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EMERGENCY MEDICINE ALERT

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Pertussis on the Rise—Atypical Infections Increasingly Common

ABSTRACT & COMMENTARY

Source: Centers for Disease Control and Prevention. Pertussis—United States, 1997-2000. *MMWR Morb Mort Weekly Rep* 2002;51:73-76.

The centers for disease control and prevention tracks the number of pertussis cases reported by state departments of health on a weekly basis. A clinical case of pertussis is defined as an acute cough lasting at least 14 days when associated with paroxysmal coughing, post-tussive vomiting, or inspiratory whoop, or when associated with a known pertussis outbreak.

Between 1997 and 2000, 29,134 cases of pertussis were reported. Twenty-nine percent of cases were younger than age 1, 12% were 1-4 years old, 10% were 5-9 years old, 29% were 10-19 years old, and 20% were 20 years old or older. Among infants younger than 6 months old, 63% required hospitalization, 12% had pneumonia, and 1% had seizures. The incidence of hospitalization and other serious sequelae decreased dramatically with increasing age, although 4% of patients 20 years old and older required hospitalization and 5% developed pneumonia. Among all patients, there were 26 cases of encephalopathy and 62 pertussis-related deaths.

Compared to the 1994-1996 reporting period, the incidence of pertussis has increased 11% among infants, 62% among adolescents, and 60% among adults. While some of the increase in older patients may be due to better disease recognition, the increase among infants suggests a true rise in the incidence of pertussis.

COMMENTARY BY DAVID J. KARRAS, MD, FAAEM, FACEP

Pertussis, commonly known as whooping cough, is a highly contagious bacterial respiratory illness. Prior to widespread use of vaccines in the 1950s, most children developed the disease. In 1934, more than 260,000 cases and 10,000 deaths were reported. By contrast, only 1010 cases were reported in 1976. The incidence of the disease began rising in the early 1980s, and in 1993 more than 6500 cases were reported.[1]

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INSIDE

The increase in pertussis has been greatest in adolescents and adults. The immunity conferred by vaccination wanes within five to 10 years, leaving older age groups susceptible to infection. Disease in previously immunized individuals appears to be much milder than in infants, making it far more difficult to diagnose. Older patients do not present with the classic three-stage (catarrhal, paroxysmal, convalescent) illness. Their clinical course generally is mild, with protracted cough lasting several weeks. Several studies have suggested that 20-25% of adults with protracted coughs might have pertussis.[2]

Diagnosis is important, both because therapy can shorten the duration of illness and because adults are the primary source of infection to susceptible children, who have a high incidence of serious illness. Unfortunately, diagnosis requires specialized testing and generally falls outside the scope of practice for emergency physicians. We do, however, have an obligation to recognize the potential for pertussis in patients with protracted coughs and make appropriate referrals to primary care practitioners. ❖

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Acute Dyspnea: Diagnostic Role of the B-Natriuretic Peptide Assay

ABSTRACT & COMMENTARY

Source: Morrison LK, et al. Utility of a rapid B-natriuretic peptide assay in differentiating congestive heart failure from lung disease in patients presenting with dyspnea. *J Am Coll Cardiol* 2002;39:202-209.

Acute shortness of breath is the usual chief complaint on emergency department (ED) presentation for both congestive heart failure (CHF) and pulmonary disease such as chronic obstructive pulmonary disease (COPD), pneumonia, and pulmonary embolism. Clinical history, examination, laboratory work-up, and even chest radiograph are often non-specific in differentiating CHF from pulmonary disease, particularly in the elderly and obese. This study investigates the utility of a rapid blood assay of B-type natriuretic peptide (BNP) in distinguishing CHF from other pulmonary causes of dyspnea.

BNP is a neuro-hormone natriuretic polypeptide secreted by cardiac ventricular tissue. Serum BNP levels have been demonstrated to rise proportionally with ventricular volume expansion and pressure overload, which occurs with acute CHF exacerbations.

In this investigational study, a convenience sample of 321 patients who presented to a Veterans Administration (VA) hospital urgent care center with a complaint of acute dyspnea had blood samples drawn for BNP measurements by means of a rapid, point-of-care assay kit and machine (Triage Biosite Diagnostics). Treating physicians were blinded to the results, and the diagnosis of CHF was based on independent, blinded review of the medical record by two cardiologists.

The investigators found a significantly higher mean BNP level (759 pg/mL) in patients with acute CHF (n = 134) than in those with pulmonary disease as a cause of their dyspnea (61 pg/mL, n = 85). This significant difference also was found in the subgroup of patients who had a history of both CHF and lung disease (such as COPD). In patients with acute CHF with a history of lung disease, mean BNP level was 731 pg/mL, whereas in patients with acute COPD exacerbations with a history of CHF, mean BNP level was only 47 pg/mL.

