



Management

The monthly update on Emergency Department Management

Vol. 14, No. 11

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November 2002

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Don't rely on staffing ratios alone: Here are cutting-edge strategies to use

Avoid being shortsighted when it comes to staffing

Do you staff your emergency department (ED) based solely on ratios? Do you use staffing productivity measures that only address paid nursing hours per patient visit?

These methods are *not* effective in the ED and actually can endanger patients, warn staffing experts, who point to a growing trend toward state-mandated ratios for nursing staff.

“They do not look at variables unique to emergency nursing, such as acuity, length of stay, and staff skill mix,” says **Carl E. Ray**, BSN, RN, senior clinical analyst for Sentara Healthcare in Virginia Beach, VA, and a member of the Des Plaines, IL-based Emergency Nurses Association (ENA)’s Staffing Best Practice Workgroup.

Ray gives this example: Some ratios have set a one-nurse-to-one-patient ratio for trauma and critical care patients, yet it takes at least two nurses to care for that patient during the first hour they are in the ED.

“Length of stay is also crucial because as long as patients remain in the ED, they require nursing care,” he adds. “This is especially true in today’s hospital environments where patients are held for long periods in the ED while waiting for inpatient beds.”

The dollars saved in keeping a low ratio in the face of increased patient volume, admissions, and ED inpatient holds will be spent later on contract labor, the costs

Audio conference tackles HIPAA concerns

The recently released final privacy rule under the Health Insurance Portability and Accountability Act (HIPAA) makes significant changes to the existing regulations. With the April 14, 2003, compliance deadline fast approaching, are your staff receiving the proper training?

The American Hospital Association says implementing HIPAA will require “sweeping operational changes” and will take “intense education of hospital workers and patients.” To help you and your staff prepare, American Health Consultants offers **HIPAA’s Final Privacy Regulations: What You Must Know to Comply**, an hour-long audio conference Dec. 4, 2002, from 2:30-3:30 p.m. ET.

(Continued on page 130)

of ED nurse attrition, and potential risk management expenses, warns **Camilla L. Jones, RN**, director of emergency and transfer services at Lewis-Gale Medical Center in Salem, VA.

“In a nutshell, shortsightedness regarding appropriate staffing can destroy your competitive advantage,” she says.

Here are ways to effectively staff your ED:

- Use the new ENA staffing tool.

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Executive Summary

You need to address acuity, length of stay, and staff skill mix when staffing your emergency department (ED).

- The Emergency Nurses Association has developed new staffing guidelines.
- Track changes in acuity and time spent on nursing tasks to obtain additional nursing hours.
- Use different ratios for specific patient groups.
- Admission holds in the ED must have the same staffing as inpatients.

New staffing guidelines developed by ENA give you the nursing full-time equivalents (FTEs) needed to staff an ED based on patient volume, patient acuity, and length of stay, says Ray. **(For more on the staffing guidelines and tool, go to the ENA web site, www.ena.org.)**

The workgroup has developed an ENA Staffing Tool in an automated Excel Workbook format based on the guidelines. By inputting data into the tool, you will be given the number of FTEs needed to staff your ED, explains Ray.

He notes that the tool takes census changes specific to the ED into account. The census usually peaks about noon, with a second, larger peak in the early evening, and a dramatic drop late at night, Ray says.

- Obtain extra staffing for high-acuity patients or inpatient holds.

Jones developed a staffing formula to use when the ED has high-acuity patients who require extended care and/or if inpatients are held in the ED. **(See formula inserted in this issue.)**

“I created the formula to communicate the extra man-hours needed to cover effective patient care and justify them mathematically,” she says.

When justifying your staffing needs, a general statement such as “we were swamped” is not as effective as a formula that objectively converts the extra length of stay into a productivity value, emphasizes Jones.

Your ED's admission rates are another indicator that can be used to adjust man-hours to an appropriate level, Jones says. “If an ED typically runs at two man-hours and has typically experienced admission rates of 10%, it is only logical to assume that it will take more staffing resources to manage admission rates of 20% or greater,” she says.

The location of the patient's admission also is relevant, Jones says. “For example, if the ED is holding critical care patients, this will drive staffing requirements up,” she says.

- Determine what man-hour per stat ratios to use.

The ratios you use will depend on the services your ED offers, such as forensics, a chest pain center, and interfacility transfer services, says Jones.

“The fact that EDs can’t be compared as apples to apples has further complicated the standardization of ED staffing,” she says. “There continue to be many methods out there that are used, even within local communities and market divisions.”

Jones advises against using a nurse-to-bed ratio to calculate staffing in the ED setting. “Patients can continue to enter beyond the room capacity,” she notes.

Jones monitors man-hour per stat ratio trends that occur monthly, weekly, daily, and hourly, and staffing patterns are staggered, based on trend averages.

Incentives are offered to staff willing to work extra hours if patient load goes beyond average capacity or if patients are held, Jones reports.

“In addition, leadership staff maintain an on-call status so that extra resources can be made available on the spur of the moment if needed,” she says. “We all share this responsibility.”

- **Use different ratios for various patient groups.**

Consider staffing differently for three groups: acute emergent patients who usually are admitted, urgent and nonurgent patients who usually go home, and admission holds who can’t get an inpatient bed, suggests **Jerry Keyes**, RN, director of emergency services for Florida Hospital Celebration Health in Orlando.

“Each one of these patient types needs a different staffing ratio,” he explains.

Keyes suggests looking outside the ED to the surgery area; the best performers separate outpatient and inpatient surgical patients into two categories because processing and staffing are different. He says that the same approach should be used in the ED, and he points to the success of fast tracks for minor care patients.

“Thus, this group gets faster treatment than they would mixed in with the acute group,” he says.

- **Track changes in acuity to justify additional staff.**

Cindy Wage, RN, BSN, nurse educator of the ED at Trinity Medical Center in Rock Island, IL, has demonstrated increased acuity levels linked to tasks routinely performed by nurses. She says that doing this has supported the need for additional nursing staff.

“I just kept some of my own stats on things that we do every day that no one seemed to take into consideration,” she says.

Wage gives the example of nurses doing an average of 600 electrocardiograms each month. She used this statistic to show administrators that acuity levels had changed since the hospital started its open heart program.

“We have an average of [less than] 40 minutes from the door to the cath lab for acute myocardial infarctions,” she reports. However, Wage says that the extra time nurses spent on electrocardiograms, which contributed to this impressive statistic, was overlooked until she pointed it out.

Wage also tracked the time nurses spent in answering radio calls from ambulance services, and transferring ED medical/surgical admissions to the units.

The ED manager and director took Wage’s findings to the vice president of nursing to discuss the budget plans for the year. “I was able to have our nursing care hours increased,” she reports. “We are now budgeted for one additional nurse for both days and second shift.”

- **Provide the same level of care to admission holds as inpatient units.**

Keyes says that the most pressing staffing issue in his ED is measuring the workload for admission holds. “We need an inpatient acuity system to ensure equal patient care standards are met,” he stresses.

Keyes says that his ED is negotiating with the inpatient units to supply nurses to care for admission holds. Either revenue will be transferred from the inpatient units to the ED, or the cost of the ED’s labor will be transferred to the inpatient units, he explains.

“Too often, we hear of ED staff caring for these patients with fewer care hours per day than the inpatient setting,” he says. “That is foolish and opens you up to criticism by [the Joint Commission on Accreditation of Healthcare Organizations] for having different care standards in different settings.” ■

Sources

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ED staff will be first to receive smallpox vaccine

A plan that targets hospital emergency workers to receive a smallpox vaccination first will substantially lessen the potential threat of a public-health nightmare, according to sources.

“If there is an outbreak and most health care workers are unprotected, then we may see some workers not showing up for their shifts when the epidemic hits the streets of the U.S.,” warns **Gary Wright, MD**, FACEP, medical director of the ED at South Baldwin Regional Medical Center in Foley, AL.

According to a Bush administration plan, still to be finalized at press time, the vaccine will be offered first to hospital emergency workers because these workers are considered to be at greatest risk of coming into contact with a patient infected with smallpox.

Despite the announcement, ED managers have not developed concrete plans for how the vaccination process would be handled. “I have fielded several questions from nursing and physician personnel, but we have not yet had any meetings addressing this issue,” Wright says.

The lack of a plan is due largely to practical concerns that have not been addressed by government officials. “Until we find out the requirements for post-vaccination duty, we are not going to proceed,” he points out.

Wright says he suspects that if staff are required to be off for a two- to three-week period after vaccination, his facility won’t participate as a voluntary center. “From a personal standpoint, if I am not allowed to return to duty after vaccination, I will also not be seeking vaccination,” he adds.

If ED personnel are allowed to rapidly return to work, there will be good participation in the program, Wright predicts. “Otherwise, I feel there will be dismal participation,” he says.

Nancy Auer, MD, FACEP, medical director for hospital bioterrorism planning for the state of Washington, acknowledges that plans for vaccination cannot be made until certain issues are addressed. “Until then, we will not advocate for pre-exposure vaccination,” she says.

In particular, Auer says that the government has to announce its policy for furlough after vaccination, who pays for disability if a vaccinated worker becomes ill, and liability if an individual develops vaccina through exposure from a vaccinated individual.

“One of the problems we currently face is that the smallpox vaccine is considered an experimental

Executive Summary

According to current plans, emergency department (ED) staff will be offered the smallpox vaccination, but important staffing, logistic, and liability issues still are unclear.

- The need for staff to take off work is a major worry for ED managers.
- It is unclear who will assume responsibility for disability and liability.
- There is a concern about immunocompromised individuals being exposed to vaccinated staff.

vaccine, so there is no liability coverage from the federal government under the usual coverage for vaccines,” she says. “We also need to know who will distribute the vaccine, and when and how it will become available.”

Here are items you should consider, in order to prepare:

• Risks of immunocompromised individuals.

The Atlanta-based Centers for Disease Control and Prevention recently announced that there may be higher rates of complications from smallpox vaccination now than in the past, due to increased numbers of individuals with immune suppression as a result of organ transplants and such illnesses as cancer and HIV/AIDS. (Go to the CDC web site: www.bt.cdc.gov/agent/smallpox/index.asp. Under “News,” click on “Chart: Smallpox Vaccine Adverse Event Rates.”)

Wright notes that patients who are immunocompromised would be at increased risk if large numbers of staff are vaccinated, but he adds that most of these individuals need to avoid hospitals anyway.

Often, it isn’t known which patients are immunocompromised, so he suggests putting out a public notice for those individuals to avoid the facility unless arrangements are made with their physicians.

• **Staffing issues.** Wright says his biggest operational concern is the proposed requirement to keep workers out of contact with patients for a two- to three-week period after vaccination.

“If this is a requirement, I suspect there will be almost zero participation other than the military, public health workers, and other state or federal employees who would get paid leave or be reassigned,” he says. “For those of us having to fund our own employment, I suspect almost no one will want to take three weeks of unpaid leave.”

Wright suggests that one possibility is to give employees the vaccine just before they take off for a two-week vacation. Over the course of a year, most workers could be vaccinated.

“Granted, they would probably not like the idea of

Sources/Resource

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For updated recommendations, go to the Centers for Disease Control and Prevention's Smallpox web page: www.bt.cdc.gov/Agent/Smallpox/SmallpoxGen.asp.

being ill for their only vacation of the year," he says. "However, I doubt any hospital system is going to fund two weeks of paid leave for every employee."

Another approach would be to vaccinate half of the employees, wait three weeks, and vaccinate the other half, says Wright. "During this six-week period of time, the employees would be allowed to continue working." ■



Toyota's tips drive dramatic ED improvements

Progressive emergency department (ED) managers increasingly are looking outside health care for cutting-edge ideas to improve quality and boost efficiency.

"It is important for us to look to other industries, because we haven't been successful in reducing waste and errors with our status quo," says **Cindy Jimmerson**, RN, process improvement researcher at Community Medical Center, a 108-bed facility in Missoula, MT, and co-investigator in a research project funded by the Arlington, VA-based National Science Foundation on "Applying the Principles of the Toyota Production System to Healthcare."

Jimmerson says there is a lot that EDs can learn from the Tokyo-based Toyota Motor Corp.

The automaker has mastered reducing waste; giving customers exactly what they want, when they want it; and eliminating defects, says Jimmerson. Here are three examples of Toyota principles that can be implemented in the ED:

1. Make changes without the addition of staff or technology. According to Jimmerson, changes are made from the "bottom up," with workers considered the experts. "This is not someone from the top telling people what to do," she underscores.

The idea is to make changes as soon as possible after a roadblock is identified, she says. "You figure out why it occurred and what you will do about it," she says. "This is very different from reporting a problem to a supervisor, who takes it to a director, who takes it into a meeting."

