BOARD REVIEW SESSION 4
ANSWER KEY
TUESDAY, AUGUST 27, 2013

Session Moderators: Drs. Gilbert and Whitley

Session Panelists: Drs. Bennett, Fowler, Freedman, Marr, Masur, Tunkel, and Weinstein
Question #30 | Central Nervous System Infections | Weinstein

A 24-year-old woman is admitted to the ICU with suspected bacterial meningitis. She is treated empirically on admission with intravenous ceftriaxone and vancomycin. Cerebrospinal fluid culture obtained in the Emergency Department grows *Neisseria meningitidis* on hospital day 2. The patient's doctor calls you. The patient has received ceftriaxone plus vancomycin for 48 hours and is improving but has not been on any isolation precautions.

The doctor asks which of the following options would be most appropriate at this point.

A. Continue standard precautions.
B. Place the patient on airborne isolation.
C. Place the patient on contact precautions.
D. Place the patient on contact precautions and airborne isolation.

**Correct answer: A**

**Rationale:**

*Neisseria meningitidis* is transmitted person-to-person by respiratory droplets, which travel about 3-6 feet before being removed from the air by the force of gravity. *N meningitidis* is a common cause of bacterial meningitis, and therefore, patients with suspected bacterial meningitis are placed on droplet precautions -- personnel mask when within 6 feet of the patient.

Patients are contagious 7 days prior to onset of meningitis.

After 24 hours of “effective therapy,” patients with meningitis due to *N. meningitidis* are no longer considered contagious and hence in this case, in which the patient had been treated for >24 hours, isolation precautions were no longer indicated.
Question # 31 | Sweets Syndrome | Gilbert

A 46-year-old woman is seen for fever and a rash.

She was recently diagnosed with acute myelocytic leukemia.

Following induction chemotherapy, she developed neutropenic fever that responded to antibiotics. Her marrow recovered, and she was well at home until four days ago when she developed fever with no localizing symptoms.

An outpatient CBC showed a white blood cell count of 12,250 with 40% bands. She was admitted, blood cultures were sent and she was started on broad spectrum antibiotics. Other than fever and tachycardia, her exam was unremarkable.

On the second hospital day, she developed the acute onset of a rash consisting of multiple red to red-purple tender, non-pruritic papules predominantly on her face, but also involving her neck and the dorsum of her hands.

Blood cultures were negative. Biopsy of two of the skin lesions was performed. Despite antibiotics her fever continued; some of the papules turned into plaque-like lesions with a central yellow discoloration.

Today, the biopsy was reported as showing dense dermal perivascular infiltrates of neutrophils without evidence of vasculitis; stains for organisms were negative.

Which one of the following is the most likely diagnosis?

A. Ecthyma gangrenosum  
B. Pyoderma gangrenosum  
C. Sweet Syndrome  
D. Leukemic infiltrates  
E. Staphylococcal folliculitis

Correct answer: C

Rationale:

This patient has an acute neutrophilic dermatosis most consistent with Sweet Syndrome. At least half of patients with Sweet Syndrome have underlying illnesses and half of those are malignancies particularly acute myelocytic leukemia and other lymphoproliferative disorders. Lesions appear abruptly and are papules or plaques most often found on the face.
and extremities, particularly the dorsum of the hands. Biopsy shows neutrophilic dermal infiltrates without vasculitis. Most patients have antecedent fever. Treatment is steroids.

**Ecthyma gangrenosum** is the necrotic skin lesion associated with Pseudomonas bacteremia.

**Pyoderma gangrenosum** is associated with inflammatory bowel disease, and the lesions are ulcerative with undermined borders.

**Leukemic infiltrates** would be very unlikely given the good response to chemotherapy and the absence of blasts on CBC.

**Staphylococcal folliculitis** is ruled out by the absence of organisms on biopsy stains.
An injection drug user is admitted with fever for four days. Exam shows a grade IV aortic insufficiency murmur, and he is started on vancomycin 1gm q12h after three blood cultures are obtained. Methicillin-resistant Staphylococcus aureus is grown from all admission blood cultures, and repeat blood cultures on days two and three also grow MRSA. The vancomycin M.I.C. for his MRSA is 1.5. On day four of treatment he is short of breath, he has diffuse crackles on chest exam, and x-ray of the chest shows acute pulmonary edema.