The diagnostic utility of BNP was assessed by multivariate analysis and receiver-operator characteristic (ROC) curves, demonstrating that BNP had high sensitivity, specificity, and accuracy for acute CHF. The authors report that a cutoff BNP value of 80 pg/mL had a 99% negative predictive value for CHF. In a regression analysis, the investigators reported that BNP levels provided meaningful diagnostic information beyond the standard clinical workup data and information obtained on the study population.

The authors conclude that a rapid BNP blood assay has excellent diagnostic utility in differentiating CHF from other pulmonary causes of dyspnea, even in patients with co-morbid conditions that make such diagnoses difficult in the acute setting.

COMMENTARY BY THEODORE C. CHAN, MD, FACEP

In previous studies, elevated BNP levels have been associated with both severity and prognosis in patients with left ventricular dysfunction.[1,2] In this industry-sponsored study, a rapid, point-of-care BNP assay demonstrated excellent utility in discriminating CHF from pulmonary causes of dyspnea in patients presenting with acute shortness of breath.

While the mean BNP levels were elevated to a remarkable extent in CHF patients (759 vs 61 pg/mL), it is important to note that the standard deviation from the mean was quite large (± 798 pg/mL), suggesting that there was a wide range of BNP results in the CHF study population. Moreover, patients with pulmonary embolism or COPD resulting in cor pulmonale also had elevations in their BNP levels.

This study was conducted at a VA institution, primarily in men (95% of all subjects). Patients presenting with cardiac ischemia (unstable angina or acute myocardial infarction) were excluded. In fact, BNP can be a marker of necrosis and, thus, elevations may be seen in the setting of ischemia. In addition, elevations may be seen in patients with renal failure or those on dialysis without evidence of CHF.

Despite these limitations, this study does indicate that the BNP assay, along with clinical assessment and other standard diagnostic tools such as chest radiography, is of use in diagnosing acute CHF in patients with dyspnea. However, the authors themselves note that BNP is "not a stand-alone test." This same group recently has reported that elevated BNP levels had prognostic value in predicting subsequent CHF and cardiac events during the following six months.[3] What remains to be determined is whether the diagnostic use of BNP is cost-effective and results in an improved clinical outcome when utilized as a point-of-care test in the ED setting. ❖

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Oral vs. IM Steroids as Supplementary Treatment for Exudative Pharyngitis

ABSTRACT & COMMENTARY

Source: Marvez-Valls EG, et al. A randomized clinical trial of oral versus intramuscular delivery of steroids in acute exudative pharyngitis. *Acad Emerg Med* 2002;9:9-14.

Previous work has suggested that a single dose of intramuscular (IM) steroid given at the time of initial treatment is more effective than placebo in reducing the duration and severity of pain associated with acute exudative pharyngitis.[1,2] Should the advantage—apparently conveyed by the anti-inflammatory effects of these agents—be generalized to steroids administered by the oral route? The authors report on their randomized, double-blind trial comparing dexamethasone 10 mg IM with prednisone 60 mg given orally in a convenience sample of adult patients with exudative pharyngitis presenting to an inner-city emergency department (ED).

Inclusion criteria were as follows: visible evidence of pharyngitis (enlarged tonsils with purulent exudate) together with complaints of sore throat, odynophagia, dysphagia, and fever. A 10 cm visual analog scale (VAS) was employed, and a minimum initial pain score of 5 also was required for study entry. Immunocompromised patients (e.g., AIDS, diabetes mellitus) were excluded, as were those with evidence of peritonsillar abscess,

thrush, or ulcerative changes in the pharynx. Pregnant patients also were excluded, as were patients with a history of allergy to steroids or who had received steroid therapy within the three months prior to enrollment. All patients received IM penicillin, but no one received pain medication as part of the study protocol; acetaminophen or ibuprofen for fever or pain control was left to physician discretion. VAS pain scores were recorded at study outset, and then by phone contact at 24 and 48 hours, and ultimately until pain cessation. Patients were prompted with VAS scores from their initial assessment if they did not have their scale (given to them at discharge) available to them at the time of phone contact.

Seventy-eight patients were enrolled in the study, but four were lost to follow-up in each study arm; thus, statistical analysis was performed on a final population of 70 patients (both groups equally represented). Mean VAS scores from both groups were equivalent at study outset. There was no difference in total duration of pain between the IM dexamethasone and oral prednisone groups. Furthermore, there was no difference between the groups in median pain scores at 24-hour and 48-hour follow-up. Amount of adjuvant analgesic use, as well as side effects, did not differ between the two treatment arms. Antibiotic compliance was assured in that all patients in the study population received IM penicillin (none were penicillin allergic). The authors conclude that oral and IM steroids provide similar levels of pain relief in acute exudative pharyngitis.