She gives an example: A trauma patient arrives in the ED and needs a peritoneal lavage, but no tray is stocked. The nurse arranges to get one sent up from central processing, or runs to the operating room to borrow one. Jimmerson says that according to the principles of the Toyota Production System, the time spent in getting the tray is considered a "nonvalue-added" activity. Instead, the nurse would ask the following questions right after the event: Why was the tray not on the shelf? How do we stock shelves? What are the clear signals when the shelf is low and needs restocking? Who is responsible for stocking? "In other words, how do we fix this so that it doesn't happen again, instead of just putting a [bandage] on a single event at hand," says Jimmerson.

At St. James Healthcare, a 100-bed facility in Butte, MT, ED staff used this Toyota principle to solve a problem with the laboratory, reports **Pat McNeill**, the ED's patient representative. It was taking up to 90 minutes to complete necessary lab work, which increased the patient's overall time in the ED, she explains.

"Both the lab and ED personnel were angry and blaming each other," she says.

In using the "Toyota way" of understanding "how work happens," McNeill observed the process in the

Executive Summary

The Toyota Motor Corp.'s key concepts of allowing workers to make changes, putting the customer first, and reducing waste can have a dramatic impact when implemented in emergency departments.

- Staff should be empowered to make changes to improve quality.
- A chain of events should be set in motion for each customer request.
- Identify and eliminate roadblocks that cause delays.

How a common problem is solved with Toyota system

Here is a sample patient care problem in the emergency department (ED). **Pat McNeill**, RN, patient representative at St. James Healthcare in Butte, MT, compares routine problem solving with problem solving according to the principles of the Toyota Production System.

- ✓ **Problem:** A pregnant patient needs a Doppler ultrasound for assessment. The ED nurse tries to locate this equipment at several locations, but the batteries are dead or the device is malfunctioning. The nurse has to call the obstetrics floor to get working equipment. This causes delays in treatment.
- ✓ **Routine problem solving:** Working equipment is located. The nurse complains to the supervisor about the problem. The problem is put on the agenda for the next staff meeting. There are too many items on the agenda, so the item is delayed for another month until the next meeting is held. The problem is ignored until the next time it occurs.
- ✓ **Toyota Production System problem solving:** Working equipment is located. A root-cause analysis is done to identify what caused the problem. The findings are shared with staff. Staff formulate a plan to correct the problem. The plan specifies what needs to occur and who is responsible to test the results. After changes are made, the problem is solved or revisions are made. ■

lab and the ED, and a committee of three ED nurses and three lab technicians met to discuss her findings.

“The staff began to focus on the breakdown of the system, rather than on personalities,” McNeill says. “Both the ED and lab staff felt some ownership in coming up with the solutions.”

As a result, computer problems were identified, labeling changes were made, and a buzzer was used to alert the lab that new specimens have arrived.

She reports that the lab results showed consistent improvement, with results within 10-30 minutes. “If there are any longer delays, the lab notifies the ED,” McNeill says.

2. Solve problems from the perspective of individual patients. A key part of Toyota’s corporate culture is addressing problems from an individual customer’s point of view, says Jimmerson. For example, instead of addressing a general problem of “the lab never gets the work done on time,” the Toyota method would address a specific scenario such as “Jones spent unnecessary time in the ED because

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his lab results were delayed by 30 minutes.”

She says that by fixing a problem for an individual patient, you wind up fixing that same problem for future patients. (See **sample problem solving at left.**)

Another key concept is to solve a problem by observing a process, instead of placing blame on individuals or departments, Jimmerson says.

“The idea is to look at how each person along the way can improve the process,” she says. “Nobody has been personally attacked, and everybody takes some ownership in finding solutions.”

3. Eliminate “nonvalue-added activities.” She underscores a key Toyota concept: To identify and eliminate “nonvalue-added” activities. Jimmerson points to the work that the nurse did to locate a peritoneal lavage tray in the above example. “All of that activity did nothing to move the patient along,” she says. “Only when the tray was delivered to the room did the work resume.”

The idea is to avoid “work arounds,” Jimmerson says, when you must work around a roadblock. “The goal is to find sources of frustration and get them out of the way,” she says. “In this era of nursing shortages, we can’t afford to make people unhappy at work anymore, or to waste time doing anything that doesn’t add value to the patient.” ■

Try these novel ways to use ancillary staff

If you and your staff are overworked, consider some creative delegating. “As the nursing shortage grows, we should start looking at what other professionals can do within their area of expertise,” says **Barbara Weintraub**, RN, MPH, MSN, coordinator of pediatric emergency services at Northwest Community Hospital in Arlington Heights, IL.

Identifying ways to better use staff skills is time well spent, stresses **Paula Hafeman**, RN, MSN, director of the cancer and emergency center at St. Vincent

Executive Summary

Ancillary staff can be used to offload nursing tasks and provide improved care to patients.

- A health unit coordinator role can handle such tasks as registration, notification of physicians, and patient transport.
- Physical therapists can evaluate orthopedic patients, assist patients in obtaining needed devices, and provide follow-up care.
- Phlebotomists can follow up on orders in addition to drawing blood.

Hospital in Green Bay, WI, a 517-bed tertiary care hospital. “It is extremely important to utilize staff as efficiently as possible, especially in a busy emergency department [ED],” she says.

Here are innovative ways to utilize ancillary staff in the ED:

- **Find new ways to cross-train staff.** Hafeman says that cross-training of staff has provided many benefits at her ED. “This has given us flexibility and eliminated bottlenecks in patient flow,” she says.

Emergency medical technicians and certified nursing assistants set up patients for procedures, apply orthopedic supplies, dress wounds, perform ear irrigations, handle oxygen saturation, order and stock supplies, discontinue intravenous lines, perform laboratory tests including venipuncture and arterial draws, and give electrocardiograms, she says.

In addition, the ED uses health unit coordinators to register patients, address insurance issues, enter charges and orders, notify physicians, and transport patients, says Hafeman. **(See the facility’s job description for health unit coordinators, inserted in this issue.)**

The health unit coordinators have improved patient flow by registering patients at the bedside so that patients no longer wait in line for registration, she says.

Three health unit coordinators work each shift and rotate team assignments every six hours in a 12-hour shift, says Hafeman. She adds that the health unit coordinators and technicians also are cross-trained to do each other’s jobs.

“The benefits of this are a tremendous amount of flexibility in scheduling, and an increase in salary if staff work additional hours,” she says. “They are also more satisfied in their positions because of their increased value as part of our team. We could not do it without them.”

- **Use physical therapists.** Orthopedic patients often have complex follow-up needs that aren’t easily addressed in the ED, and a dedicated physical therapist

can be of tremendous value, says Weintraub. For example, orthopedic patients may be sent home in a cast, and then they may realize that they can’t use a bathroom, she says.

“When I had foot surgery a month ago, they gave me a special shower boot to go over my lower leg,” says Weintraub. “For 17 years, I’ve been telling people to put garbage bags over their foot to avoid getting wet. This was something that existed that I didn’t even know about!”

A physical therapist can provide exactly this kind of information to ED patients, she says.

Weintraub adds that it’s often a tough call whether it’s safe to send an elderly patient home after experiencing a fall.

“We do a ‘road test,’ and if we can get them up and walking, then we send them home. But I’m not sure how scientific that is — just because you can walk, doesn’t mean you’re not at risk for falling again,” she explains.

A physical therapist can perform a more detailed assessment to evaluate elderly patients with unstable gait and also determine what devices a patient may need.

“Often, you would feel comfortable sending a patient home if you could just get them a walker or a commode seat,” Weintraub says. “But there is no way a busy ED nurse could do that.”

Having a physical therapist address these needs decreases the number of elderly patients admitted because they can’t manage at home, she adds. The physical therapist also could handle follow-up care and address ongoing concerns of patients, Weintraub suggests.

- **Use phlebotomists to follow up on orders.** In some EDs, the phlebotomist is responsible for not only drawing the blood, but entering the orders, and then following up to see where the results are, Weintraub says. “This follow-up is an area that ED nurses spend

Sources

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an inordinate amount of time on,” she adds.

The phlebotomist also can be responsible for point-of-care testing done in the ED and for maintaining compliance with Clinical Laboratory Improvement Amendments (CLIA) standards, advises Weintraub.

• **Use paramedics for specific tasks.** Weintraub suggests cross-training paramedics to perform phlebotomy, but she cautions that many state nursing and emergency medical services practice acts prohibit them from giving medications in the hospital setting.

“They can apply post molds, finger splints, ace wraps, and other orthopedic tasks,” she says. “As their assessment and training are higher, they can transport more critically ill patients than many other technicians can.”

Respiratory therapists also can be cross-trained to do phlebotomy and electrocardiograms, she adds.

• **Hire an individual devoted to patient needs.** Weintraub suggests having someone in your ED who is solely devoted to updating patients on their waits; making sure they are comfortable; updating family members; and bringing in telephones, TVs, magazines, or food. “This can significantly raise customer satisfaction scores,” she says. ■

Joint Commission

Comply with new standard for disaster volunteers

Have you wondered how to handle volunteers if a disaster occurs in your community? A new emergency privileging hospital standard from the Oakbrook Terrace, IL-based Joint Commission on Accreditation of Healthcare Organizations provides clear instructions for this scenario.

The standard, which is effective immediately, provides for the privileging of volunteer licensed independent practitioners (LIPs) during emergencies. It allows the hospital chief executive officer, medical staff president, or a designee to grant emergency privileges when the emergency management plan has been activated.

The standard will help appropriately credentialed clinicians respond in an organized manner so they can be used appropriately, says **Suzanne Pugh**, RN, nurse manager of the ED at St. Vincent’s Manhattan in New York City.

The following are given as acceptable sources of identification:

- a current license to practice;

Executive Summary

The Joint Commission on Accreditation of Healthcare Organizations has announced a new standard for giving emergency privileges to volunteer clinicians during a disaster.

- Emergency privileges can be granted when your facility’s emergency management plan has been activated.
- Volunteers must present a current license, current hospital identification with license number, or have their identity verified by a staff member.
- Establish mutual aid agreements with other local hospitals so you know which clinicians are willing to volunteer.

- a current picture hospital identification accompanied by the LIP’s license number;
- verification of the volunteer practitioner’s identity by a current hospital or medical staff member.

Joint Commission officials say that health care personnel during last year’s flood in Houston and the terrorist attacks in New York City and Washington, DC, identified a need for rapid access to clinicians to meet patient care demands in emergencies.

On Sept. 11, hospitals were overwhelmed with physicians and nurses showing up at the hospital ready to assist, Pugh says. “We were and are extremely grateful for their willingness to volunteer. However, even with a license in hand, these are ‘unknown’ clinicians. In addition, we had more volunteers than patients at one point.” She points to an example of appropriate use of volunteer clinicians on that day, when a hospital chairman contacted her facility asking if ophthalmologists were needed. “He was told we could use three physicians, which were quickly dispatched,” she says.

Laura Guerrieri, RN, BSN, director of emergency services at Gottlieb Memorial Hospital in Melrose Park, IL, says the new standard will be of tremendous help to emergency departments (EDs). “Ideally, it would be preferable if volunteer physicians were board-certified in emergency medicine,” she says.

Guerrieri suggests that volunteer physicians who are not board-certified could be used to evaluate and treat less severely injured and noncritical patients in the ED. She explains that specialty physicians such as orthopedic surgeons would be extremely valuable to hospitals in disaster situations because they could be utilized in the operating room rather quickly, thereby giving the ED the advantage of being able to accommodate a greater number of victims.

Here are ways to comply with the standard:

- **Develop a policy to handle volunteer clinicians.**

Guerrieri’s ED has developed a policy for credentialing of nonstaff physicians in the event of an emergency

Sources

For more on the emergency privileging standard, contact:

- **Laura Guerrieri**, RN, BSN, Director, Emergency Services, Gottlieb Memorial Hospital, 701 W. Melrose Park, IL 60160. Telephone: (708) 450-4988. Fax: (708) 681-1545. E-mail: laura_guerrieri@ghr.org.
- **Suzanne Pugh**, RN, Nurse Manager, Emergency Department, St. Vincent's Manhattan, 153 W. 11th St., New York, NY 10011. Telephone: (212) 604-2513. Fax: (212) 604-2339. E-mail: spugh@saintvincentsnyc.org.

The *Medical Staff Standard on Emergency Privileging of LIPs for Hospitals* — MS.5.14.4.1, can be accessed at the Joint Commission Resources web site, www.jcrinc.com. Search for "MS.5.14.4.1."

or disaster, based on the Joint Commission standard. The policy is as follows:

— The following information will be obtained and verified in order for a physician to be granted emergency privileges:

1. Valid professional license to practice in any state in the United States, currently holding active staff privileges.
2. Photo identification.
3. List of current hospital affiliations where practitioner holds staff privileges.
4. Malpractice face sheet (obtained from primary hospital, if available).

— Verification of the above information will be done as soon as possible by the medical staff office.

— The practitioner will be paired with a currently credentialed Gottlieb medical staff member and will act under the direct supervision of a Gottlieb medical staff member.

— The practitioner's emergency privileges will be for the period during the duration of the disaster only.

• **Have volunteers report to their own facility first.**

Pugh says that the main issue with disaster volunteers is determining who is needed and when. She recommends reporting to your own facility to be dispatched as needed. "Communication should be at the chairman or administrative level of an institution," she adds.

