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Epidemics—Recognition, Response, and Control

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“Epidemic”vs. “Endemic”

- An endemic disease occurs more frequently in a specific population and/or geographic area than most
- An epidemic is a sudden outbreak of infectious disease “syndrome” which spreads rapidly throughout a population or area, incapacitating the participants

How do we "recognize" an epidemic?

1. Establish a background for individual infectious diseases thru medical surveillance database
2. Health Care providers routinely include in medical history questions RE: living conditions, recent illness in family members, occupation, etc.
3. Heightened awareness of personnel practicing in epidemic prone populations, ie, military training camps, Daycare centers, response teams to disaster areas, etc.

Occupational Health Surveillance

- Surveillance= data collection, analysis, feedback, action The whole point of surveillance
- GOAL of surveillance=Corrective action to control disease BEFORE the disease spirals to epidemic proportions
- Primary focus of military medicine is the prevention and/or control disease to maintain a population fit to perform duty in military or civilian response.

Impact Civilian & Military of Epidemic?

- .Epidemic by definition is infectious disease syndrome spiraling out of control---"domino effect
- •Impacts a s**pecific population in all sectors—economic, health care, psychological, family cohesiveness, productivity**
- Surveillance **Database Maintained before, during, after epidemic occurs to analyze time, place, person, counts, rates, ie, Lessons Learned**
- Lessons learned—action plans to improve c**ommunication, health policies, prevention, health resources**

Epidemic Disease Presentation

- Epidemic diseases are likely to present as an infectious disease or undifferentiated febrile syndrome.
- A few clinical diagnostic clues to assist in early recognition:
- Plague, tularemia, and staphylococcal enterotoxin (SEB) disease all may present as pneumonia.
- Botulism, VEE, Q-fever, brucellosis may present with peripheral and central neuromuscular findings. Even syndromic diagnosis, however, is complicated by the fact that many BW diseases (VEE, Q-fever, brucellosis) may present simply as febrile illnesses.
- Suspected Bioterrorism agents--- anthrax, plague, tularemia, and smallpox—present as undifferentiated febrile prodromes easily dismissed as Upper respiratory infection or flu-like syndrome.

Common epidemic agents

- Anthrax
- Smallpox
- Plague
- Influenza virus
- Tularemia,
- Staphylococcal enterotoxin (SEB)
- Botulism
- VEE
- Q-fever
- Brucellosis

Response to Suspected Epidemic

- Quarantine effected individuals and household contacts
- Military-Establish a field hospital dedicated to ill individuals
- Alert Public Health in community
- Initiate medical evaluations to isolate the viral, bacterial, or zootic etiology
- Educate healthy military personnel on initial presenting symptoms, necessity to report to designated field hospital if symptoms develop, and avoid contact with any ill person

Response to suspected epidemic, continued

- Prodromal phase of many diseases that therapy is most effective.
- Military, deployed--Empiric therapy for pneumonia or undifferentiated febrile illness may be indicated .
- Empiric treatment of respiratory casualties (patients presenting with undifferentiated febrile illnesses possibly prodromal anthrax, plague, or tularemia are managed similarly.
- Doxycycline has been effective against most strains of *Bacillus anthracis, Yersinia pestis,* and *Francisella tularensis,* as well as against *Coxiella burnetii*, and the *Brucellae*.
- Fluoroquinolones (Cipro) was issued as prophylactic therapy during anthrax scar in US post 9/11 events.

Clinical Assessment, Military

- Military medicine-- the "patient" is a population, typically an operational unit. Incidence of Rash,GI, URI, heat injury, etc., are key indicators of the unit health. Sudden increase illness or injury indicates a threat to a unit's fitness for duty.
- Military health providers should include information about illnesses among other unit members, the presence of unusual munitions, food and water procurement sources, vector exposure, vaccination history, travel history, occupational duties, and MOPP status.
- Physical exam at this point should concentrate on the pulmonary and neuromuscular systems, as well as unusual dermatologic and vascular findings

Diagnostic Tools

- Nasal swabs (important for culture and polymerase chain reaction (PCR), even if the clinician is unsure *which* organisms are present)
- Bacterial and viral Blood cultures
- Sputum and stool samples
- Blood and urine for toxin analysis
- Nasalpharyneal swabs
- Environmental survey samples (drinking water, sanitary and sleeping facilities)
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“Index of Suspicion”