COMMENTARY BY RICHARD A. HARRIGAN, MD, FAAEM

Prior work by two of these authors has demonstrated that IM betamethasone (a steroid of equivalent potency to dexamethasone) provided a more rapid onset of pain relief, as well as a shorter time to complete cessation of pain, than placebo.[2] Their present endeavor to compare oral and IM routes of steroid delivery parallels the work done by other researchers in the treatment of asthma and croup. If the drugs are equivalent, then the oral route is certainly preferable to an injection. The doses of prednisone and dexamethasone used in this study are roughly equivalent, with 10 mg of dexamethasone corresponding to a dose of approximately 65 mg of prednisone.

The fact that roughly 50% of patients needed to be prompted during phone follow-up as to their previous pain scale scores introduces some bias into the study—as the authors readily acknowledge—but it is difficult to judge the importance of this. As the authors discuss, it is unknown if verbal VAS scores (with the associated need to remind the patient what their first score was) are equivalent to written VAS scores with patients looking at the scale, given that all patients began the study with the VAS visible to them. Perhaps appropriately, subgroup analysis was not performed, and it is mentioned that both study arms had equivalent representation of these patients. ❖

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Screening for Renal Insufficiency in ED Patients with Severe Hypertension

ABSTRACT & COMMENTARY

Source: Karras DJ, et al. Urine dipstick as a screening test for serum creatinine elevation in emergency department patients with severe hypertension. *Acad Emerg Med* 2002; 9:27-34.

As many as 32% of patients seeking care in urban emergency departments (EDs) present with elevated blood pressure (BP) readings, and 2-5% present with severely elevated BPs. The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-VI), recognized as the national standard for the evaluation and management of hypertension, recommends extensive evaluation looking for end-organ damage among patients with severely elevated BPs. Most emergency medicine texts recommend this same extensive work-up, even in the asymptomatic patient, citing the JNC-VI criteria. As part of this work-up, serum creatinine (Cr) testing and urinalysis are recommended to rule out hypertensive renal dysfunction.

This prospective, observational study sought to evaluate the utility of the urine dipstick test in screening for the presence of acute Cr elevation among ED patients with severely elevated BPs. Adult patients with diastolic BPs of 115 or greater were included, and serum Cr and urine dipstick tests were performed. Exclusion criteria were menstruation, pregnancy, urinary tract infection, trauma, dialysis dependence, or renal insufficiency without a known baseline Cr. The investigators examined the performance of the urine dipstick tests for hematuria and proteinuria in identifying an elevated Cr, defined as Cr greater than 1.2 mg/dL or Cr greater than 25% above baseline.

One hundred forty-three patients met the study criteria, with 24 having elevated Cr. The presence of any degree of either proteinuria or hematuria identified these patients with 100% sensitivity and 30% specificity. When defining an abnormal dipstick test as either hematuria in any amount or 1+ or greater proteinuria, sensitivity remained 100% and specificity rose to 42%.

The authors conclude that the urine dipstick test may be an effective screening tool for identifying Cr elevation among patients with severe hypertension. Using the more restrictive definition of an abnormal dipstick would increase the specificity of the test without sacrificing sensitivity.

■ COMMENTARY BY JACOB W. UFBERG, MD

As the authors point out, this small sample size of 24 elevated Cr values is appropriate for the derivation of a prediction rule. However, a larger validation study is needed before the urine dipstick can be widely used to avoid serum Cr determinations in severely hypertensive ED patients. Perhaps the more important question is whether asymptomatic patients with very elevated BPs need any work-up other than a careful physical examination. The JNC-VI criteria were created with the office practitioner in mind, and do not provide any recommendations for the care of patients in acute care settings such as the ED. However, most emergency medicine texts continue to cite the JNC-VI in their recommendation of extensive ED evaluations for patients with severely elevated BPs.

Little, if any, literature exists examining the utility of these workups in the asymptomatic ED patient, and many emergency physicians do not perform any testing in this population. Hopefully, this study is a small first step toward a set of evidence-based recommendations for the ED setting which may reduce the time and money spent (perhaps needlessly) on the ED patient with asymptomatic severe hypertension. ❖

Special Feature

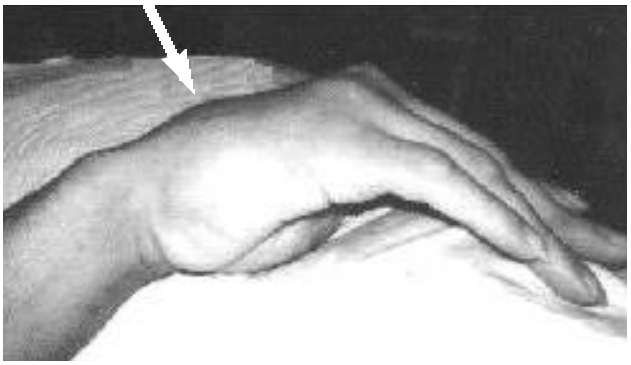
Dislocation of the Carpometacarpal Joints