The clinicians dispatched then would be known entities, vouched for by their "home" department and institution, she explains. Then, emergency privileges could be granted as outlined by the Joint Commission, she says.

• **Create a pre-established list of local physicians willing to help in a disaster.**

Guerrieri recommends arranging for mutual aid agreements with other local hospitals. "This way, you

will know which specialty physicians you can count on," she explains. "This is something that we are working toward." ■

EMTALA



[This column is part of an ongoing series that will address reader questions about the Emergency Medical Treatment and Labor Act (EMTALA).]

Question: At a smaller critical access hospital, members of the community have been allowed to come to the emergency department (ED) to have their blood pressure checked. There is no documentation of the visit or the vital signs. Patients are not asked if they want a medical screening examination, and they leave without being checked in or registered. Is this practice an EMTALA violation?

Answer: The practice described in the question is similar to any number of "public relations" types of services provided by hospitals as a convenience to the community, says **Jonathan D. Lawrence**, MD, JD, FACEP, an ED physician and medical staff risk management liaison at St. Mary Medical Center in Long Beach, CA. Other such services include health fairs where blood pressure, blood sugar, and cholesterol levels are checked free of charge, he adds. "The question does raise interesting EMTALA ramifications," Lawrence says. No EMTALA liability attaches for asymptomatic patients coming to merely have their blood pressure checked, he says. "After all, they could just as easily have the same blood pressure checked by a machine automatically down at the local pharmacy," Lawrence says.

He explains that under EMTALA, a patient must come to the ED for medical evaluation and treatment of an emergent medical condition before EMTALA requirements kick in. Therefore, Lawrence says that if a patient is not coming to the hospital for evaluation and treatment of an emergency medical condition (defined by the layperson standard "symptoms of such severity that a prudent layperson would conclude that an emergency medical condition exists"), EMTALA

Source

For more information, contact:

- **Jonathan D. Lawrence**, MD, JD, FACEP, Emergency Department, St. Mary Medical Center, 1050 Linden Ave., Long Beach, CA 30813. Telephone: (562) 491-9090. E-mail: jdl28@cornell.edu.

doesn't apply. "These people requesting blood pressure checks are presumably asymptomatic," he says. "If not, then a simple blood pressure check should be refused, and the person should be encouraged to sign in as a patient and receive a full-screening exam."

A competent person may refuse a screening exam, Lawrence notes. A symptomatic patient with headache, shortness of breath, and chest pain, for example, should be registered and screened or a refusal of examination form should be signed, he says. Asymptomatic people with elevated blood pressures, the parameters of which need to be defined by each ED in accordance with the "comfort level" of the physicians, need to be offered a formal screening examination and be signed in. "In my

experience, the majority of people requesting these blood pressure checks are the 'worried well,' but a few people with seriously elevated blood pressures or who are symptomatic may show up," he says.

Lawrence cautions that those taking the blood pressure measurements should refrain from dispensing advice. "They may be asked, for example, whether a particular reading is normal or not. Certainly the range of normal blood pressures can be related," he says. "But any advice as to what should be done for any given measurement such as increasing or decreasing medication, for example, should be left to the person's own physician or clinic."

He advises that any request by the person for more detailed advice should require registering as a patient. "Likewise, blood measurements clearly far off the normal range should trigger the ED to offer a screening exam," he says. "If refused, documentation of refusal should be documented." ■

An audio conference from the publisher of *Hospital Access Management, Compliance Hotline, ED Management, Same-Day Surgery and Healthcare Risk Management*

HIPAA'S FINAL PRIVACY REGULATIONS: What you must know to comply

Presented by Debra Mikels and Chris Wierz, BSN, MBA

Dec. 4, 2002 - 2:30 to 3:30 p.m. EST

Have your staff received the proper training on the final medical privacy rule under the Health Insurance Portability and Accountability Act (HIPAA) recently released by the Department of Health and Human Services? Guarding private health information isn't just an ethical concern; it is a legal one, and the deadline of April 14, 2003, is approaching fast.

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(Continued from cover)

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Mikels is corporate manager of confidentiality for Partners Healthcare in Boston. She will provide the practical information and guidance you need to implement a comprehensive privacy policy in your organization. Wierz is vice president of HIPAA and compliance initiatives for Houston-based Healthlink, a health care consulting firm. She has worked with numerous facilities across the country to prepare them for HIPAA compliance, and now she shares many of her ideas with you.

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COMING IN FUTURE MONTHS

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■ Update on sentinel events in the ED

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■ Novel ways to get admitted patients upstairs quickly

CE/CME questions

Save your monthly issues with the CE/CME questions to take the two semester tests in June and December issues. A Scantron sheet will be inserted in those issues, but the questions will not be repeated.

7. Which is recommended regarding nurse-to-patient staffing ratios in the ED, according to Camilla Jones, RN, director of emergency and transfer services at Lewis-Gale Medical Center?
 - A. The same ratio should be used for all patient groups.
 - B. Staffing should be adjusted for high-acuity patients or inpatient holds.
 - C. Acuity-based staffing is not effective for fast tracks.
 - D. High-acuity admission holds require the same staffing level as other ED patients.

8. Which of the following is recommended for small-pox vaccination, according to Nancy Auer, MD, FACEP, medical director for hospital bioterrorism planning for the state of Washington?
 - A. offering no quarantine for staff who previously received the vaccination
 - B. assuming responsibility for patient and staff liability
 - C. asking immunocompromised patients to go to a single facility
 - D. addressing concerns about quarantine, disability, and liability before proceeding with vaccination

9. Which of the following is an example of a Toyota Production System principle, according to Cindy Jimmerson, RN, process improvement researcher at Community Medical Center?
 - A. Managers identify all changes to be made.
 - B. Individual staff members identify and implement changes.
 - C. Changes are driven by the addition of cutting-edge technology.
 - D. Additional staff are required.

10. Which is an effective way to utilize ancillary staff, recommended by Barbara Weintraub, RN, MPH, MSN, coordinator of pediatric emergency services at Northwest Community Hospital?
 - A. Avoid cross-training staff because it creates confusion.
 - B. Use a physical therapist to assess the needs of orthopedic patients.
 - C. Have phlebotomists draw blood, with nursing staff managing follow-up.
 - D. Avoid using paramedics for patient care tasks due to liability risks.

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PS Form 3526, September 1999 (Reverse)

11. Which is accurate regarding a new emergency privileging hospital standard from the Joint Commission?
- Hospital chief executive officers can give emergency privileging during disasters.
 - All volunteer physicians must be board-certified in emergency medicine.
 - Physicians who practice in the state are given preference.
 - Only specialists will be given emergency privileges.
12. To comply with EMTALA, what should be done when offering blood pressure checks in the ED, according to Jonathan D. Lawrence, MD, JD, FACEP, an ED physician and medical staff risk management liaison?
- Every individual should be given a medical screening examination before blood pressure is checked.
 - Patients should be offered a medical screening examination only if symptomatic.
 - Each individual should be given medical advice after blood pressure is checked.
 - The need to increase or decrease medication should be addressed.

CE/CME objectives

- Name one way to improve nurse-to-patient staffing ratios. (See *“Don’t rely on ratios alone: Here are cutting-edge strategies to use.”*)
- List one recommendation for smallpox vaccination. (See *“ED staff will be first to receive smallpox vaccine.”*)
- Identify one principle of the Toyota Production System. (See *“Toyota’s tips drive dramatic ED improvements.”*)
- List one way to effectively utilize ancillary staff. (See *“Try these novel ways to use ancillary staff.”*)
- Name one way to comply with a new emergency medicine privileging standard from the Joint Commission. (See *“Comply with new standard for disaster volunteers.”*)
- Cite one way to comply with the Emergency Medical Treatment and Labor Act (EMTALA) when doing blood-pressure checks. (See *“EMTALA Q&A.”*) ■

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Adjusted Outpatient Census Formula

Standard, benchmark, or fixed information:

Average length of stay (ALOS) = 140 minutes

Variables:

X = census

Z = adjusted census

Y = number of patients in emergency department (ED) > 6 hours

T = average length of stay in minutes of Y

The formula uses the referenced fixed and variable data to demonstrate increased volume represented:

Formula:

$$Z = \frac{(T \times Y - \text{ALOS} \times Y) + X}{\text{ALOS}}$$

Application:

The ALOS at Lewis-Gale Medical Center ED is 140 minutes. If 83 patients came to the ED in 24 hours and 10 stayed more than six hours at an average of 513 minutes, the following adjusted census formula is true:

$$Z = \frac{(TY - 140Y) + X}{140}$$

$$Z = \frac{(513 \times 10) - (140 \times 10) + 83}{140}$$

$$= \frac{5,130 - 1,400 + 83}{140}$$

$$= 26.64 + 83 = 109.64 \text{ patients (adjusted census)}$$

This information is used to calculate an adjusted man-hour per patient ratio (adjusted patient census is 109 patients instead of 83). More man-hours were needed to care for patients on this day than was budgeted for typical outpatient acuity, even though the overall census volume did not support the additional manpower. The most applicable time to use this formula is when patients are held in the ED or other outpatient setting for inpatient care due to bed saturation.

Source: Camilla L. Jones, RN, Director, Emergency and Transfer Services, Lewis-Gale Medical Center, Salem, VA. Formula taken from: Zimmermann PG. *Nursing Management Secrets*. Philadelphia: Hanley & Belfus Inc. Medical Publishers; Copyright 2002.

St. Vincent Hospital

Job Description

TITLE: Emergency Center Health Unit Coordinator

REPORTS TO: Director

DEPARTMENT: Emergency Center

SUMMARY OF RESPONSIBILITIES:

Perform clerical duties for the unit, function as a receptionist, transcribe physician's orders, and register Emergency Center/First Care patients entering the facility for services.

ESSENTIAL FUNCTIONS:

1. Understand and live St. Vincent Hospital's mission and values of Care, Joy, Respect, and Quality.
2. Enter orders and patient charges, enter and/or retrieve data, and locate patient data on charts or on-line as needed.
3. Answer telephone, screen calls, take messages, and provide information according to established policies.
4. Greet and assist visitors demonstrating positive customer relations and communication skills.
5. Assemble and maintain patient charts accurately.
6. Maintains complete and accurate unit records.
7. Facilitate patient transfers and discharges.
8. Communicate pertinent information regarding patient, physician, personnel concerns, and unit activities to the director.
9. Promote and maintain confidentiality
10. Comply with the specific department standards established for personal/work-related responsibilities.
11. Interview patient to obtain, verify, update and correct information necessary to complete the registration process. Enter patient information into the system.
12. Review hospital admissions to ensure accurate financial, demographic data and to ensure documents have been obtained and properly entered into the hospital data system.
13. Explain pertinent hospital policies, obtain signatures and answer questions about the hospital.
14. Compile and distribute information regarding patient's personal, insurance, and financial status. Provide appropriate forms to other departments.
15. Practice regular and reliable attendance.

MARGINAL ACTIVITIES:

1. Update Emergency Center manuals.
2. Assist in care and maintenance of department equipment and supplies.
3. Perform other job-related duties as assigned.
4. Monitor supply level and order when needed.

QUALIFICATIONS:

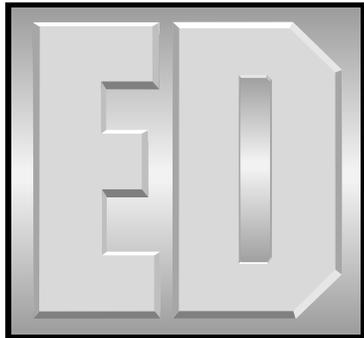
A high school diploma and knowledge of medical terminology are required. Completion of the Health Unit Coordinator course is preferred. Candidate should possess the ability to work autonomously and deal with a variety of people; be able to read and follow a written/verbal protocol; and demonstrate effective communication and organizational skills.

ACCOUNTABILITIES FOR MISSION:

Support and maintain the Christian philosophy of the Hospital Sisters Health System and the mission of St. Vincent Hospital. Identify patient related ethical concerns. Promote patient rights and responsibilities. Demonstrate and promote positive customer relationships with visitors, patients, physicians, and unit, department and interdepartment staff in a friendly, caring, and timely manner.

Source: St. Vincent Hospital, Green Bay, WI.

2002 SALARY SURVEY RESULTS



Management

The monthly update on Emergency Department Management

Are you meeting the needs of your staff? Here are cutting-edge strategies to use

You may have tried sign-on bonuses, salary increases, and attractive benefits packages to retain and recruit staff. However, your management style should be your top priority to nurture future leaders, emphasizes **Val Gokenbach, RN, MBA, CNA**, director of emergency services and observation at William Beaumont Hospital in Royal Oak, MI.

You'll need to meet the needs of a newly emerging work force, which are very different from the work force of the past, Gokenbach explains. Key concerns for today's staff are flexible work schedules and opportunity for advancement, she says.