Which one of the following is the most important next step in management of this patient?

A. Immediate aortic valve replacement
B. Valve replacement once blood cultures are negative
C. Change vancomycin to daptomycin
D. Add gentamicin to vancomycin
E. Increase vancomycin dose

Correct answer: A

Rationale:
Severe heart failure in endocarditis is an immediate indication for surgery, even in patients who are still bacteremic. Delay in surgery increases mortality and infection risk for the new valve is small. Changes to antimicrobial therapy, even if potentially useful, would not supersede the need for surgery which may be life-saving.

**ACC/AHA Guideline-Surgery for Native Valve Endocarditis**

**Strong Indication**

- Valve stenosis or regurgitation leading to heart failure.
- Aortic or mitral regurgitation with hemodynamic evidence of elevated left ventricular end-diastolic or atrial pressures such as premature closure of the mitral valve with aortic regurgitation, rapid decelerating mitral regurgitation signal by continuous wave Doppler (v-wave cutoff sign), or moderate to severe pulmonary hypertension.
- Endocarditis due to fungal or other highly resistant organisms.
- Complications such as heart block, annular or aortic abscess, or destructive penetrating lesions such as fistula from the sinus of Valsalva to the right or left atrium or right ventricle, mitral leaflet perforation with IE of the aortic valve, or infection in annulus fibrosis.
Less Compelling Indication

- Recurrent emboli and persistent vegetations despite appropriate antibiotic therapy.

Possible Indication

- Mobile vegetations larger than 10 mm with or without emboli.

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Question #33 | Tularemia | Gilbert

A 38-year-old man from Nantucket was admitted three days ago with a dense pneumonia and a pleural effusion. He has been treated with azithromycin and ceftriaxone but is not improving. His illness began abruptly two days PTA with fever and chills; he began to cough the following day and developed pleuritic pain. He has scant sputum production. On exam he is febrile with a normal pulse; there are crackles and percussion dullness in the right chest. The WBC is normal; the pleural fluid is exudative with a lymphocyte predominance. Admission sputum culture grew normal flora; the pleural fluid was sterile.

He is an accountant, has no recent travel history, and no exposure to ill persons. His only possible animal exposure occurred 4 days before he became ill when he was mowing his lawn, and some kind of small animal darted out from behind a bush and was pulverized by the mower blades.

Which one of the following is the most likely diagnosis?

A. Primary tuberculosis  
B. Q fever  
C. Mycoplasma pneumonia  
D. Plague  
E. Tularemia

Correct answer: E

Rationale:

This patient likely has tularemic pneumonia acquired through inhalation when an infected rabbit or rodent was aerosolized by his mower. Rapid onset, scant sputum, pleural involvement (exudative and lymphocytic effusion), temperature-pulse disparity, absence of visualization of the organism on sputum gram stain, and negative sputum cultures (many strains needed cysteine added to media for growth), and normal WBC count are all common findings. Primary TB can cause a lymphocytic pleural effusion but wouldn’t likely be associated with a dense pneumonia and this kind of abrupt onset with chills. Q fever and Mycoplasma pneumonias may be associated with temperature-pulse disparity but the abrupt onset and pleural involvement would be unlikely. Plague pneumonia patients are desperately ill with pronounced leukocytosis.
A 39-year-old female received allogeneic hematopoietic cell transplantation for acute myelogenous leukemia, from an unrelated donor, using a myeloablative conditioning regimen.

Her post-transplant course was complicated by skin and gut graft vs host disease which was treated with methylprednisolone (2 mg/kg).

She had a positive CMV PCR on day 40, at 3000 copies, and was treated with induction doses of ganciclovir (5 mg/kg twice daily, Cr 1.0). During the second week of induction dosing of ganciclovir, her absolute neutrophil count declined to 200/mm3; ganciclovir was changed to foscarnet (90 mg/kg twice daily).