By William J. Brady, MD

The carpometacarpal (CMC) joints of the hand, excluding the thumb, are extremely stable joints with relatively limited motion. They have significant bony and ligamentous supports that fix them in position. As a result, isolated dislocations are uncommon. Dislocations usually are associated with significant trauma and most commonly are associated with fractures of the base of the metacarpal.[1] Isolated dislocations do occur, however, and the fourth and fifth CMC joints are the most common sites because they have the greatest degree of motion and related laxity.[2] Numerous attempts in the laboratory have failed to produce a precise reproducible mechanism for isolated dislocations to these joints. Usually, however, they result from extreme violence, such as motor vehicle accidents or direct blows from heavy falling objects. Alternatively, they occasionally are associated with direct blows with a closed fist against an immovable object (e.g, a brick wall). These dislocations are high-energy injuries and should alert the physician to search for other associated injuries to the hand and wrist. They commonly are associated with fractures of adjacent metacarpals.[3]

The gross deformity of the subluxed or dislocated joint often is obscured by the severe swelling present on the dorsum of the hand. An obvious step-off deformity may be observed and/or palpated at the level of the dislocation—i.e., note the proximal end of the metacarpal as it overrides the distal carpus. *(See Figure 1.)* The points of maximum tenderness will be over the metacarpal bases and any areas of corresponding fractures. There may be rotational deformity of the digits or shortening of the metacarpal with attempted fisting. In all of these injuries, a careful assessment should be made of the neurovascular status of the hand. In dislocations of the fifth CMC joint (the most common injury pattern), specific attention should be directed to the status of the deep branch of the ulnar nerve in that it lies immediately volar to the fifth CMC joint where it winds around the hook of the hamate. The median nerve also may be injured, particularly with dislocation patterns resulting from a direct blow to the hand. Vascular compromise, particularly in patients with injury to the third

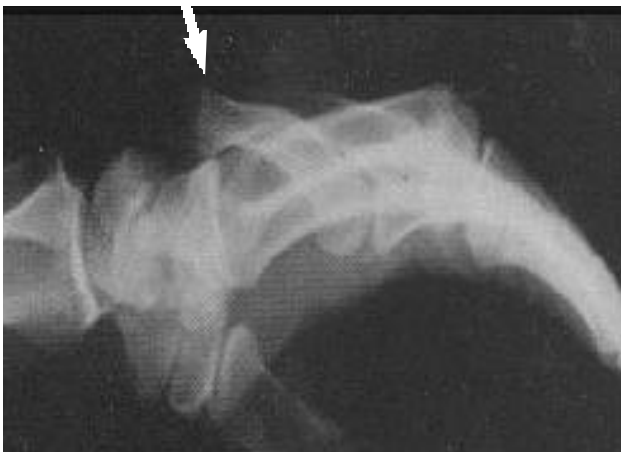
Figure 1
Dorsal distal wrist—CMC dislocation



Patient's hand demonstrates deformity of the dorsal distal wrist indicative of the carpometacarpal dislocation. The prominence on the dorsal wrist (arrow) results from the proximal portion of the metacarpal over-riding the distal carpal row.

Figure 2

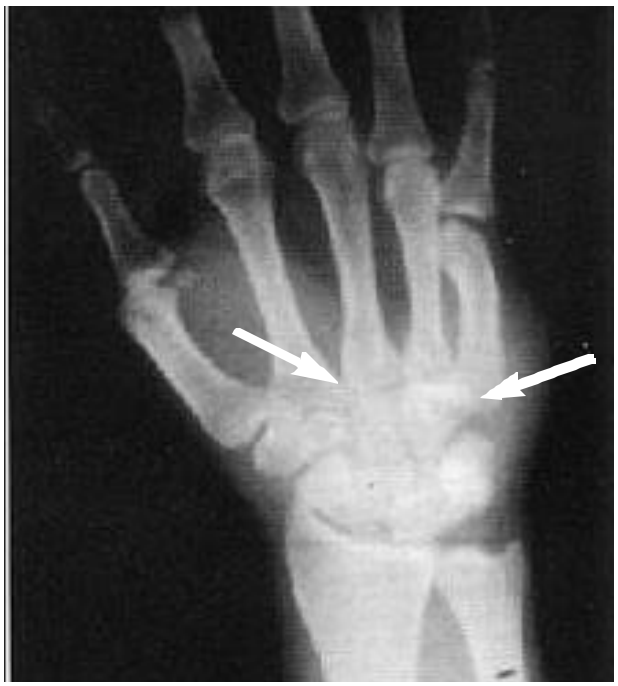
Dorsal distal wrist—CMC dislocation



Lateral radiograph of the wrist—dorsal carpometacarpal dislocation (arrow) with the proximal portion of the metacarpal over-riding the distal carpal row.