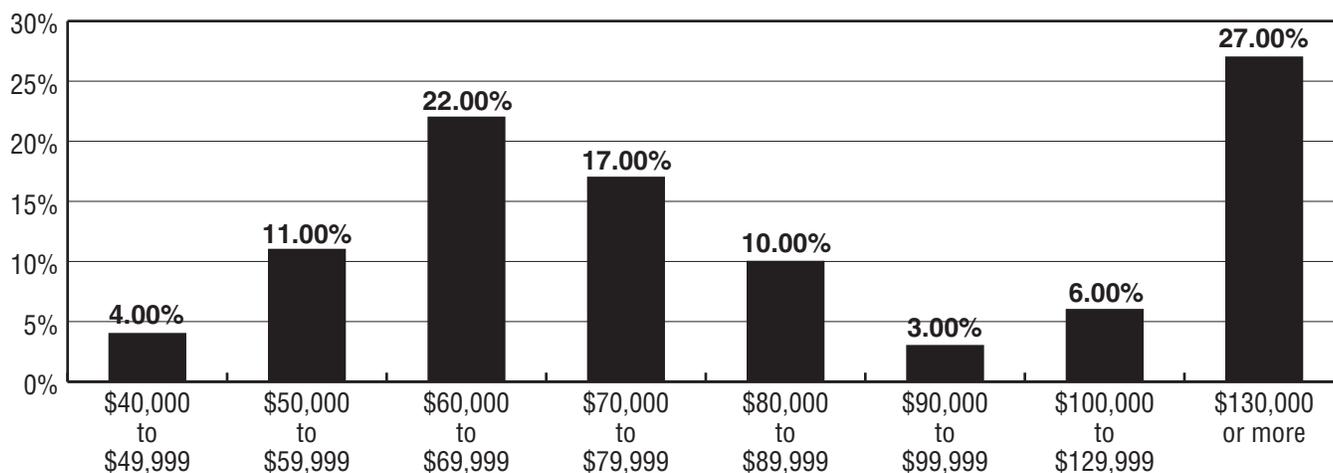
The *ED Management* 2002 Salary Survey was

mailed in July to 1,250 subscribers. There were 100 responses, for a response rate of 12.5%. Here are career and salary trends for ED managers, based on the survey results:

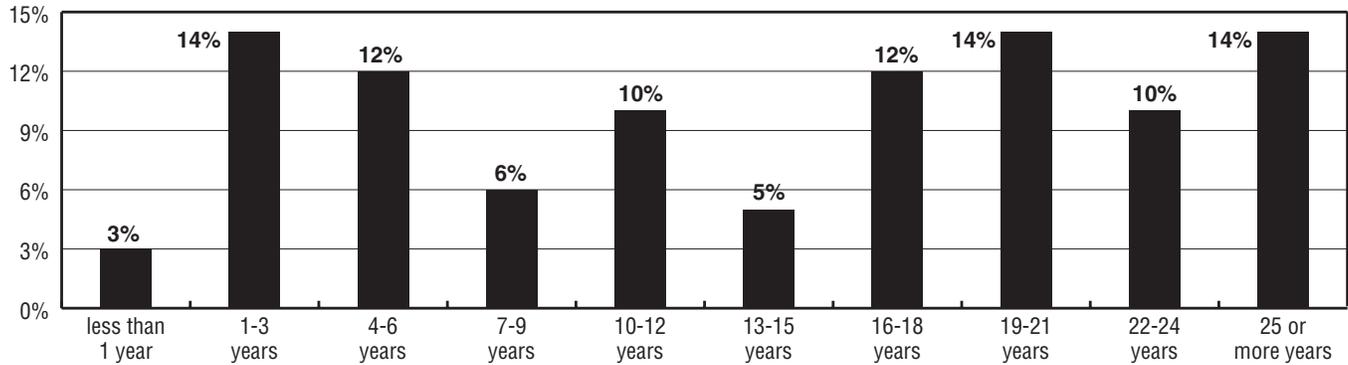
- **ED managers tend not to change fields.**

According to the survey, 50% of respondents have worked in their present field for more than 15 years (see top chart, p. 2), and 76% have worked in health care for more than 15 years. According to **Diana Contino, RN, MBA, CEN, CCRN**, president of Emergency Management Systems, a Monarch Beach, CA-based consulting firm that specializes in staffing issues, this indicates that individuals don't change fields once they have a degree and/or experience in health care.

What Is Your Annual Gross Income From Your Primary Health Position?



How Long Have You Worked in Your Present Field?



She says that the survey shows that senior staff members are filling management positions.

However, she notes that only 32% had bachelor's degrees, and only 21% had a master's degree.

"Of the latter, only 7% had MBAs, and none indicated an MHA," she says. "One would have to wonder if we have the incentives to encourage leaders to obtain advanced degrees."

She recommends evaluating what training and education ED managers need to be successful.

"I have been pretty aggressive in making sure our managers are current on the latest leadership theory," Gokenbach says.

She points out that many ED managers have come up from the nursing ranks and may not possess business backgrounds. "So it's important for those individuals to get the foundation that they may have missed," she says.

Gokenbach says her ED leadership team has a mandatory meeting once a week. "We discuss leadership trends, and staff are bombarded with articles," she says. "We also do a number of grand rounds and lunch and learns where people can

come and learn about leadership theory."

Gokenbach stresses the importance of conferences — not only to attend, but to encourage staff to give presentations. She explains that sharing your knowledge is one of the greatest contributions you can make to your profession. "If listeners take away one tidbit of information that is helpful to them, then it is worth it," she says.

Other benefits of presenting include networking with colleagues and improved self-esteem, Gokenbach adds.

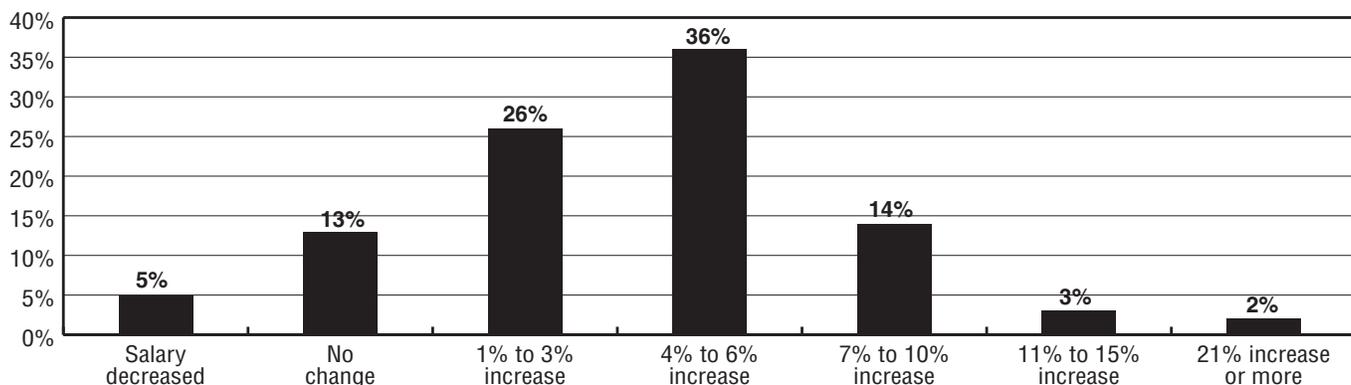
- **Salaries have increased but not dramatically.**

According to the survey, 62% of respondents reported a 1% to 6% increase in salary. (See chart, below.) Salaries are increasing at the staff and leadership levels, according to Contino.

The increases depend on the facility's financial solvency and the surrounding community economics, she adds.

Gokenbach says the survey's findings reflect salary increases at her ED. However, she adds that salary is not the No. 1 reason why staff choose to stay at a job. "The quality of leadership is usually

In the Last Year, How Has Your Salary Changed?



why people stay," she says.

However, Gokenbach acknowledges that with the nursing shortage, compensation has become more important. "We should be looking for ways to reward people for their contributions, such as financial incentives for developing programs," she says.

- **Most EDs have increased staff in the past year.**

According to the survey, 64% of EDs have increased the number of employees in their ED. (See chart, at right.)

Over the last several years, there has been considerable publicity about the nursing shortage, ED overcrowding, and diversion, Contino says.

"Nurse and physician directors who have successfully reversed this trend at their facilities often attribute it to increased nurse staffing, which decreases wait times, throughput times, and bypass times," she says.

Contino reports that most of the EDs in southern California have added nursing staff, additional staff for holding units, technicians, and ancillary staff.

- **ED managers are putting in long hours.**

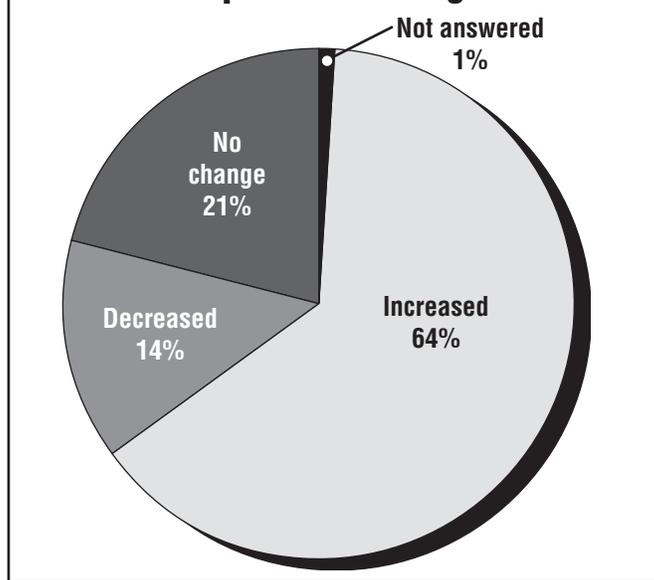
A total of 69% of survey respondents reported working more than 45 hours a week. (See chart, below.)

Contino says one reason for these hours is technology that allows access to rapidly changing information. "The Internet, e-mail, and listservs allow organizations to send out information and request that it be returned in very short turn-around times," she says.

Contino gives the example of continuously changing reimbursement: "There is a plethora of information that managers have to review and keep abreast of," she explains.

ED managers simply may be receiving too much information and have trouble meeting deadlines, says Contino. "At times, this creates quite a bit of work stress and often longer work hours," she says.

In The Past 12 Months, How Has the Number of Employees in Your Company or Department Changed?



She recommends the following to improve time management:

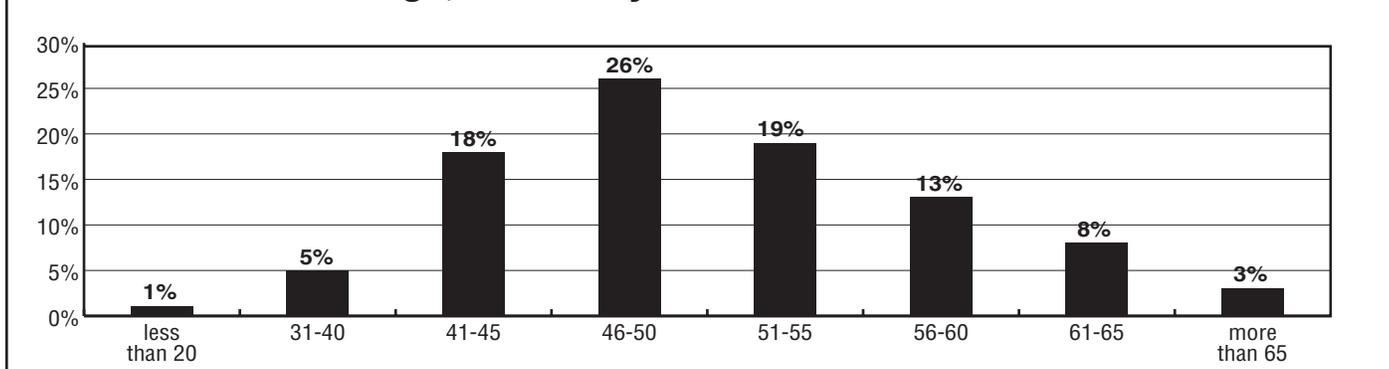
- **Always take a little work with you to meetings.** "Sometimes, there will be downtime, so you can review or edit documents or give feedback on policies," she says.

- **Find a way that works for you to manage paperwork and e-mail.** Contino recommends using file folders to organize projects. "Many experts recommend that you touch a piece of paper just once," she says. "Be decisive and do something with it."