Two weeks after switching to Foscarnet, her serum CMV PCR was undetectable but she developed vaginal pain, with visual ulcers on her vulva and adjacent to her urethra. She has no concurrent diarrhea, rash, or oral mucositis.

WBC is now 5000 with 70% neutrophils.

What is the best therapeutic intervention for her vaginal ulcers at this point?

A. Continue foscarnet and increase hydration  
B. Continue foscarnet and add topical trifluridine to vulva 
C. Continue foscarnet and add topical corticosteroids to vulva 
D. Switch foscarnet to acyclovir 
E. Switch foscarnet to ganciclovir 

Correct answer: E 

Rationale: 

This patient likely has genital ulcers caused by foscarnet. Genital ulcers can occur during foscarnet therapy, likely as a result of contact dermatitis caused by high concentrations of foscarnet in the urine.

Other causes of genital mucosal lesions include HSV; however, breakthrough Herpes simplex vaginitis/cervicitis is highly unlikely for someone receiving high dose foscarnet. A negative PCR for HSV on a swab of an ulcer would also help exclude HSV.

She is unlikely to have graft vs host involving her vulva, since she has no other manifestations: no diarrhea, no oral mucositis, no rash.
The appropriate first step is to switch to an alternative anti CMV drug. There is no role for topical agents.

Since the ANC had improved on foscarnet, switching back to ganciclovir or oral valganciclovir is a reasonable choice. If the ANC drops again, support with hematopoietic growth factors may be needed to stabilize the counts.

Given the improvement in her CMV viral load, she doesn’t need to go back to the higher induction dosing of ganciclovir.

Switching to acyclovir would be inappropriate in this situation because the patient still requires suppression of CMV and acyclovir (even at higher doses) is not an effective treatment.
Question #35 | Clindamycin (Staph) | Fowler

A 43-year-old otherwise healthy male construction worker with a penicillin allergy (hives) presents with a painful 2 cm red furuncle on his calf. Purulent material shows Gram positive cocci in clusters; Staphylococcus aureus is identified. You initiate therapy with clindamycin pending susceptibility results.

The lab performs susceptibility tests and reports that the isolate is resistant to penicillin and erythromycin but susceptible to clindamycin, oxacillin, rifampin, trimethoprim-sulfamethoxazole and linezolid.

What therapeutic option would you select?

A. Continue clindamycin and request a D test to determine if clindamycin is likely to induce resistance
B. Continue clindamycin. No further tests warranted.
C. Change to linezolid
D. Add gentamicin
E. Switch to Synercid

Correct answer: A

Rationale:

When a S. aureus is resistant to erythromycin, the lab may be requested to perform a D test to determine if the Staphylococcus aureus has inducible resistance to clindamycin. With a small lesion like this, the clindamycin can be continued while awaiting the D test results. Rifampin use is not indicated. Trimethoprim-sulfamethoxazole is a reasonable option but not necessarily preferred in a clindamycin susceptible isolate. Linezolid is more expensive and has potential toxicity.

(Rationale continued on next page.)
Although the clinical evidence is not strong, case reports have suggested that inducible clindamycin resistance predicts a higher probability of clinical failure with that drug. Erythromycin (a macrolide) and clindamycin (a lincosamide) represent two distinct classes of antimicrobial agents that inhibit protein synthesis by binding to the 50S ribosomal subunits of bacterial cells. In staphylococci, resistance to both of these antimicrobial agents can arise when the isolate acquires an “erm” gene, named “erm” for erythromycin resistance methylase. These genes lead to methylation of the ribosomal binding site of the antibiotic in the staphylococcus and block antibiotic effect. This resistance can be constitutive, where the rRNA methylase is always produced. Resistance can also be inducible, in which case methylase is produced only in the presence of an inducing agent. Erythromycin is a much better inducer of this gene than clindamycin. The D test allows erythromycin to induce resistance that affects the clindamycin zone size next to the erythromycin disc.
Question #36 | HSTC | Marr

A 20-year-old male with refractory lymphoma received an HLA-mismatched and T cell depleted allogeneic stem cell transplant

He engrafted his WBC on day 22, and developed a faint diffuse erythematous rash and low-grade fever on day 68, diagnosed as acute graft vs. host disease, for which he was treated with prednisone, which was ultimately tapered. The rash faded and he became afebrile.