Figure 3

Dorsal distal wrist—CMC dislocation



Anteroposterior radiograph of the wrist, demonstrating dorsal dislocation of the metacarpals over the distal carpal row (arrows).

metacarpal, may involve the deep palmar arterial arch, which lies directly beneath the third CMC joint. Integrity of the wrist extensor tendons also must be assessed in these dislocation injuries in that disruption may occur. Additionally, those patients who have suffered a direct blow are at risk for compartment syndrome in the hand.[4]

The radiographic series to assess these injuries should include anteroposterior (AP), lateral, and oblique views of the wrist. The lateral radiograph often is diagnostic with obvious visualization of CMC joint dislocation. *(See Figure 2.)* The AP view may reveal an overlap of the carpal bones over the proximal metacarpals. *(See Figure 3.)* The oblique films, if needed, should be taken with the hand pronated and supinated, respectively, from the true lateral. The critical factor for the physician reviewing the films is to recognize the potential for this injury any time there is a displaced fracture of a metacarpal. The metacarpals are tethered tightly together and these injuries can be analogous to Galleazi and Monteggia fractures in the forearm. Any displaced metacarpal fracture should, therefore, elicit concern about injury to the adjacent CMC joints.

Acute treatment in the ED consists of ruling out compartment syndrome and attempting closed reduction. This usually can be done with longitudinal traction, most easily accomplished by hanging the patient in finger traps with 5-10 pounds of weight suspended from the arm. The hand then should be splinted and digital motion encouraged to prevent stiffness associated with swelling. The patient must be referred urgently for definitive care in that these injuries often will require percutaneous pinning or open reduction/internal fixation. ❖

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Physician CME Questions

27. Which of the following is *not* true regarding pertussis?

a. The incidence has risen in all age groups.
b. Vaccination confers life-long immunity.
c. Adults generally have atypical presentations.
d. Diagnosis requires specialized testing procedures.

28. Extra-pulmonary manifestations of pertussis include which of the following?

a. Lymphatic (e.g., splenic enlargement)
b. Cardiovascular (e.g, progressive AV block)
c. Neurologic (e.g, encephalopathy, seizures)
d. Gastrointestinal (e.g., hemorrhagic diarrhea)

29. In addition to cough for 14 days or more, each of the following are clinical criteria for the diagnosis of infection with *B. pertussis except*:

a. hemoptysis.
b. paroxysms of coughing.
c. inspiratory whooping sound.
d. post-tussive emesis.

30. B-natriuretic peptide levels may be elevated in all of the following *except*:
a. COPD resulting in cor pulmonale.
b. CHF associated with cardiac ischemia.
c. CHF not associated with cardiac ischemia.
d. liver failure.
e. dialysis-dependent renal failure.

31. Prednisone 60 mg orally appears to be _____ to dexamethasone 10 mg IM for the treatment of pain associated with acute exudative pharyngitis.
a. equivalent
b. superior
c. inferior
d. synergistic

32. The urine dipstick, like most screening tests, is _____ for the presence of an elevated serum creatinine.
a. specific, but not sensitive
b. sensitive, but not specific
c. neither sensitive nor specific
d. both sensitive and specific

33. Which of the following statements regarding carpometacarpal dislocation is correct?
a. Isolated injuries are common.
b. Fracture-dislocations are rare.
c. They usually occur from a fall on an outstretched hand.
d. The lateral wrist view often provides the diagnosis.

34. Which is the most commonly dislocated carpometacarpal joint?
a. Fifth
b. Fourth
c. Third
d. Second

35. Choose the most appropriate pairing of injury and complication:
a. Third carpometacarpal dislocation/ulnar nerve entrapment
b. Fifth carpometacarpal dislocation/deep palmar arch compromise
c. Fifth carpometacarpal dislocation/deep branch of ulnar nerve injury
d. Third carpometacarpal dislocation/recurrent branch of median nerve injury

CME Objectives

To help physicians:

- Summarize the most recent significant emergency medicine-related studies;
- Discuss up-to-date information on all aspects of emergency medicine, including new drugs, techniques, equipment, trials, studies, books, teaching aids, and other information pertinent to emergency department care; and
- Evaluate the credibility of published data and recommendations.

VT With No Heart Disease?

