TOXIC SHOCK SYNDROME (TSS)

A. Agent[1,2]

Toxic shock syndrome (TSS) is a serious complication of infection with strains of *Staphylococcus aureus* and *Streptococcus pyogenes* (group A streptococci or GAS) that produce certain toxins (TSS toxin 1 for *S. aureus*, pyogenic exotoxin A for GAS).

B. Clinical Description[1,2]

TSS is a severe, toxin-mediated illness characterized by sudden onset of high fever, vomiting, profuse watery diarrhea and myalgia, followed by hypotension and multi-system organ involvement. The systems affected may include the gastrointestinal, muscular, mucocutaneous (including vagina, pharynx, and conjunctivae), renal, hepatic, respiratory, hematologic, and central nervous systems. Severe cases may result in shock and death. A "sunburn like" rash is often present during the acute phase of the illness, with desquamation—especially on the soles and palms—typically occurring 1–2 weeks later. The gastrointestinal symptoms and cutaneous desquamation are more commonly present with *S. aureus*-mediated TSS than GAS-mediated TSS. Pain is a common initial symptom of GAS-mediated TSS, with 80% of patients having clinical signs of soft tissue infection, such as localized swelling and erythema. Both forms of TSS may be associated with invasive infections and can be fatal. TSS may also occur without an identifiable focus of infection.

C. Reservoirs[1,2]

Humans are a reservoir of both *Staphylococcus aureus* and Group A *Streptococcus.* The most frequent sites are the skin, mucosal surfaces and upper respiratory tracts.

D. Mode of Transmission[1,2]

While TSS itself is not communicable from person to person, the organisms that cause TSS are transmissible. Both *S. aureus* and GAS are transmitted from person to person through direct contact with lesions or contaminated respiratory secretions, including droplets. With both S. aureus and GAS, transmission involving indirect contact through objects has occurred in schools (contaminated wrestling mats) and in daycare centers (through play food and shared toys).

E. Incubation Period[1,2]

- *S. aureus*-mediated TSS and GAS-mediated TSS vary from hours to days depending on the source and the route of infection
    - Post-operative *S. aureus*-mediated TSS, the incubation period can be as short as 12 hours.
    - GAS-mediated TSS, the incubation period can be as short as 14 hours after the subcutaneous inoculation of GAS (e.g. childbirth or injury)

F. Period of Communicability[1,2]

- TSS itself is not communicable from person to person, but the bacteria that cause TSS are transmissible
    - *S. aureus*: The infectious period lasts as long as lesions drain or the carrier state exists.
    - GAS:
        - In untreated, uncomplicated GAS cases, the infectious period may be 10–21 days

- If purulent discharges are present, the infectious period may be extended to weeks or months
- Untreated GAS pharyngitis may carry and transmit the bacteria for weeks or months, with decreasing contagiousness 2–3 weeks after illness onset

- Adequate treatment can end transmissibility within 24 hours.

G. Susceptibility and Resistance

Toxic shock syndromes are toxin-mediated illnesses. Both produce "superantigens" which are capable of stimulating certain T-cells to produce massive numbers of new cells. These new T-cells are not targeted towards an antigen and are therefore not helpful in eliminating the infection. It is hypothesized that HLA type may predispose some individuals to greater susceptibility to the toxic effects.

H. Treatment

- **TSS (Streptococcal) :** Surgical debridement, clindamycin plus penicillin plus supportive care.
- **TSS (Non-Streptococcal):** Clindamycin plus oxacillin or vancomycin plus supportive care.

Disease Management

I. Clinical Case Definition[3]

TSS (Non-Streptococcal)

An illness with the following clinical manifestations:

- Fever: Temperature >38.9oC (102oF)
- Rash: diffuse macular erythroderma
- Desquamation: 1-2 weeks after onset of illness
- Hypotension: systolic blood pressure ≤90 mm Hg for adults or <5th percentile by age for children <16 years of age;
- Multisystem involvement - three or more of the following organ systems:
    - Gastrointestinal (vomiting or diarrhea at onset of illness)
    - Muscular (severe myalgia or creatine phosphokinase level at least twice the upper limit of normal for laboratory):
    - Mucous membrane (vaginal, oropharyngeal, or conjunctival hyperemia);
    - Renal (blood urea nitrogen or creatinine at least twice the upper limit of normal for laboratory or urinary sediment with pyuria [greater than or equal to 5 leukocytes per high-power field] in the absence of urinary tract infection):
    - Hepatic (total bilirubin, AST/SGOT [aspartate aminotransferase enzyme/serum glutamic-oxaloacetic transaminase], or ALT/SGPT [alanine aminotransferase enzyme/serum glutamic - pyruvic transaminase] at least twice the upper limit of normal for laboratory):
    - Hematologic (platelets <100,000/mm3)
    - Central nervous system (disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent)