He is receiving trimethoprim-sulfamethoxazole three times a week and twice daily valacyclovir for prophylaxis.

- On day 110, he developed fever to 38°C, dyspnea, cough, and a faint erythematous rash.
- His WBC was 7,000, with a normal differential.
- Chest CT scan demonstrated bilateral ground glass opacities but cultures and/or stains of a bronchoalveolar lavage for bacteria, fungi and pneumocystis were negative.
- Alkaline phosphatase was 309 U/L, AST 488 U/L, ALT 430 U/L, total bilirubin 1.9 mg/dl.
- Urinalysis revealed hematuria: 1500 RBC, 20 WBC, with no bacteria on stain.
- His CMV PCR on peripheral blood was undetectable.

What is the most likely cause of this syndrome?

A. HSV
B. VZV
C. Graft vs host disease
D. Adenovirus
E. BK virus

**Correct answer: D**

**Rationale:**

Adenoviral diseases are well characterized in hematopoietic cell transplant (HCT) recipients. Manifestations include pneumonia, colitis, hepatitis, hemorrhagic cystitis, tubulointerstitial nephritis, encephalitis, and disseminated disease—and this patient has many of these manifestations.
The T cell depleted graft and graft vs host disease are both risk factors for disseminated adenovirus disease.

Diagnosis of adenovirus disease in this setting is complicated: serum PCR assays, sterile fluid PCR, bronchoalveolar lavage PCR and tissue biopsies all have roles. There is no specific therapy that is clearly effective although T cell infusions and perhaps cidofovir may have roles.

The hematuria suggests adenovirus or BK virus, but BK virus would not cause the pneumonitis, hepatitis, or other manifestations outside the bladder in a stem cell recipient.

HSV and VZV would be unusual causes of hematuria, and unusual to occur in a patient receiving valacyclovir.

BK virus causes hemorrhagic and non-hemorrhagic cystitis in bone marrow transplant recipients. This is in contrast to kidney transplant recipients who rarely develop cystitis but who can develop other syndromes: tubulointerstitial nephritis and ureteral stenosis.
Question #37 | VISA (Staph) | Fowler

A patient has catheter related Staphylococcus aureus bacteremia. An E test is done to determine vancomycin susceptibility.

What is the mechanism of the resistance demonstrated by this E test?

A. Beta lactamase  
B. Efflux pump  
C. D lactase replacement of d alanine in staph aureus cell wall  
D. Excess D alanine binding to vancomycin, i.e. thick cell wall

Correct answer: D

Rationale:

This E test shows some colonies of Staphylococcus aureus growing within the area where most Staph aureus have been inhibited by vancomycin. Were it not for these few colonies, this Staph aureus would have an MIC of about 2.
**Question #38 | Adenovirus | Whitley**

You are consulted about an outbreak of conjunctivitis. In late August, in a period of 10 days, 15 of 30 college students attending a summer French language camp in upstate New York developed eye pain and redness. Exams are notable for conjunctivitis without purulent exudate, fever or preauricular adenopathy. All the students swim in the camp lake on a daily basis and eat meals together in a dining hall. The camp cat has recently had a litter and all the affected students say that they have played with the kittens.

Which one of the following is the most likely cause of the outbreak?

A. Enterovirus  
B. Adenovirus  
C. Bartonella  
D. Acanthamoeba  
E. Pneumococcus

**Correct answer: B**

**Rationale:**

- **Adenoviruses** are the most common cause of epidemic keratoconjunctivitis, a syndrome characterized by eye pain and inflammation, fever, and preauricular lymphadenopathy. Outbreaks at camps are common.
- **Enteroviruses** can cause similar outbreaks but are much less common than adenoviruses.
- **Bartonella** (cat scratch disease) can cause conjunctivitis and preauricular adenopathy, but cases are sporadic and do not occur as outbreaks.
- **Acanthamoeba** can cause keratitis in those who swim in lakes, but again, cases are sporadic.
- **Pneumococcus** has caused outbreaks of conjunctivitis on college campuses; conjunctivitis is typically purulent and cases are much less common than those due to adenoviruses.
A 30-year old male with a history of obstructive hydrocephalus had implantation of a ventriculoperitoneal shunt. Three months after implantation, he developed headache and nausea over a period of about 1 week; he denied fever. On physical examination, he was afebrile with normal vital signs. He was awake, but somewhat lethargic.