By Ken Grauer, MD

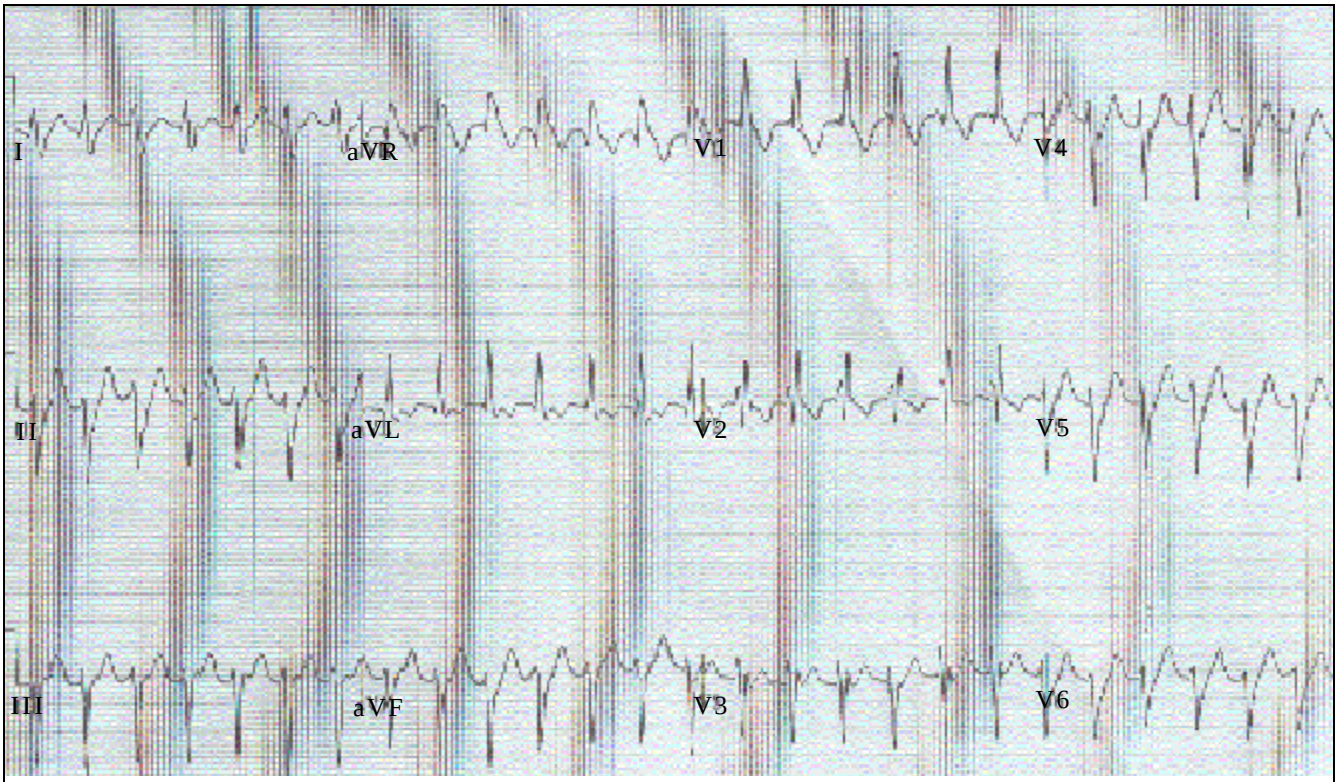

Figure. 12-lead ECG obtained from a 40-year-old man. Does this WCT represent VT?

Clinical Scenario: The wide-complex tachycardia (WCT) shown in the Figure was obtained from a 40-year-old man with schizophrenia, but no other medical problems. He had no other evidence of heart disease. What is the rhythm likely to be? Is there anything special about this type of WCT?

Interpretation: The rhythm in the Figure is regular at a rate of 160/minute. Atrial activity is absent. The QRS complex is wide, although not markedly so. The differential diagnosis includes ventricular tachycardia (VT) vs. supraventricular tachycardia with QRS widening resulting from either preexisting bundle branch block or aberrant conduction. Subtle morphologic clues in favor of VT as the diagnosis include the atypical right bundle-branch block (RBBB) configuration of the QRS complex in lead V_1 (slurring of the initial r wave in this lead) and the predominant, negative deflection (S wave) in lead V_6. That said, definitive diagnosis of the etiology of this arrhythmia was not forthcoming until electrophysiologic study, which demonstrated fascicular VT arising from the left posterior hemifascicle.