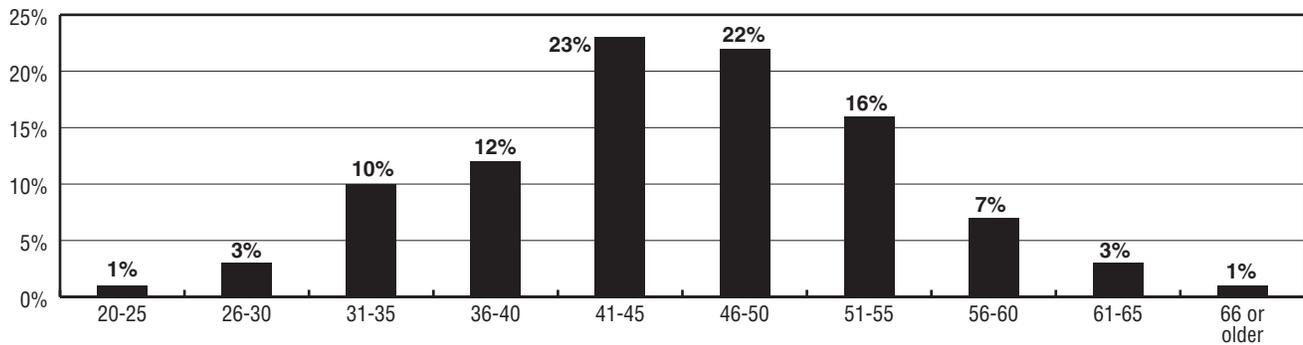
- **Offload tasks by getting your clinical staff involved in any projects you can.** "Managers are only as strong and successful as the staff who work for them," says Contino.

Gokenbach says there is a problem when a leader self-imposes work schedules that are well in excess of what anyone can achieve realistically.

On Average, How Many Hours a Week Do You Work?



What Is Your Age?



"I hear a lot from my managers that 'we feel guilty when we leave,'" she says. "If a leader is putting in [more than] 50 hours a week, they need to pay attention to exactly what is going on that is forcing them to stay."

Managers may be afraid to delegate, and this is especially important because today's staff are looking for autonomy, Gokenbach says. She recommends singling out staff members who are experts in various areas and delegating work to them. "You should consider each staff member a leader," she says.

- **A significant number of ED managers are nearing retirement age.**

According to the survey, 49% of respondents were older than age 45. (See chart, above.) This trend is consistent with nursing in general, Contino says, and it underscores the need to recruit young women and men into the profession.

Every good manager has a "farm club" of individuals who are up and coming in the department, Gokenbach says. "Even if there is no management position available, there are still ways to groom those individuals for leadership." She recommends getting staff involved in key projects. "We actually have staff managing our committees," she says. "We have an active nurse practice council, and every single nurse on that council could be a leader in the department."

Turnover of men in nursing is higher, and the turnover of younger nurses is higher than rates of older nurses, says Contino.¹ She says that higher salaries and opportunities to travel have increased enrollment and graduates, but cautions that work environment still will dictate whether they will stay.

The most successful strategy, Contino says, is to hire managers that are willing to act as mentors and use creative ways to reach individual nurses.

"It's all about knowing your employees, and getting them involved in things they excel in and are motivated to participate in," she stresses.

Contino gives these examples:

- **For nurses who love to travel:** Ask them to present an inservice about nursing roles and responsibilities in another country.

- **For nurses who are fitness experts:** Ask them to keep an information board updated with exercise and fitness research updates.

- **For nurses who love to cook:** Have them post healthy recipes and research articles on health and nutrition.

- **For detail-oriented nurses:** Have them help you with chart audits and data analysis.

- **For nurses who are enthusiastic speakers:** Ask them to give lectures at local schools.

Leadership training is important for upcoming leaders and current leaders, she stresses. Many nursing leaders need education in human resource management, including how to motivate staff and how to identify who is the best fit for a job. "Learning these things will also help to decrease turnover," she says. (For more information, see *EDM*, October 2002, p. 109.)

Contino suggests bringing in experts for education sessions, and presenting case studies at staff meetings on ways to resolve conflict and how to identify the right people for different positions.

"We are in the service business, and we need to train staff how to provide excellent service — not just to patients but to their employees," she says.

Contino recommends financial incentives to encourage leaders to obtain advanced degrees. If pay scales increase in step with increased education and certification, then more staff will strive to reach these goals, she says. "Continual learning helps people keep informed of new trends, new research, and new solutions to old problems," she says.

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Nov./Dec. 2002

The threat of bioterrorism continues to loom over the United States with emergency departments likely to be the front lines. In the second article of this two-part series, the author updates the emergency department (ED) physician on the current status of smallpox, viral hemorrhagic fevers, tularemia, and botulism as both disease entities and weapons of bioterrorism.

—The Editor

Smallpox

Clinical Features. Few diseases have rivaled smallpox as a cause of human suffering and death, with epidemics of smallpox surpassing other diseases such as plague, cholera, and yellow fever as instruments of morbidity and mortality.¹ It is ironic that the possibility of an outbreak is more feasible after this disease has not been seen in the last quarter-century and vaccination programs were halted in the wake of this accomplishment.²⁻⁴ Known repositories of variola are limited to the two sites specified by the World Health Organization (WHO): the Centers for Disease Control and Prevention (CDC) in Atlanta and VECTOR in Novosibirsk, Russia. The former Soviet Union had created weapon forms of variola in ton quantities. While the stockpiles of smallpox reportedly were destroyed, the accounting of such is

incomplete and the true disposition is uncertain.⁵ In addition, other nations strongly are suspected of maintaining hidden stocks as part of clandestine biological weapons programs.^{6,7}

Smallpox is extremely contagious. In one of the last outbreaks in Europe, a single index patient infected 11 others, who subsequently

infected 175 others, resulting in 35 deaths. Due to the delay in clinical diagnosis, some 10,000 contacts of patients had to be quarantined and 20 million were vaccinated.⁸ In conditions of low temperature and low humidity, aerosolized variola is very stable, and has resulted in widespread, hospital-based epidemics. The predominant method of transmission is by respiratory droplet requiring face-to-face (within 2 meters)

contact, although patients with cough frequently generate infectious aerosols that may result in airborne spread. Infected bed linens and other fomites also have resulted in a small number of outbreaks. In previous epidemics it was common to see 10-20 secondary cases from each infected patient, eventually resulting in one-third of all contacts becoming infected.^{9,10} Infectivity is maximal during the first week of rash, and is increased markedly in patients who manifest a cough.⁶

One Year Later: Emergency Department Response to Biological Terrorism Part II: Smallpox, Viral Hemorrhagic Fevers, Tularemia, and Botulinum Toxins

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The case fatality rates are strain-dependent, with fewer than 1% in immunologically naïve patients infected with the variola minor strain, but 30% of unimmunized and 3% of vaccinated patients infected with variola major. Soviet scientists had developed strains with considerably higher virulence and transmissibility. This, coupled with the large inoculum expected from an intentional aerosol release, likely would result in much higher fatality rates.¹¹

Following a 10- to 14-day incubation period, patients with smallpox present with acute onset of fever, prostration, malaise, myalgias, rigors, vomiting, backache, and cephalgia.¹⁰ Patients appear toxic, and some fair-skinned patients will exhibit an erythematous exanthem. Acute delirium is seen in 15% of patients. After 2-3 days, the pathognomic rash begins as an enanthem on the oropharynx, and within 1-2 days develops on the face, forearms, and hands. It then spreads to the trunk and lower extremities. The lesions begin as macules and display synchronous development into deeply rooted papules. These lesions subsequently evolve into vesicles and tense, often umbilicated, pustules.¹² Approximately 8-9 days after eruption, the pustules involute and form scabs, eventually crusting on days 14-16. The crusting of the lesions is associated with resolution of fever. A week later, the crusts separate, leaving hypopigmented scars, particularly on the

face.⁶ Lesions may be so extensive as to appear confluent. Cough and bronchitis commonly are associated with infection, but pulmonary consolidation is unusual except in fatal cases. Secondary bacterial infections are rare. Monkeypox is identical in presentation, except that lymphadenopathy is more common and mortality is only 10-15%.¹³

Variola minor shows a similar progression of symptoms with less toxicity and often smaller lesions. Both show the typical progression starting with the face and lower arms, with fewer lesions on the abdomen, and with all lesions in adjacent anatomic areas at the same stage of development.¹⁴ One-fifth of variola major resulted in atypical presentations. Modified smallpox often was seen in those with prior vaccination, with sparse, short-lived skin lesions and infrequent toxicity. Even those with recent immunization were susceptible to a brief upper respiratory infection after exposure. Flat-type smallpox has been reported in 2-5% of cases, with severe systemic toxicity associated with slow development of flat, soft, velvety skin lesions; it usually is fatal (95% in unvaccinated patients, 66% in vaccinated). Hemorrhagic smallpox, seen most often in pregnant women, shows a rapid progression, with development of mucosal bleeding, petechiae, and ecchymoses prior to death.^{12,14} Asymptomatic infections likely are more common than previously appreciated, and virus may be recovered from the oropharynx of such individuals. The potential transmission from these asymptomatic carriers is not known, but probably is limited.^{9,14}

Diagnosis. Historically, experienced clinicians in endemic areas reliably could diagnose smallpox based on clinical features. However, in nonendemic areas, variola minor frequently was confused with varicella. However, varicella lesions are more superficial, evolve in a variety of stages over a given anatomic region, spare the soles and palms, and are more prominent on the trunk.⁸ Other exanthems and pustular dermatosis that were less frequently confused with smallpox lesions include erythema multiforme with bullae, contact dermatitis, and impetigo.^{6,10}

Treatment. Treatment largely is supportive and symptomatic. Strict isolation to reduce secondary transmission is essential starting with onset of rash until all scabs have separated. Anyone exposed to a patient in this time period must be vaccinated and quarantined for 17 days.

Antiviral therapy historically has not been useful. Both cidofovir and ribavirin inhibit variola in vitro, and both had significant but lesser activity against monkeypox and vaccinia.¹⁵ Cidofovir, currently licensed in the United States for treatment of cytomegalovirus (CMV) retinitis at a dose of 5 mg/kg, is protective in a mouse cowpox model at a 20-fold higher dose.¹⁶ Cidofovir only is available as an intravenous formulation, and must be administered with concomitant hydration and probenecid to reduce the risk of nephrotoxicity.¹⁷ There are no in vivo studies of ribavirin for poxvirus infections. Other proposed antiviral therapies are undergoing study.^{18,19}

Vaccination is effective in preventing infection or attenuating disease. It is possible that EDs will assist in a public health disaster by providing vaccination, and it is certain that any vaccine-related complications would require ED intervention.

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Vaccination within five years prior to or within 2-3 days after natural exposure provides almost complete protection.¹² Revaccination is associated with prolonged immunity. To add a margin of safety, the WHO recommends revaccination if exposure occurs more than three years after vaccination. Vaccination 4-5 days after exposure attenuated natural disease and reduced death rates.⁸

Vaccinia immune globulin (VIG) has limited potential as a post-exposure prophylactic agent if given within a week of exposure in conjunction with vaccination.¹⁰ It is given at a dose of 0.6 cc/kg, often requiring multiple intramuscular injections (as the volume for a typical adult is 42 cc), and can be repeated in 2-3 days if symptoms progress. Supplies are available through the CDC. It was derived for treatment of complications of vaccination, including eczema vaccinatum and some cases of progressive vaccinia. It also can be used in cases of severe generalized vaccinia. It is not effective in post-vaccination encephalitis, and is of no benefit in treatment of smallpox.²⁰

Following successful dermal inoculation with the vaccine (referred to as a "take"), a papule forms after 4-5 days. This often intensely pruritic papule evolves over 2-3 days to an umbilicated vesicle or pustule, with surrounding erythema and induration peaking a week after initial appearance. Regional lymphadenopathy and mild systemic symptoms with fever are common. The pustule frequently ruptures prior to forming a scab, which separates with scarring two weeks later. The vaccination site must be covered with a non-occlusive dressing (e.g., a gauze pad) until the scab separates, and strict hand washing after contact with any drainage is essential to limit the inadvertent inoculation of additional sites or persons.^{10,12,20} Occlusive dressings result in maceration and extensive local infection and should be avoided. Systemic antihistamines and non-narcotic analgesics often are useful for patient comfort. Common adverse effects which require only symptomatic treatment include nonspecific erythematous or urticarial eruptions, which may be confused with generalized vaccinia, as well as erythema multiforme.²⁰ Generalized vaccinia results in a vesicular eruption 7-9 days after vaccination, often accompanied by fever. The eruption usually is self-limited, requiring therapy only in immunocompromised patients.¹⁰

While most vaccinees experience mild morbidity that rarely interferes with activity, serious complications occur in 0.13% of primary vaccinations and an order of magnitude less often in revaccination.²¹ The most common complication, accounting for over half of the serious adverse effects, is accidental inoculation of a site distant to the inoculation. Infection of the face, genitals, and rectum are common, but usually self-limited. More concerning are ocular infections, which account for one-fifth of accidental infections, which can result in corneal injury with permanent defects. One-fifth of accidental ocular infections occurred due to contact with a vaccinated person.²² Ocular infection responds reasonably well to VIG and topical idoxuridine (one drop in affected eye q1h while awake, q2h while asleep).¹⁰ However, if keratitis is established, there is an increased risk of corneal scarring with use of VIG, and its use is contraindicated.²⁰