TSS (Streptococcal)

An illness with the following clinical manifestations:

- Hypotension defined by a systolic blood pressure ≤90 mm Hg for adults or <5th percentile by age for children <16 years of age.
- Multi-organ involvement characterized by two or more of the following:
    - Renal impairment: Creatinine greater than or equal to 2 mg/dL (greater than or equal to 177 µmol/L) for adults or greater than or equal to twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than twofold elevation over the baseline level.
    - Coagulopathy: Platelets less than or equal to 100,000/mm3 (less than or equal to 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 greater than or equal to twice the upper limit of normal for the patient's age. In patients with preexisting liver disease, a greater than twofold 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.

J. Laboratory Criteria for Diagnosis[3]

TSS (Non-Streptococcal)

Negative results on the following tests, if obtained:

- Blood or cerebrospinal fluid cultures (blood culture may be positive for *Staphylococcus aureus*);
- Negative serologies for Rocky Mountain spotted fever, leptospirosis, or measles

Case Classification	
Confirmed	A case which meets the laboratory criteria and in which all five of the clinical findings described above are present, including desquamation, unless the patient dies before desquamation occurs.
Probable	A case which meets the laboratory criteria and in which four of the five clinical findings described above are present.

TSS (Streptoccocal)

- Isolation of group A *Streptococcus (Streptococcus pyogenes)*

Case Classification	
Confirmed	A case that meets the clinical case definition and with isolation of group A Streptococcus from a normally sterile site (e.g., blood or cerebrospinal fluid or, less commonly, joint, pleural, or pericardial fluid).
Probable	A case that 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.

K. Classification of Import Status:

Not Applicable

L. Laboratory testing:
Arizona State Public Health Laboratory does not perform routine cultures for streptococcal or staphylococcal diseases.

M. Assessing Laboratory Results:
S. aureus and GAS are easy to culture and identify in most clinical laboratories.

N. Outbreak Definition:
An increase in cases of Toxic Shock Syndrome in time or place that is greater than expected.

O. Time Frame[4]

- Providers must submit a report within five working days after a case or suspect case is diagnosed, treated, or detected.
- Local health agency must submit an epidemiologic investigation report within 30 calendar days after receiving a report.

P. Forms:
None

Investigation Guidelines

Q. Investigation Steps:

- **Confirm Diagnosis**
  - Refer to clinical case definition and laboratory criteria for case classification to determine if laboratory and clinical criteria are met for a suspect or confirmed case.
- **Conduct Case Investigation**
  - Collect case's demographic data and contact information:
  - Birth date, county, sex, race/ethnicity, address, phone number(s).
  - Obtain information from the provider or medical chart.
  - Obtain medical records, including admission notes, progress notes, and discharge summary.
  - Examine the symptoms and clinical history, especially, date of illness onset, type of disease syndrome, symptoms, record hospitalizations (reason, location, and duration of stay).
- **Conduct Contact Investigation**
  - Not applicable
- **Initiate Control and Prevention Measures**
  - Standard precautions recommended
- **Isolation, Work and Child Care Restrictions**
  - Standard precautions recommended
- **Case Management, including Susceptible Contacts**

        - Not applicable

    - **Notifications**
        - Providers must submit a report within five working days after a case or suspect case is diagnosed, treated, or detected.

R. Outbreak Guidelines:

- Refer to the general outbreak guidelines section for details on investigating an outbreak or healthcare acquired infection and utilize the ADHS outbreak definition.
- If case(s) meets outbreak definition, report suspected outbreak to ADHS via outbreak module protocol (see general outbreak guidelines section for details).

References

1. Streptococcal Toxic Shock Syndrome. Centers for Disease Control and Prevention; 2022 [cited 2022 February, 25]. Available from: https://www.cdc.gov/group-a-strep/about/streptococcal-toxic-shock-syndrome.html

2. American Academy of Pediatrics. 2021 Red Book: Report of the Committee on Infectious Disease, 32nd Edition. Illinois, Academy of Pediatrics, 2021.

3. Arizona Department of Health Services. In: Case Definitions for Reportable Communicable Morbidities: 2025. [cited 2022Feb24]; Available from: https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/casedefinitions/case-definitions.pdf

4. Arizona Administrative Code [Internet]. 2013Sep30 [cited 2019Aug1]; Available from: http://apps.azsos.gov/public_services/Title_09/9-06.pdf