Two distinct patterns of VT are commonly seen in patients without heart disease. One pattern manifests a left bundle-branch block (LBBB) morphology with an inferior axis; the other simulates bifascicular block (RBBB and left anterior hemiblock). The latter form is the type seen here. These two forms of ventricular outflow tract VT occur most often in relatively younger adults, and frequently are precipitated by exercise. Despite symptoms of palpitations and/or presyncope, long-term prognosis usually is surprisingly good. The important therapeutic feature unique to these forms of VT is their generally favorable response to treatment with calcium channel blockers (verapamil/diltiazem) and beta-blockers, which often allows ambulatory management of these patients with minimal morbidity or impingement on lifestyle. ❖

In Future Issues:

Pediatric Asthma Management

BIOTERRORISM WATCH

Preparing for and responding to biological, chemical and nuclear disasters

Building a bridge over the abyss: Will bioterrorism help bring disjointed health system together?

Getting in same boat as 'tsunami' of money builds

Diverse and disjointed, the nation's public health and clinical settings have education needs and communication gaps that must be bridged if the system is to improve its response to bioterrorism, a group of consultants recently told the Atlanta-based Centers for Disease Control and Prevention (CDC).

The CDC's national center for infectious diseases is holding a series of meetings to assess the lessons of last year's anthrax attacks and begin to close the long-standing breach between public health and clinical medicine.

The gap may stem from differences between the private and public health care systems, both of which are fragmented and highly variable by geography and urban vs. rural settings, according to a CDC draft summary of the Jan. 7, 2002, consultants' meeting, which was obtained by *Bioterrorism Watch.*

Seeking collaboration

"There was lot of [discussion] about the gap between public health, private practices, and hospitals and how to bridge that gap and make things more collaborative," said **William Scheckler**, MD, a consultant at the meeting and hospital epidemiologist at St. Mary's Hospital in Madison, WI. "[We need] to reduce some of the redundancies in the systems both in terms of preparing and education."

Scheckler also is a member of the CDC Healthcare Infection Control Practices Advisory Committee (HICPAC), which met Feb. 25-26, 2002, in Atlanta.

Scheckler gave a report on the consultants' meeting, telling HICPAC members that the CDC had input from a broad range of bioterrorism groups and clinical specialties. There is a wealth of information scattered among these groups and on numerous web sites, he noted. For example, a dermatology group at the meeting has photographs of skin lesions that could be a good resource in an investigation of cutaneous anthrax.

"When an outbreak occurs, the same questions [arise]: What do people need to know? What is the best way to get out the information?" he said. "There should be one best-practices web page that you can go to."

The CDC currently operates several different clearinghouses for information as well as different public inquiry numbers. The agency now is considering the possibility of centralizing its clearinghouses and public inquiry services, the CDC report states.

"During the anthrax crisis, the CDC public inquiry system was overwhelmed, and therefore the agency set up a new system during the outbreak," the CDC report continues.

In addition, the CDC found that "during the attacks, the amount of information on anthrax increased from virtually nothing to an overwhelming number of e-mails, web sites, printed

This supplement was written by Gary Evans, editor of *Hospital Infection Control*. Telephone: (706) 742-2515. E-mail: gary.evans@ahcpub.com.

documents, and other materials. Much of this information and work was duplicative."

The consultants suggested that the CDC devise a strategy to centralize information development activities and then distribute the product, rather than having so many individuals working independently. **(See CDC action items, below right.)**

Linking the data base

Regarding public health and clinical partnerships, a relatively simple system of linking health departments with hospital emergency departments (ED) was described by HICPAC member **Alfred DeMaria Jr.**, MD, state epidemiologist at the Massachusetts Department of Public Health in Jamaica Plain.

Under the program, participating hospitals in the Boston area report their daily number of ED visits to the health department. The numbers are compared against emergency visits a week earlier and on the same date a year prior to detect surges that might suggest a bioterrorism event, he said.

The information is easily obtainable by the hospitals and can be submitted electronically to the health department without extra work. That is important because bioterrorism surveillance systems that are labor-intensive will likely falter as vigilance inevitably wanes, DeMaria noted.

The system has provided the secondary gain of improving communication between public health and clinical sectors. The threshold for investigation occurs at two orders of magnitude above baseline, which thus far has occurred with influenza ED visits and those associated with a large trauma event such as a bus crash, he said.

Sometimes, the threshold will be reached simply out of random chance, as ED visits increase for no single reason. "The question is, we don't know how big an event has to happen [to be detected]," DeMaria said.

The CDC is interested in such bioterrorism surveillance systems, and also may seek to apply its existing hospital sentinel networks, including the National Nosocomial Infections Surveillance system, said **Steve Solomon**, MD, chief of special studies activity in the CDC division of healthcare quality promotion.

National concerns about patient safety and bioterrorism have created a "tsunami of money" to address such issues, Solomon told HICPAC members.

"We have a lot of concerns about the surveillance and response needs," he said. "We are seeking a small trickle of that tidal wave of funds."

Ultimately, the CDC may help shape a national system or contribute to a "mosaic" of systems that track surrogate markers such as severity of illness in "real time," he said.