Eczema vaccinatum results in extensive or even generalized vaccinia infection in patients with eczema or other exfoliative skin

disorders and, perhaps, burn victims. The disease usually is self-limited, but as many as one in 10 cases can be fatal.¹⁰ It occurs independent of the current degree of eczema. Treatment with VIG is indicated and usually effective. If vaccination is essential, it can be done with concomitant administration of VIG.²⁰ VIG also is indicated in cases of vaccinia necrosum, a progressive vaccinia infection with extensive local destruction and metastatic lesions. Progressive vaccinia occurs only in patients with deficiencies in cell-mediated immunity and is fatal in three-quarters of cases.¹⁰ Post-vaccination encephalitis complicates 12 per 1 million primary vaccinations, and two per 1 million revaccinations. VIG is ineffective and is not indicated.²⁰

Routine contraindications to vaccination include immunosuppression, eczema, pregnancy, household contact with individuals with contraindications, or in children. Prior experience with vaccination showed very rare congenital infections, usually fatal, after primary vaccination of pregnant mothers. Prior to smallpox eradication, vaccination routinely was done in children, and in the face of exposure, this should not deter vaccination. In the face of a documented exposure to smallpox, it may be necessary to vaccinate even those with contraindications with concomitant VIG administration.^{11,20}

Viral Hemorrhagic Fevers

Clinical Features. The viral hemorrhagic fevers (VHF) are prominent emerging infectious diseases. A variety of enveloped RNA-containing viruses are capable of causing severe illness marked by fever, shock, multi-organ failure, and hemorrhagic diathesis of varying severity. Recent outbreaks of Ebola hemorrhagic fever (EHF) in West Africa and Crimean-Congo hemorrhagic fever (CCHF) in Pakistan have highlighted the high mortality and potential for person-to-person transmission.²³ Increasing concern about the public health impact of VHF and potential to extend beyond traditional geographic boundaries is heightened by the potential for these highly infectious viruses to be used as terrorist weapons.^{24,25} While technically difficult to produce in quantities similar to the former Soviet Union, small-scale production suitable for terrorist use can be accomplished in a typical two-car garage with minimal modifications.²⁶

The filoviruses, Ebola and Marburg, have been responsible for severe explosive outbreaks and sporadic nosocomial cases. A well-documented, large outbreak occurred in Zaire in 1995, with 316 cases and an 80% fatality rate.²⁷⁻³⁰ One-quarter of those infected in the Kikwit, Zaire, outbreak were health care workers.

The arenaviral hemorrhagic fevers are caused by Lassa fever virus, from Africa, and the Tacaribe complex of South American viruses: Machupo (Bolivian), Junin (Argentinean), Sabia (Brazilian), Guanarito (Venezuelan), and the recently described North American Whitewater Arroyo virus.³¹⁻³³ Human infection results from inhalation of infected rodent waste products, and may be transmitted person-to-person. Lassa fever is a substantial public health problem in West Africa, and accounts for one-quarter of febrile hospital admissions and deaths.³⁴

CCHF has a wide endemic area, with sporadic tick-borne outbreaks and frequent hospital-centered outbreaks, marked by a

high incidence of fatal infections in health care providers.^{33,35}

The filoviruses are associated with high-level viremia and widespread cytopathic effects without evidence of concomitant immunologic effect. Thrombocytopenia and lymphopenia with marked lymphoid depletion of bone marrow, spleen, liver, and peripheral lymph nodes only partially account for the immunosuppression.^{36,37} While evidence of a consumptive coagulopathy occurs in the majority of patients, it is likely that direct viral destruction of endothelium and direct viral toxic effects are substantial contributors.^{38,39} Hepatopathy without icterus usually is evident with elevations of aspartate aminotransferase (AST) greater than alanine aminotransferase (ALT).^{40,41} Myocarditis and encephalitis appear common, but frequency depends on strain-specific features.⁴² The virus survives in immunological privileged sites, such as the anterior chamber of the eye or the testes, which likely accounts for the delayed clinical features and protracted excretion of infectious virus in semen in survivors.⁴³⁻⁴⁵ Similarly, the arenaviruses result in substantial thrombocytopenia, lymphopenia, and necrosis of liver, spleen, and adrenals without associated inflammatory response.⁴⁶

All are highly infectious by aerosol in very low titers; perhaps as little as a single virion is infectious. All but yellow fever have been associated with person-to-person transmission and nosocomial epidemics. In the Kikwit Ebola outbreak, one-third of the physicians and one-tenth of the nurses contracted Ebola. The filoviruses are found in large amounts in and on skin. Physical contact with intact skin appears to be sufficient for transmission.⁴⁷ It appears, based on a small number of animal and epidemiological observations, that a minority of patients can generate infectious aerosols.^{43,48-50} Argentine hemorrhagic fever (AHF) and Bolivian hemorrhagic fever (BHF) appear less transmissible, with occasional person-to-person spread, but may be secreted in semen after recovery, resulting in infection in intimate partners.⁵¹ Guidelines for management of these patients are based on the infrequent generation of highly infectious aerosols, and call for strict respiratory and mucosal protection, negative airflow precautions, and isolation and decontamination of all bodily fluids.^{24,35,52,53}

All agents of VHF present as a similar, non-specific febrile illness. Myalgias, malaise, prostration, and headache are nearly universal. Orthostatic symptoms and relative bradycardia appear common. The arenaviruses typically present with insidious onset. Common physical findings include evidence of diffuse capillary leak with hypovolemia, conjunctival injection, flushing, and petechia.^{42,54-57}

Significant hemorrhage is present inconsistently and the absence of a bleeding diathesis should not dissuade the clinician from considering the possibility.⁴¹ Minor bleeding—typically gingival, gastrointestinal, or oozing from vascular puncture sites—is seen in approximately 13% of AHF infections (Junin virus); 50% of VHF cases (Guanarito virus) and 40% of Ebola (Zaire strain) infections.^{54,55}

Ebola typically presents with significant gastrointestinal (GI) symptoms, with non-bloody diarrhea present in more than 80% of patients and vomiting in 60%. Sore throat is a symptom in two-thirds of patients. Chest pain was a prominent feature in the

Ebola-Sudan (EBO-S) outbreaks, but was not prominent in patients afflicted with Ebola-Zaire (EBO-Z) or Marburg disease.⁵⁸ A non-pruritic morbilliform or macular rash frequently is seen in fair-skinned individuals. The disease progresses in a biphasic manner with apparent recovery after the first week. A minority will have mild disease and continue to convalesce gradually over the next six weeks with frequent sequelae, while the majority will develop the hemorrhagic signs, tachypnea, hiccoughs, encephalopathy, normothermia, and oliguria that precede death.⁵⁹

AHF, the most common and best characterized of the South American arenaviruses, typically presents 6-14 days after exposure, but the incubation period may range from four to 21 days. Onset is insidious, with fevers, chills, anorexia, myalgias, and malaise progressing over several days to prostration, tremor, cephalgia, abdominal pain, photophobia, and GI motility disturbance. Sore throat, nasal congestion, and cough are distinctly absent, and are helpful in limiting the differential diagnosis. Examination may reveal flushing of the face and upper torso with edema and hyperemia of the conjunctiva, gingiva, and oropharynx. Petechiae of the soft palate and axilla are common, along with small palatal vesicles and cervical lymphadenopathy. Patients often develop neurologic disease within a week of presentation, with a wide range of central nervous system (CNS) dysfunction, including ataxia, decreased deep tendon reflexes, and hyperesthesia. Three-quarters of patients will improve over the second week of illness, with the others manifesting bleeding, progression of CNS disease, shock, and secondary bacterial infections, particularly pneumonias. Convalescence is protracted, and up to 10% of antihemophilic factor A (AHF) patients treated with immune plasma developed a late onset self-limiting neurologic syndrome. Mortality ranges from 15-30%, with coma, severe bleeding, seizures, and oliguria portending poorer outcome. Treatment with immune plasma or ribavirin has reduced this to approximately 1%.^{51,60}

Lassa fever differs only slightly in presentation from the South American arenaviruses, with less neurologic involvement, less prominent bleeding diathesis, and inconsistent thrombocytopenia or leukopenia.⁶¹⁻⁶³ Recovery typically takes 10 days. A minority develop edema, encephalopathy, tachypnea, hypotension, and bleeding manifestations portending a poor outcome.⁶⁴ Higher case fatality rates occur in pregnant women and fetal loss is universal.⁶⁵ Lymphopenia may be seen, but white blood cells may be unaffected or may reflect a neutrophilia, particularly in severe cases.^{61,66} Disseminated intravascular coagulation (DIC) is not associated with Lassa fever. An elevated AST (> 150 U/L) is associated with worse prognosis and is an indication for initiation of ribavirin therapy.^{34,67,68}

Most VHFs present with nondiagnostic features in a seriously ill-appearing patient with multiple organ involvement similar to other biowarfare (BW) agents and endemic diseases of the tropics. Misdiagnoses have been common. Similar presentations are shared by a variety of tropical viral agents, such as yellow fever, dengue, and the Hantaviruses responsible for hemorrhagic fever with renal syndrome, and Rift Valley fever, all of which have limited BW potential and can present with hemorrhagic manifesta-

tions. Other tropical diseases include malaria and leptospirosis, which have been seen in conjunction with Ebola outbreaks in the past, and may confound the diagnosis and treatment of both. Other diseases considered in the differential diagnosis include typhoid fever, borreliosis, septicemic plague, typhus, dysentery, acute African trypanosomiasis, fulminant meningococcemia, or other causes of sepsis with DIC.^{33,69}

Diagnosis. Any evidence of a bleeding diathesis should result in isolation and aggressive diagnostic testing, to include attempts at viral isolation at one of the reference laboratories with biocontainment capabilities.^{33,52,70} Lymphopenia and thrombocytopenia commonly are seen in all VHF syndromes and are ubiquitous in arenaviral disease, and a platelet count of fewer than 100,000 or WBC fewer than 4500 is 100% sensitive.⁵⁴ Almost all patients will have laboratory evidence of a consumptive coagulopathy, but rarely full-blown DIC may be present. Similarly, all patients with arenaviral disease display proteinuria, which also is common in the other VHFs.⁷¹⁻⁷³

Laboratory diagnosis of VHF is difficult, and even routine blood tests (e.g., CBC and chemistries) pose severe hazards to laboratory workers. If VHF is in the differential, the laboratory must be warned, and physiochemical viral inactivation must be employed.^{52,74,75}

Viral culture often is essential to establish the diagnosis. Most patients have intense viremia at presentation and viral cultures can yield a specific diagnosis in 3-10 days. This must only be attempted under BSL-4 conditions by experienced technicians. Samples should be sent to a reference laboratory (*See Insert*), after contacting the laboratory to arrange shipping and packaging details.

Rapid diagnostic testing is available for all the VHF agents, and antigen detection tests show remarkable sensitivity in acute disease. These tests are available through the reference laboratory system, and some may be available at local level B or C laboratories, as they do not require biocontainment after specimen inactivation.

Treatment. All VHF syndromes require barrier nursing and intensive supportive care, which has been shown to improve outcomes. Invasive procedures and IM injections should be avoided. No therapy available, including interferon, antibody preparations, or currently marketed antiviral drugs, is effective against the filoviruses.⁷⁶⁻⁷⁹ Intensive efforts at developing new drugs have been promising.^{80,81} Antibody preparations, chiefly in the form of serum or plasma from convalescent patients, reduces mortality of the South American arenaviruses, but is no longer available in the United States, and may be associated with late-onset neurological disease.⁸²⁻⁸⁴ Uterine evacuation, in pregnant patients, improves survival in Lassa Fever and is indicated as fetal loss is ubiquitous.⁶⁵

Ribavirin inhibits the arenaviruses, RVF, and CCHF.^{79,85} Ribavirin is well tolerated with mild reversible hemolytic anemia as the only consistent adverse effect.^{17,52,85} The initial dose is 30 mg/kg IV given over one-half hour in saline or 2 g orally. Intravenous ribavirin is available through the reference centers listed in the Insert. Survival benefit has been shown in large studies with the arenaviruses. Although experience with ribavirin in RVF and CCHF is limited, it is recommended.^{68,79,83,86-90}

Tularemia

Clinical Features. Tularemia is a zoonotic infection that in many ways resembles brucellosis and plague. Sporadic outbreaks in the United States continue to occur, with frequent misdiagnosis.⁹¹ While hospital microbiology laboratory acquired infections are common, person-to-person transmission has not been described.^{92,93} Aerosolized *F. tularensis* is highly infectious, with 10-50 organisms required to establish infection in healthy adult humans.⁹⁴

Tularemia's incubation period typically is 3-6 days, dependent on route and dose of inoculation, but may range from 1 to 21 days.^{95,96} As many as six different clinical forms of tularemia have been described, depending on the site of local infection and degree of dissemination. Common presentations include local ulceration and lymphadenopathy (ulceroglandular), lymphadenitis (glandular), conjunctivitis with lymphadenopathy (oculoglandular), ulcerative or exudative pharyngitis, and pneumonia.^{93,97} Ingestion of contaminated water commonly results in pharyngitis, abdominal pain, and fever. Regardless of the presenting form, systemic symptoms of asthenia, malaise, fatigue, myalgias, low back pain, headache, chills, and fever usually are seen.⁹²