There was no tenderness or erythema along the area of the implanted shunt. His abdominal examination was normal. Neurosurgery is consulted and cerebrospinal fluid removed from the shunt reveals a WBC count of 500/mm3 with 80% segs, glucose of 45 mg/dL, and protein of 100 mg/dL. Gram stain was negative, but cultures grew *Staphylococcus epidermidis*.

The neurosurgeons are surprisingly willing to follow your advice.

In addition to administration of intravenous vancomycin, which of the following is the most appropriate management of this patient?

A. Intraventricular vancomycin through the implanted shunt  
B. Shunt removal and immediate implantation of a new shunt  
C. Shunt removal, external drainage, and re-shunting after cultures are negative  
D. No additional management is required

**Correct answer: C**

**Rationale**

This patient has a cerebrospinal fluid (CSF) shunt infection. Staphylococci are the most likely infecting agents (55-95% of cases), with most caused by coagulase-negative staphylococci. The most common clinical symptoms are headache, nausea, lethargy and altered mental status; fever is reported in 14-92% of cases.

Numerous methods of treating CSF shunt infections have been reported, but no randomized, prospective trials have been performed. The principles of antimicrobial therapy are generally the same as for acute bacterial meningitis. Direct instillation of antimicrobial agents into the ventricles (i.e., through an external ventriculostomy or shunt reservoir) is occasionally needed for difficult to eradicate infections, but the indications for intraventricular administration are not well-defined.
Early attempts to treat CSF shunt infections with use of antimicrobial agents alone (given by the intravenous and/or intraventricular route) were not very successful (about a 34-36% success rate).

Combining removal of shunt hardware with immediate shunt replacement and intravenous antimicrobial therapy cures approximately 65-75% of patients.

Antimicrobial use with removal of all components of the shunt along with some component of external drainage appears to be the most effective treatment, with treatment success usually >85%.
Question #40 | Malaria | Freedman

A 29-year-old travels to Papua New Guinea. He takes mefloquine 250 mg weekly starting 2 weeks before and for 4 weeks after travel as recommended. He was not told to take other drugs.

Six months after the trip he becomes febrile and is diagnosed with smear positive *Plasmodium vivax* infection.

The explanation for this is most likely:

A. Primary infection with mefloquine resistant *P. vivax*
B. Lack of adequate adherence with the mefloquine regimen
C. Heavy exposure to *P. vivax*
D. Failure to eradicate the hepatic hypnozoite

**Correct answer: D**

**Rationale:**

This is a relapse of *P. vivax* due to failure to eradicate the hepatic hypnozoite.

Malaria prophylaxis does not prevent malaria infection. Mefloquine acts in the blood only, so this drug provides only suppressive prophylaxis for either *P. falciparum* or *P. vivax*.

Mefloquine doesn't penetrate the liver and is not active against the dormant hypnozoites of *P. vivax* in the liver.

The only drug active against hypnozoites (the stage that causes relapses of *P. vivax* or *P. ovale*) (the only 2 species capable of relapse) is primaquine.

This patient never received terminal prophylaxis with primaquine after travel to a very high-risk area.

*P. vivax* primarily resistant to mefloquine in the erythrocytic stages has not been described.

If the patient had been non-compliant a primary clinical illness with *P. vivax* almost always occurs earlier than 6 months after exposure.
You are called by a family physician friend who wants to ask about a patient, a 17-year-old who she saw two days earlier for severe sore throat and malaise of five days duration.

The patient was well until he developed the sore throat accompanied by low grade fever and “feeling tired and sick.” He doesn't know anyone else who is sick. He is sexually active with a single partner and always uses condoms.

