</strong>):</td>
<td>AM / PM</td>
</tr>
</tbody>
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- Yes  No **Hypotension present** (< 90 mmHg in adults or < 5th percentile in children ≤ 16 years)
  - Systolic Blood pressure (lowest measurement):  

**Multi-organ manifestations:**

- Yes  No **Renal impairment present** (≥ 2 mg/dL (177 umol/L) in adults or > 2x the normal upper limit for age)
  - Creatinine level:  

- Yes  No **Coagulopathy present** (< 100,000/mm³ platelets or disseminated intravascular coagulopathy (DIC))
  - Platelet level (lowest):  
  - Evidence of DIC indicated by:
    - Prolonged clotting time reported, or
    - Low fibrinogen level reported, or
    - Fibrin degradation products detected

- Yes  No **Liver involvement present** (ALT, AST or Total bilirubin levels > 2x normal upper limit for age)
  - Alanine aminotransferase (ALT) level:  
  - Aspartate aminotransferase (AST) level:  
  - Total bilirubin level:  

- Yes  No **Acute respiratory disease present** (As shown by one of the following below)
  - Acute onset of diffuse pulmonary infiltrates and hypoxemia in absence of cardiac failure, or
  - Diffuse capillary leak manifested by acute onset of generalized edema, or
  - Pleural / peritoneal effusions with hypoalbuminemia

- Yes  No **Generalized erythematous macular rash** that may desquamate
- Yes  No **Soft tissue necrosis** including necrotizing fasciitis or myositis, or gangrene.

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### Clinical Description of STSS for Public Health Surveillance:

- **Hypotension**: systolic blood pressure ≤ 90 mm Hg for adults or < 5th percentile by age for children aged ≤ 16 years.
- **Multi-organ involvement** characterized by two or more of the following:
  - **Renal impairment**: Creatinine > 2 mg/dL (177 µmol/L) for adults or > twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than two-fold elevation over the baseline level.
  - **Coagulopathy**: Platelets < 100,000/mm³ (< 100 x 10⁶/L) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
  - **Liver involvement**: Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels > twice the upper limit of normal for the patient’s age. In patients with preexisting liver disease, a greater than two-fold increase over the baseline level.
  - **Acute respiratory distress syndrome**: defined by acute onset of diffuse pulmonary infiltrates and hypoxemia in the absence of cardiac failure or by evidence of diffuse capillary leak manifested by acute onset of generalized edema, or pleural or peritoneal effusions with hypoalbuminemia.
  - A generalized erythematous macular rash that may desquamate.
  - Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene.

*Clinical manifestations do not need to be detected within the first 48 hours of hospitalization or illness, as specified in the 1996 case definition. The specification of the 48 hour time constraint was for purposes of assessing whether the case was considered nosocomial, not whether it was a case or not.*