In approximately one-quarter of all cases, systemic dissemination may occur following one of the localized forms or in the absence of other signs, resulting in the typhoidal presentation.⁹⁴ Diagnostic considerations include typhoid fever, typhus, brucellosis, Legionella infection, Q fever, malaria, disseminated mycobacterial or fungal infections, rickettsiosis, endocarditis, primary HIV infection, toxic-shock syndrome, and other causes of sepsis. Mortality approaches 33% in typhoidal cases, in contrast to only 4% in ulceroglandular disease.^{94,95}

Primary pulmonary tularemia, the chief form expected following aerosolization, presents with abrupt onset of high fevers, rigors, dyspnea, nonproductive cough, pleuritic chest pain, and diaphoresis. It may result in systemic disease without localizing pulmonary disease or progress to a fulminant, fatal pneumonia.⁹² The pulmonary form is indistinguishable from other common causes of community-acquired, zoonotic, fungal, and tubercular pneumonia. A pulse-temperature discrepancy occurs in up to 42%.⁹⁵ Production of purulent sputum or hemoptysis are seen in a minority.^{98,99} Pneumonia also may complicate dissemination from localized infection and present with a more indolent course, chronic fevers, cachexia, fatigue, and lymphatic suppuration. It is seen in 83% of typhoidal cases.⁹⁵

Pulmonary findings are nonspecific, with rales and friction rubs most often described. Radiographic findings may mimic tuberculosis, with multiple granulomatous lesions, hilar adenopathy and effusions, or may present with typical pneumonic findings such as subsegmental or lobar consolidation.¹⁰⁰ The triad of oval opacities, hilar adenopathy, and pleural effusions are strongly suggestive of tularemia, but are seen only in a minority of cases.⁹⁹

Exam may show evidence of simultaneous extrapulmonary inoculation, most typically pharyngitis. The ulcerative and exudative pharyngitis commonly is confused with infectious mononucleosis, adenoviral tonsillopharyngitis, or streptococcal pharyngitis. It may become membranous, similar in appearance to diphtheria.^{101,102}

Localized infection resulting in ulceroglandular or oculoglandular tularemia remains the most common natural presentation. Localized disease may occur even with aerosol exposure.⁹² The majority develop an abrupt fever, with variable complaints of chills, malaise, fatigue, cough, and headache. Fever, as well as the other systemic symptoms, may remit and recur for weeks to months.⁹³ Following cutaneous inoculation, patients develop a small, painful, papule which rapidly necroses and ulcerates. Lymphadenopathy may occur as an isolated finding, or may persist well beyond the acute febrile illness.⁹⁵ Ocular manifestations are analogous, with corneal or conjunctival ulcerations, conjunctivitis and anterior chamber inflammation, or even frank hypopyon.¹⁰³ Meningitis is an exceedingly rare manifestation.

The ulceroglandular form of tularemia may be mistaken for the cutaneous form of anthrax, sporotrichosis, and *Mycobacterium marinum*. However, the papule and ulcer of tularemia are painful with local adenitis, in sharp distinction to that of the more edematous anthrax, which has minimal discomfort.⁹⁹ Other considerations include pyogenic infections, cat-scratch disease, syphilis, chancroid, and herpetic whitlow.

In addition to the pathognomonic skin lesions, a wide range of disseminated dermatological manifestations has been described, and may occur in up to one-third of patients within the first two weeks of illness, including diffuse maculopapular and vesiculopapular eruptions, erythema multiforme, acneiform lesions, urticaria, and, most commonly, erythema nodosum.^{14,104}

Diagnosis. Routine laboratory studies are nonspecific. Lymphocytosis occasionally is seen, but the lymphocyte count is most often within normal limits. Up to one in four may show microscopic pyuria, which may lead to misdiagnosis of pyelonephritis. Minimal transaminase and lactate dehydrogenase elevations reflect hepatic infection and infrequently patients may develop rhabdomyolysis with the associated elevation of creatine phosphokinase (CPK).⁹⁵

Francisella tularensis is difficult and dangerous to cultivate in hospital microbiology laboratories.¹⁰⁵ The organism is not typically seen on Gram stain of clinical specimens, but may be cultured from blood, lymph node aspirate, pharyngeal swabs, sputum, and cutaneous or corneal ulcers. Modern automated blood culture systems detect *F. tularensis* in at least 60% of bacteremic cases, but misidentification is common.^{106,107}

Due to the difficulties with culture, diagnosis typically is accomplished via serology.¹⁰⁸ Cross-reactivity to *Brucella* and *Legionella* is seen. Polymerase chain reaction (PCR) is emerging as a valuable tool, with rapid return of accurate results without the risk of laboratory acquired infection.¹⁰⁹⁻¹¹¹ Additional diagnostic assistance can be obtained through the Division of Vector-Borne Infectious Disease, CDC, Ft. Collins, CO (dvbid@cdc.gov). (See *Insert*.)

Treatment. Untreated, most patients have a prolonged debilitating febrile illness lasting months. Antibiotic treatment may result in a rapid improvement, but a substantial number of patients have a suboptimal response, particularly if ineffective antibiotic therapy is used, therapy is abbreviated, or if there is a delay in initiation of treatment.^{92,112} A Jarisch-Herxheimer-like reaction may

be seen with initiation of antibiotic therapy. Streptomycin or gentamicin for 10-14 days is the standard treatment regimen, although longer or repeated courses may be required.^{9,92,113,114} Streptomycin-resistant organisms were engineered and investigated by both the United States and Soviet programs.⁹² Ceftriaxone has an unacceptably high treatment failure rate and should not be used.¹¹⁵ Doxycycline and chloramphenicol have been used extensively, but have higher treatment failure and relapse rates than the aminoglycosides, particularly in those with immunocompromise or chronic systemic disease.^{116,117} A minimum of 14 days of treatment is recommended.⁹² The addition of chloramphenicol to an aminoglycoside is recommended in the rare cases of meningitis.¹¹⁸ Fluoroquinolones, principally ciprofloxacin, have been used in a limited number of cases, appear to be very effective, and are a reasonable first-line alternative to the aminoglycosides.^{49,116} A 10-day course is recommended.⁹²

Limited studies in humans demonstrate that a two-week course of a tetracycline, but not a shorter course, is effective for post-exposure prophylaxis.¹²⁰ Ciprofloxacin (or other fluoroquinolone) also is recommended.⁹²

Botulinum Toxins

Clinical Features. Botulinum toxins are the most toxic substance known, with an inhalational LD50 of 3 ng/kg, approximately 100,000 times as toxic as sarin.¹²¹ In addition, it is easy to manufacture and is well absorbed via aerosol.¹²² A gram of botulinum toxin potentially could kill 1 million people. The quantity of botulinum produced by Iraq would have been sufficient to kill three times the total living human population.¹²³

Naturally occurring food-borne outbreaks of botulism remain public health emergencies. While each outbreak averages 2.5 patients, approximately half have only a single victim.¹²³ The three largest outbreaks involved a total of 121 patients, illustrating the potential for even accidental poisonings to generate mass casualties, with half presenting with clinical symptoms to an ED.¹²⁴ Due to the implications of on-going exposure, the delayed and often insidious onset, and possible geographic dissemination, a nation-wide surveillance system is in place through the CDC.¹²⁵

Most cases present within 36-72 hours (range 6 hours to 8 days) with an afebrile symmetric descending flaccid paralysis with a clear sensorium.^{126,127} Depending on dose and route, the presentation can range from a subtle motor weakness to acute profound flaccid paralysis with respiratory arrest. The initial GI symptoms associated with food-borne outbreaks are thought to be due to other microbial by-products and would not be seen if purified toxin was released.^{123,125}

Presenting complaints include weakness, blurred vision, diplopia, dry mouth, and dysarthria.¹²⁴ Facial muscle weakness and diminished ocular motility mimicking cranial neuropathies may result in a diagnostic delay. Typically, the initial sign of progression is a loss of head control. While the sensorium remains clear, and sensory features are uncommon, acral paresthesias due to hyperventilation are well described. Patients may appear obtunded due to the hypotonia.¹²³ Deep tendon reflexes may be

preserved initially, but diminish with progression, in sharp contrast to Guillain-Barré syndrome and the descending Miller-Fisher variant.¹²⁹ Constipation and urinary retention are common.¹³⁰ Ptosis and upper extremity weakness may indicate progression to the point that respiratory compromise may require mechanical ventilation.¹³¹ Respiratory failure may be prolonged, typically requiring 2-8 weeks of ventilatory support.¹²⁸ Without mechanical ventilation, fatality rates are approximately 60%; with contemporary ICU care, the rate is now 5-10%.¹²⁶

Prompt clinical diagnosis is critical. Delays and misdiagnosis are common and are associated with worse outcomes.^{132,133} Other clinical entities with similar presentations that would suggest the need to consider botulism include myasthenic crisis, cholinergic crisis, Guillain-Barré syndrome, basilar artery insufficiency, tick paralysis, Eaton-Lambert syndrome, and various drug and toxin intoxications.^{124,134,135} Prominent symmetric bulbar motor and anti-muscarinic features strongly support botulism.

Routine laboratory and radiographic studies are usually normal or non-diagnostic. However, serum chemistries may reveal other diagnoses, such as abnormalities of calcium or potassium, an elevated CPK suggesting a myopathic process, an elevated CSF protein suggesting Guillain-Barré syndrome, evidence of stroke or mass on computed tomography of the brain or CSF evidence of CNS infection, especially tuberculous or fungal meningitis.^{128,136}

Urgent consultation with a neurologist in equivocal cases may facilitate diagnosis, as electromyogram (EMG) findings are highly suggestive.¹³⁷ Early clinical botulism may respond to anticholinesterase therapy similar to myasthenia gravis.^{128,136} Serum samples should be collected (4-6 vacutainer tubes; red or tiger top) prior to administration of antitoxin or cholinesterase inhibitors, as it interferes with the gold-standard mouse bioassay.¹²³ The mouse bioassay is very sensitive and specific, but is time consuming and is not widely available. New diagnostic modalities remain limited.^{138,139} The more sensitive stool cultures and PCR, while helpful in food-borne outbreaks, would not be helpful if preformed toxin was released intentionally.¹⁴⁰

Treatment. If significant oral exposure is suspected, activated charcoal may be effective at reducing absorption.¹⁴¹ Any exposed or symptomatic patients should be treated with antitoxin, admitted and followed closely for respiratory failure.^{9,142,143} In cases of mass casualty exposure, the decision to withhold administration of antitoxin until development of symptoms may be necessary. Patients who present late in the course with stable or improving symptoms do not require antitoxin.¹²³

Patients who are not mechanically ventilated should be cared for in a reverse Trendelenburg position with sufficient head and neck support to prevent airway occlusion. Patients admitted will require frequent neurologic assessments with careful attention to ability to handle secretions and otherwise protect their airway. Pulmonary function testing may show a decrease in vital capacity and inspiratory force prior to onset of hypercarbia.¹⁴⁴ Clindamycin and aminoglycoside antibiotics should not be administered because they may precipitously

worsen neuromuscular function.¹⁴⁵⁻¹⁴⁹ Succinylcholine should be used with caution.¹⁵⁰ Aspiration or loss of a patent airway usually precedes hypoventilation. The need for mechanical ventilation ranges from 20% to 60% of cases.¹²³ Once respiratory compromise occurs, treatment is mechanical ventilation, which usually is sufficiently prolonged to mandate tracheostomy.¹³¹ Efforts to stockpile ventilators for emergency use are ongoing.¹⁵¹ Recovery is prolonged with frequent complications associated with protracted immobilization and tracheal intubation.

There is a single commercially available antitoxin, a trivalent (containing anti-A, anti-B, and anti-E activity) equine preparation made only by Connaught Laboratories. Small-scale production of other products is limited to Japan and two European suppliers.¹²⁵ Given early in the course, it arrests progression of neurologic disease, shortens duration of mechanical ventilation and reduces mortality.¹⁴² In one series, administration within 12 hours of presentation reduced intubation rates from 85% to 57% and duration of mechanical ventilation from a median of 54 days to 11 days.¹³¹ Patients with significant wheal and flare will require intensive desensitization over several hours. While it is usually well tolerated, up to 9% of recipients will manifest typical serum sickness or urticaria and 2% will have life-threatening reactions.¹⁵² A single vial will neutralize several lethal doses and is sufficient for naturally occurring botulism.¹⁵³ Additional doses theoretically may be needed following exposure to large amounts of purified toxin.