On exam, his temperature was 100.8°F; pulse 86, BP 112/78. He had periorbital edema and bilateral anterior and posterior cervical nodes that were more prominent posteriorly. His throat was red with small exudates. The spleen tip was palpable.

A rapid strep test performed in the family physician’s office was negative.

The doctor thought the young man had mononucleosis and ordered a CBC and Monospot test (heterophile antibody). The WBC count was 12,000; there were 32% lymphocytes and 12% atypical lymphocytes and the platelet count was slightly low at 120,000.

The Monospot test was negative, so the doctor decided to give you a call.

Which one of the following is most likely responsible for the young man’s illness?

A. Cytomegalovirus
B. HIV
C. Epstein-Barr virus
D. Toxoplasma
E. Human herpesvirus 6

Correct answer: C

Rationale:

This patient has a classic mononucleosis syndrome. About 90% of mononucleosis illness in adolescents and young adults is due to Epstein-Barr virus, and the peak age for EBV mononucleosis in the US is 16-17.

The Monospot test, a rapid agglutinin test for heterophil antibody, is highly specific but not highly sensitive.

The important point is: The false negative rates are highest during the beginning of clinical symptoms (25 percent in the first week; 5 to 10 percent in the second week, 5 percent in the third week)
Measurement of EBV-specific antibodies is usually not necessary since the majority of patients are heterophile positive. However, testing for EBV-specific antibodies may be useful in patients with suspected mononucleosis who have a negative heterophile test. IgM and IgG antibodies directed against viral capsid antigen have high (>95%) sensitivity and specificity for the diagnosis of mononucleosis.

Ten percent of mononucleosis syndromes are due to other agents including HIV, CMV (sore throat less likely), toxoplasmosis, HHV-6 and HHV-7. For strep pharyngitis there should be no splenomegaly and no severe fatigue.
An 18-year-old young man who lives in a group home in California and has severe developmental disabilities is admitted to a hospital in coma with hypertonia and hyperreflexia. The people at his residence say he had been sleepy and “wobbly” for the two previous days.

Initial laboratory studies showed peripheral eosinophilia (18% of 14,200 white blood cells), and he had CSF eosinophilic pleocytosis (40% of 42 white blood cells); CSF gram stain and cultures were negative. He was treated with cefipime, amphotericin B, and ivermectin but remained unconscious.

An investigation of the residential home by public health officials showed evidence of raccoon feces in the yard in which the patient played regularly.

Which one of the following is the most likely cause of his encephalitic illness?

A. Coccidioides
B. Angiostrongylus
C. Rabies
D. West Nile virus
E. Baylisascaris

Correct answer: E

Rationale:

The raccoon roundworm, Baylisascaris, is an rarecause of eosinophilic meningitis and encephalitis. Infected raccoons are found throughout the US with highest prevalence in the Northeast, West coast and Midwest (60-80%). Most cases occur in children. Humans become infected by ingesting infective eggs shed in raccoon feces; the larvae migrate from the GI tract to viscera, the eyes and the CNS. Baylisascaris encephalitis should be considered in humans with acute onset of eosinophilic encephalitis and a history of potential exposure (possible ingestion of feces or contaminated soil). There is no known effective treatment but albendazole is often used.

Coccidioides can cause eosinophilic meningitis but the onset here is too acute and the encephalitic picture would be rare.

The rat lung worm, Angiostrongylus, is a common cause of eosinophilic meningitis in Southeast Asia and tropical Pacific islands. Risk factors for Angiostrongylus infection include the ingestion of raw or undercooked infected snails or slugs; or pieces of snails and
slugs accidentally chopped up in vegetables or salads; or foods contaminated by the slime of infected snails or slugs.

**Rabies** and **West Nile virus** are not associated with peripheral or CNS eosinophilia.
Question #43 | Erythrovirus | Whitley

A 49-year-old male third grade school teacher with HIV infection (CD4 count 50 cells/µL, viral load <40 copies/µL) has been stable on darunavir, ritonavir, tenofovir, and emtricitabine. He had a urinary tract infection last week and was started on ciprofloxacin. He also takes vitamin C and St. John’s Wort. No one in his household has been ill but some of the children in his class had been out last month with fever and facial rash. The patient’s hemoglobin is 6 gm/dl.

