Hemolytic-Uremic Syndrome

1. Definition
    a. Typical HUS- with diarrhea (90%)
    b. Atypical HUS- without diarrhea
    c. Triad
        i. Microangiopathic hemolytic anemia
        ii. Thrombocytopenia
        iii. Renal insufficiency-oligoanuric renal failure
2. Signs and symptoms
    a. Abdominal pain
    b. Bloody diarrhea
    c. No or low grade fever
    d. Icterus
    e. Petechiae without significant bleeding
3. Causes
    a. Shiga toxin producing- Enterohemorrhagic E.coli (most often O157:H7 subtype)
4. Epidemiology
    a. Leading cause of renal failure in previously healthy children
    b. Typically 9 months to 4 years old
    c. Summer/Fall months
    d. E.coli reservoir is cattle
5. Pathogenesis: occurs 2-14 days after onset of diarrhea
    a. Shiga-like toxins bind to cell leading to interruption of protein synthesis
    b. This leads to cell death and release of pro-inflammatory and pro-thrombotic molecules
        i. In the gut this manifests as hemorrhagic colitis and protein loss
        ii. In the glomerular endothelium this manifests with creation of fibrin meshwork- This leads to:
            1. Damage of platelets and RBC
            2. Activation of renin-angiotensin system from ischemia in the kidney
6. Risk factors
    a. Diarrheal illness in combination with
        i. Blood in stool
        ii. Leukocytosis
        iii. Administration of anti-motility agents
7. Complications
    a. Need for dialysis-more common if hypertensive
    b. CNS involvement-seizure or coma
8. Tests/diagnosis-Clinical diagnosis
    a. Anemia- Hgb $<10^3$
    b. Thrombocytopenia around 40x10
    c. Negative direct coombs

    d. Schistocytes and helmet cells
    e. Increased bilirubin
    f. PT and PTT normal
    g. U/A-hematuria and proteinuria
    h. Elevated BUN and Cr
    i. Decreased albumin
    j. Hemoccult positive- gross or occult bloody diarrhea
    k. Stool culture positive for E.coli O157:H7
9. Treatment-supportive
    a. AVOID antibiotics and antimotility agents-worsen disease
    b. AVOID platelets unless active bleeding
    c. Dialysis based on kidney function
        i. BUN >80-100
        ii. Fluid overload not responsive to diuretics
        iii. Hyperkalemia and acidosis
    d. Monitor volume status
        i. Urine output and daily weight
        ii. Volume expansion with isotonic fluid
    e. Blood transfusion-Hct <15-18%
    f. Rarely transplant
10. Long term
    a. 3-5% mortality
    b. 50-80% recover normal renal function
    c. 5% severe and permanent renal/CNS sequelae
    d. yearly eval with blood pressure, creatinine and u/a
11. Prevention
    a. Cook meat well
    b. Avoid unpasteurized milk and juice
    c. Good hand hygiene
    d. Removal from group care until diarrhea gone and culture negative x2