An investigational equine F(ab')₂ product with activity against toxin types A, B, C, D, E, and F has been developed and tested by the U.S. Army. It is available for clinical use under a compassionate use protocol.¹⁵⁴ Adjunctive therapy with guanidine or amino-pyridines is not effective.¹⁵⁵

The trivalent equine antitoxin is stockpiled by the CDC in airports in New York, Chicago, Atlanta, Miami, Los Angeles, San Francisco, Seattle, and Honolulu. In addition, the state health departments of California and Alaska maintain their own stores. Additional stocks are held by the U.S. Army, and can be accessed by CDC officials. Canada maintains its own supply, but other members of the Pan American Health Organization are served by the CDC. This system allows most patients to be treated with antitoxin within 12 hours of contact with public health authorities.¹²⁵

Any suspected case of botulism is a public health emergency. Local health departments work closely with the CDC's Food-borne and Diarrheal Disease Branch on a 24-hour-a-day basis. Emergency consultation, including diagnostic and treatment recommendations and provisions for antitoxin is available by calling (404) 639-2888.¹²⁵

A formalin inactivated toxoid containing toxin types A, B, C, D, and E has been in use since the 1950s under an Investigational New Drug protocol to protect at-risk laboratory workers. It is safe and well tolerated, although the current product is rather painful on injection.

Although botulinum toxin has little potential for secondary aerosolization, aerosol release may require surface decontamination to avoid ingestion of persistent toxin.¹²¹

Use of Tetracyclines and Fluoroquinolones in Pregnant, Nursing, or Pediatric Patients

Although tetracyclines and fluoroquinolones usually are not used in children, nursing mothers, or pregnant women, their use for life-threatening infections is justified and recommended by the CDC, the Food and Drug Administration, the American Academy of Pediatrics, and the American College of Obstetricians and Gynecologists.¹⁵⁶⁻¹⁶⁰ A growing body of literature on the safety of fluoroquinolones, particularly ciprofloxacin, suggests that risks are minimal and that clinicians should not hesitate to use them for serious infections.¹⁶¹⁻¹⁶⁹ Adverse effects of tetracyclines in pregnant women and in children are well described, but are acceptable in the face of life-threatening disease. In addition, doxycycline appears to be much safer than tetracycline, with no reports of untoward effects in children or in pregnancy.¹⁷⁰⁻¹⁷³ Initiate therapy in children with ciprofloxacin (10-15 mg/kg/dose po q 12 hours not to exceed 1 g per day) or doxycycline (2.2 mg/kg/dose po BID not to exceed 100 mg po BID). If penicillin susceptibility is confirmed in a patient with anthrax, initiate or change to oral amoxicillin 80 mg/kg/day TID (maximum 500 mg/dose), or to trimethoprim sulfate if susceptible plague is isolated.¹⁷⁴

Summary

Detection of a biological weapons attack hinges on a clinical suspicion, followed by laboratory investigations. Circumstances that should prompt immediate contact with surrounding EDs and urgent consultation with public health and law enforcement authorities include:

- 1) Any unusual temporal or spatial clustering of infectious diseases, especially if serious pulmonary symptoms or hemorrhagic diathesis are prominent or if stereotypical features are present;
- 2) Multiple, previously healthy patients with presentations of sepsis or fulminant pneumonia in otherwise healthy patients;
- 3) Clinical diagnosis or suspicion of smallpox;
- 4) Acute flaccid paralysis with prominent bulbar symptoms, suggesting botulism; and
- 5) Isolation of pathognomonic organisms; especially variola virus, agents of viral hemorrhagic fever, engineered or highly drug resistant *Bacillus anthracis*, *Yersinia pestis*, or isolation of genetically identical organisms from multiple regions.

There is little, if any, risk of contamination to health care workers following simple decontamination (removal of contaminated clothing and a soap and water shower). However, pneumonic plague, smallpox, and the viral hemorrhagic fevers present a substantial risk for secondary spread and explosive epidemics. Respiratory protection is required to care for these patients. Isolation or quarantine of cases and contacts is essential.

Viral cultures should be sent *only* to USAMRIID, CDC, or comparable facilities in other countries, via the local public health system.

Additional rapid and confirmatory diagnostic tests are available through the public health laboratory response network (NLRN).

Hospitals and EMS agencies should not participate in testing of environmental samples or materials suspected of harboring

infectious agents. Any such concerns should be directed immediately to law enforcement agencies, which have the responsibility and expertise to address these issues.

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Physician CME Questions

To earn CME credit for this issue of Trauma Reports, please refer to the enclosed Scantron form for directions on taking the test and submitting your answers.

- Which of the following is true regarding smallpox?
 - The predominant method of transmission is by respiratory droplets.
 - Smallpox is minimally contagious.
 - Infectivity is not increased in patients with smallpox and a cough.
 - Variola minor strains have the highest mortality rates.
 - Variola minor lesions usually are larger than variola major.

2. Which of the following is/are true regarding the management of smallpox?
 - A. Strict isolation is essential.
 - B. Treatment largely is supportive.
 - C. Anyone exposed to a patient with contagious smallpox should be vaccinated and quarantined for 17 days.
 - D. Antiviral therapy historically has not been useful.
 - E. All of the above

3. Which of the following is true regarding vaccination following exposure to a patient with contagious smallpox?
 - A. An individual vaccinated 1 year ago requires a repeat dose of the vaccine.
 - B. An exposed individual optimally should be vaccinated within 2-3 days of exposure.
 - C. An individual vaccinated six years ago does not require a second dose of the vaccine.
 - D. VIG is a highly effective post-exposure prophylactic agent.
 - E. VIG is very effective against post-vaccination encephalitis.

4. Which of the following is a potentially serious complication associated with the smallpox vaccine?
 - A. Urticarial eruptions
 - B. Erythema multiforme
 - C. Accidental inoculation of the eye
 - D. Generalized vaccinia in a non-immunocompromised host
 - E. Mild systemic symptoms and regional lymphadenopathy

5. Which of the following is/are true regarding filoviruses?
 - A. The filoviruses are associated with a high level of viremia.
 - B. Thrombocytopenia and lymphopenia may occur.
 - C. Hepatopathy without icterus may be present.
 - D. Myocarditis is common.
 - E. All of the above.

6. Which of the following is *not* typical for the presentation of a patient with a VHF infection?
 - A. Severe tachycardia
 - B. Myalgias
 - C. Headache
 - D. Orthostatic symptoms
 - E. Hypovolemia

7. Which of the following is true regarding AHF?
 - A. It is an uncommon South American filovirus.
 - B. Its onset typically is acute.
 - C. Sore throat, nasal congestion, and cough typically are present.
 - D. Patients often develop neurologic disease within a week of presentation.
 - E. Treatment with immune plasma or ribavirin is ineffective.

8. Which of the following is true of management of a patient with VHF infection?
 - A. Interferon decreases the duration of the illness.
 - B. Antibody preparations reduce the infectivity of the patient.
 - C. Ribavirin inhibits arenaviruses, RVE, and CCHF.
 - D. Barrier nursing is not necessary.
 - E. Invasive procedures and IM injections may be performed without caution.

9. Which of the following is/are associated with botulism?
 - A. Weakness
 - B. Blurred vision
 - C. Dysarthria
 - D. Facial muscle weakness
 - E. All of the above

10. Which of the following is true regarding the diagnostic work-up of a patient with potential botulism?
 - A. Routine laboratory studies are typically normal or non-diagnostic.
 - B. CPK usually is elevated.
 - C. CSF protein usually is high.
 - D. CT scan of the brain may show diffuse edema.
 - E. EMG findings typically are not helpful.

CME Objectives

- Upon completing this program, the participants will be able to:
- a.) Recognize or increase index of suspicion for diseases that may result from biological terrorism;
 - b.) Be educated about rapid stabilization, and the isolation of patients with exposure to or evidence of smallpox, viral hemorrhagic fevers, tularemia, and botulinum toxins;
 - c.) Understand various diagnostic and treatment modalities for diseases associated with biowarfare; and
 - d.) Understand both likely and rare complications that may occur.

In Future Issues:

Rapid Sequence Intubation

Summary of Major Agents

| DISEASE | CLINICAL PRESENTATION | DIAGNOSTIC STUDIES | TREATMENT |
|-------------------------------------|--|--|---|
| Anthrax | | | |
| <i>Inhalational</i> | Nonspecific prodrome of fever, dyspnea, cough, retrosternal chest discomfort followed by respiratory failure and hemodynamic collapse. Mediastinal widening universal in late stage, pulmonary infiltrate seen in up to 25% and meningitis in 50%. | Blood culture and Gram stain, CSF Gram stain and culture, chest x-ray or CT, antigenemia by ELISA/PCR/CL | Ciprofloxacin (other fluoroquinolones likely effective, but largely untested; penicillin (amoxicillin acceptable); gentamycin or streptomycin. Add chloramphenicol if evidence of meningitis. Bodily fluids and secretions may generate spores if left in contact with air, and must be disinfected (e.g., soaked in bleach, incinerated, autoclaved). Aspiration of pustule may increase risk of bacteremia. Steroids effective for controlling edema, if required for airway impingement. |
| <i>Cutaneous</i> | Pruritic papule that progresses to pustule. Local edema and adenopathy common. | Gram stain and culture from under eschar | |
| Pneumonic plague | Fulminant pneumonia with hemoptysis, sepsis, and disseminated intravascular coagulation (DIC) | Sputum for Gram stain, culture, IFA | <i>Respiratory protection and droplet precautions (isolation room or cohort).</i> Avoid lactam antibiotics, if possible. Streptomycin or gentamycin with chloramphenicol for meningitis. Tetracyclines effective. Quinolones likely effective, but unproven. TMP/SMZ less effective. |
| Botulism | Bulbar neuropathy (diplopia, ptosis, dysarthria), mydriasis, xerostomia followed by descending paralysis with preserved cognition with respiratory failure in 12-72 hrs. Afebrile. | EMG helpful but not diagnostic; may see response to edrophonium, difficult to detect in serum. | Intubation for respiratory failure. If antitoxin is given, it will arrest progression, shorten requirement for mechanical ventilation, and reduce mortality. |
| Smallpox | Severe prostrating febrile illness with synchronous evolution of pustules, particularly on face and arms. | Pharyngeal swabs or scabs (BSL-4) | Cidofovir effective in mice. Vaccinia immune globulin 0.6 mL/kg IM within 72 hours of exposure in conjunction with Vaccinia vaccine. <i>Isolation essential to prevent dissemination.</i> |
| Pneumonic tularemia | Acute, nonspecific febrile illness with ulcerations, pharyngitis, and pneumonia | Blood, pharyngeal, or ulcer swabs for culture or PCR; serology | Gentamycin or streptomycin. Ciprofloxacin (other fluoroquinolones likely effective, but largely untested); doxycycline (or other tetracycline) less effective. Add chloramphenicol if evidence of meningitis. |
| Filovirus hemorrhagic fever | Severe disease, marked weight loss, prostration, late encephalopathy, and bleeding. Often see maculopapular rash. 25-90% case fatality. | Viral antigen in blood. Viral isolation | Supportive. <i>Isolation essential to prevent dissemination.</i> |
| Arenavirus hemorrhagic fever | Prostration, shock, bleeding, CNS disease (less common in Lassa fever). Thrombocytopenia, leukopenia, and proteinuria. | Viral antigen or IgM detection; viral isolation | Ribavirin. High titer plasma for AHF no longer readily available. Isolation advisable, at least droplet precautions. |
| Brucellosis | Protracted recurrent fever, depression, fatigue, myalgias, arthritis, endocarditis, meningitis, sacroiliitis, orchitis, and septic abortion. Cytopenias common. | Blood or bone marrow culture. PCR. Serology by ELISA, agglutination, or dipstick assay. | Prolonged treatment with doxycycline plus rifampin, streptomycin, or gentamycin. Fluoroquinolones plus rifampin, streptomycin, or gentamycin. TMP/SMZ less effective. |
| Q fever | Acute influenza-like illness, rare fulminant disease. High mortality due to endocarditis in predisposed patients. Liver function test (LFT) elevations common. | Culture or animal inoculation (BSL-3) impractical. Serology widely available. | Macrolide, tetracycline, or fluoroquinolone for acute disease. Macrolide should be combined with rifampin if used for pneumonia. Doxycycline plus rifampin, chloroquine, or hydroxychloroquine if underlying valvular pathology. |

Research and Reference Laboratories*

* Initial contact and consultation, as well as specimen submission, is through state and local health departments. Phone numbers are available in the blue pages of the phone book or online listings at www.statepublichealth.org/directory.php or www.cdc.gov/other.htm or www.cdc.gov/ncidod/diseases/hanta/hps/noframes/statecon.htm.

| NAME | PHONE NUMBER | INTERNET |
|---|---|--|
| Centers for Disease Control and Prevention (CDC), Atlanta, GA | Tel: (770) 488-7100, (emergency response) (404) 639-1115 (special pathogens) or (404) 639-2888 (24 hr) | www.bt.cdc.gov/ and www.cdc.gov/ncidod/dvbid/ |
| Vector Borne Disease Laboratory, Fort Collins, CO | (970) 221-6400 | |
| U.S. Army Medical Research Institute of Infectious Disease (USAMRIID), Fort Detrick, MD | (888)-872-7443 | www.usamriid.army.mil |