He returns complaining of severe fatigue.

Which of the following interventions is most likely to be beneficial for managing his anemia?

A. Stop St. John’s Wort.
B. Initiate erythropoietin.
C. Switch antiretroviral therapy from darunavir-ritonavir to efavirenz.
D. Initiate corticosteroids.
E. Initiate IVIG.

Correct answer: E

Rationale:

This patient with such severe anemia but no clear evidence for hemolysis or gastrointestinal blood loss likely has Erythrovirus (also called Parvovirus) B19 infection. Note the two names for the virus, IgM and IgG antibody tests are useful diagnostically. In immunosuppressed patients, nucleic acid amplification tests of blood are the most useful.

Giant abnormal pronormoblasts on bone marrow biopsy, when present, are also diagnostic.

IgG antibody may be negative in a large fraction of patients. This viral infection is controlled in normal hosts by humoral immunity.

In this HIV-infected patient, Parvovirus B19 infection with red cell aplasia may improve with intravenous immunoglobulin (400 mg/kg/d for 5 days is effective in 75% of patients.) Patients may require a second course of IVIG and some patients may require a maintenance regimen of 30 g per month plus iron and folate and B12.

The anemia typically develops over a long period of time since the pathogenesis is suppression of reticulocytosis.
Erythrovirus B19 spreads primarily by respiratory route and has an incubation time of 4-14 days. A typical scenario in an adult is a non-immune pregnant woman who acquires infection from her child in day care, and who then develops hydrops or self-limiting arthralgia. The other typical scenario is described in this case, which also could have been a patient with stem cell transplant or some other form of immunosuppression.

Keep in mind that Erythorvirus B 19 causes several types of disease:

- Normal Children: self-limiting fever with “slapped cheeks” followed by lacy body rash
- Healthy adults: asymptomatic or transient fever, occasionally especially in women with small joint arthropathy plus rash that resolve in three weeks
- Patients with an underlying hemolytic disease: Aplastic crisis
- Pregnancy: Fetal death, hydrops fetalis
- Immunosuppressed: Chronic red cell aplasia due to failure to develop immune response

Keep in mind also that serology is useful for diagnosing prior infection, but acute infection requires nucleic acid amplification of serum, plasma, or other body fluid.
A 62-year-old man vacationing in Alaska is taken to an emergency room by ambulance because he developed sudden weakness and could not stand or sit up.

He awakened from an after lunch nap with tingling and numbness around his mouth and tingling in his hands. He couldn’t sit up and called for help. First responders found him awake, alert, but unable to stand or sit up.

On exam in the emergency room, he was afebrile, oriented, with lower extremity and truncal weakness. Cranial nerves were normal.

Routine labs were normal.

While being evaluated, he began to complain of shortness of breath. Chest x-ray was normal. He reported that for lunch he had eaten steamed mussels that he and two friends had harvested themselves that same morning. Two days earlier he had removed a large tick from the back of his head.

Which one of the following is the most likely diagnosis?

A. Paralytic shellfish poisoning  
B. Tick paralysis  
C. Botulism  
D. Scombroid poisoning  
E. Guillain-Barré syndrome

**Correct answer: A**

**Rationale:**

- **Paralytic shellfish poisoning** occurs after ingestion of saxitoxins produced by marine dinoflagellates that become concentrated in mollusks such as clams, cockles and mussels. It is typically associated with noncommercially harvested shellfish since commercially harvested shellfish are tested for saxitoxins. Neither cooking nor freezing destroys the toxin. After a short incubation period of minutes to a few hours, victims develop paresthesias of the mouth or extremities rapidly followed by paralysis which may produce life-threatening respiratory failure.
- **Tick paralysis** occurs while the tick is still attached.
- **Botulism** involves cranial nerves.
- **Scombroid poisoning** follows ingestion of certain bacterially contaminated fish and produces a histamine-like reaction.
- **Guillain-Barré** is associated with an ascending paralysis without the paresthesias seen here.