- Occ Health providers and their patients benefit from the clinical tool referred to as “Index of Suspicion.” In the absence of this tool plus a detailed history it is unlikely that the provider will diagnose an epidemic, especially in a busy Sick Call, or clinical practice. Medical personnel removed from sophisticated laboratory and preventive medicine resources may automatically default to the common viral or flu like syndrome, treated symptomatically with rest, fluids, nasal decongestants, OTC medications, etc.
- Common epidemic organisms require early diagnosis, intervention, and treatment. Historically, these organisms have been chosen as agents of bioterrorism due to their ease of contagion , virulence, asymptomatic prodrome, and rapid deterioration.
- Anthrax, botulism, plague, and smallpox are readily prevented if patients are provided proper antibiotics, anti-toxin, and/or vaccination promptly after exposure. Each of these diseases may prove fatal if therapy or prophylaxis is delayed until classic symptoms develop.
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Mitigation/Control Epidemic

- Three types of disease transmission with concommitant precautions
- Airborne precautions: Mask patient and health care providers at minimum. Optimal treatment isolation and HEPA-filter respirator. EX: Smallpox, Hantavirus
- Droplet precautions: surgical mask, gloves, coveralls EX: Pneumonic plague
- Contact precautions: Full PPE and isolation EX: viral hemorrhagic fevers—Ebola, Marburg, Rift Valley

PPE/Isolation General Guidelines

- Anthrax, tularemia, brucellosis, glanders, Q-fever, VEE, and the toxin-mediated diseases are not generally contagious, and victims can be safely managed using standard precautions.

Hygiene!!!!!!!

- Surgical masks usually adequate
- Strict Handwashing, preferably with antiseptic hands gel
- Avoid touching any part of face
- Avoid contact symptomatic animals and ALL rodents
- Insect repellant! lice, ticks, fleas, mosquitos vectors for disease

Preventive Health

- Typical infectious disease organism affects immune compromised host population first—elderly, children, chronically ill, environmentally stressed, etc.
- The healthy, well conditioned individual most probably has a healthy immune response for survival. Exception: Spanish influenza epidemic, 1918
- Emphasize healthy diet, exercise, multiple vitamen/mineral qd, maintain optimal weight, moderate alcohol intake, no tobacco products

Immunizations

- Military Medical Command must insure participants are “fit for duty" by maintaining current status and records of immunizations in event deployment military or civilian disaster.
- Similarly, US universities, public schools, childcare facilities, food handlers, etc., require proof of current immunization status.

Community Resources

- In US, military and civilian agencies team together. Ineffective in past, such as recognition of AIDS, better now Ex: oral temp and masking inbound passengers to West Coast airports from SARS endemic countries
- Local Law Enforcement Authorities
- Local or County Health Department
- Local Pharmacists, Veterinarians, Laboratory technicians
- State Health Department
- CDC Emergency Response Hotline: 770-488-7100
- CDC Bioterrorism Preparedness & Response Program: 404-639-0385
- FBI (general point of contact): 202-324-3000
- USAMRIID General Information: http://www.usamriid.army.mil
- Johns Hopkins Center for Civilian Biodefense: http://www.hopkins-biodefense.org

Bio-surveillance

- Bioterrorism has existed since pre-historical civilizations.
- **The perfect "epidemic pathogen" is the perfect bioterrorism weapon.**
- **Threat of epidemics, from naturally occurring pathogens or those maliciously introduced, has initated a major response by the US biomedical, public health, defense, and intelligence communities.**
- **21st century technology provides information infrastructure and methods to obtain real-time detection and monitoring of diseases, as well as their diagnosis and treatment, has rapidly emerged.**

Military applications, Medical Surveillance

- **Disease and Non-Combat Injuries are the major cause morbidity and mortality Armed Forces**
- **Medical surveillance is critical to medical readiness**
- **Data influences Command decisions re: impact of diseases and injuries on duty time, diseases, risks, hazards , and conservation health care resources**
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Epidemic Prevention

- Prevention and control of epidemics directly proportional to early detection, treatment, immuno-prophylaxis
- Data registries of pathogen drug resistance
- Global health monitoring epidemic outbreaks; rapid response to disasters in emerging economies to quickly establish safe drinking water and sanitation facilities

Epidemic Prevention, con't.

- • **Tropical disease exposures more probable**
- • International Air t**ransportation of tourists, business, and military personnel enclosed space 8-12hr flights optimal epidemic population!**
- • **Military are terrorist targets**
- • **Multi-state outbreaks within continental US due to interstate transport of fresh food products**
- • Enhance communication and coordination between civilian and m**ilitary medical providers**
- • **More efficient, rapid outbreak investigations**

Conclusion

- Pathogenic organisms have ability to rapidly adapt to overcome host defenses.
- Epidemics have and will always impact animal and human populations
- Early detection, rapid response, containment mainstay of prevention

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