The research and development needs for such a system are in the ballpark of $120 million to $180 million, which may be available in the current climate over the next four or five years, he said. There is considerable interest being expressed from health care-related industries in partnering with the CDC on such efforts.

"They are standing in line," Solomon told HICPAC members. "The phone is ringing off the hook. We are trying to figure out who is the best partner." ■

CDC gets plenty of advice for action

Clarify roles, make info user-friendly

A recent consultants' brainstorming session on education and communication needs for bioterrorism resulted in numerous suggestions to the Centers for Disease Control and Prevention (CDC) in Atlanta. Some of the points of information and recommended items for action included:

- ✔ Strengthen the CDC Health Alert Network e-mail notification system to ensure that all state and local health departments are involved.
- ✔ Make surveillance and reporting as automatic as possible, and do not depend on the clinician to initiate the report quickly.
- ✔ Because the CDC is recognized as an authoritative source for information provided through *Morbidity and Mortality Weekly Report* and press releases, the CDC web site should be changed to make it more user-friendly.
- ✔ Ruling out disease is the most important clinical issue, rather than identifying new cases of disease.
- ✔ Clarify roles when a criminal investigation is going to occur during a public health emergency.
- ✔ Develop a prototype disaster plan for use by communities and make it readily available.
- ✔ The cacophony of information is a problem. For clinicians, an appropriate tool would be a page of bulleted information necessary for the

clinical setting. This should be provided in addition to baseline information.

✔ The CDC smallpox plan is a good model for allowing outside review during the development phase.

✔ Identify additional ways for using communication technology, particularly e-mail, to link local resources together. ■

Was anthrax mailer a bioweapons researcher?

'This has military lab stamped all over it'

Given the difficulty of creating high-quality anthrax in a civilian research lab, the original source of the *Bacillus anthracis* that killed five people last year was likely a U.S. bioweapons facility, the president of the American Society of Microbiology (ASM) tells *Bioterrorism Watch*.

"Given the high quality of the preparation that was used, this has military laboratory stamped all over it," says **Abigail Salyers**, PhD, ASM president and a professor of microbiology at the University of Illinois in Urbana-Champaign.

The U.S. bioweapons program was formally disbanded as part of a global treaty in the early 1970s, but many military labs remained open for "biodefense" research to counter bioterrorism, she says. "These anthrax spore preparations last for decades," Salyers says.

Anthrax mailer is 'criminal, but not stupid'

The atmosphere of a university research lab is too open and freewheeling for someone to produce anthrax undetected, she says. Salyers' personal theory is that someone who worked in a military bioweapons laboratory stole the anthrax, possibly years ago.

"It's anybody's guess as to what is going on here, but I would be astounded if this came out of a university laboratory," she says. "[This person] is crazy, criminal, but not stupid. I can't imagine that anybody who was going to do that would take the trouble and risk of trying to do that in a university laboratory environment."

In a related matter — despite a published report to the contrary — the Federal Bureau of Investigation denies it has narrowed its anthrax investigation to a former scientist in a U.S. bioweapons lab.

A FBI spokeswoman at the agency's national office in Washington, DC, told *Bioterrorism Watch* that the agency has not identified "a prime suspect" in the hundreds of interviews it has conducted in the investigation.

A story that was published in the Feb. 25, 2002, *Washington Times* reported that the FBI's search was focusing on a former U.S. scientist who worked at a government bioweapons laboratory. The government's chief suspect, the article reported, is believed to have worked at the U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick, MD, which has maintained stores of weapons-grade anthrax. No charges had been filed as this issue of *Bioterrorism Watch* went to press.

Do you know this person?

Salyers described her theory on the case — before the newspaper report was published — when the FBI openly solicited help from the ASM in the investigation. In a message appealing for help from ASM members, **Van Harp**, assistant director of the FBI's Washington, DC, field office, said "a single person" is most likely responsible for the mailings. "It is very likely that one or more of you know this individual," he told ASM members.

A $2.5 million dollar award is offered to anyone providing information that leads to an arrest of the bioterrorist. The FBI profile describes a socially withdrawn person who has "a clear, rational thought process" and is very organized. "The perpetrator might be described as 'standoffish' and likely prefers to work in isolation as opposed to a group/team setting," Harp told the ASM. It is possible the mailer used off-hours in a laboratory or may have even established an improvised, concealed facility to produce the anthrax, the FBI profile noted.

"The person is experienced working in a laboratory," Harp told the ASM. "Based on his or her selection of the Ames strain of *Bacillus anthracis,* one would expect that this individual has or had legitimate access to select biological agents at some time. This person has the technical knowledge and/or expertise to produce a highly refined and deadly product."

Indeed, the Ames strain used in the attacks has been used in bioweapons research both in the United States and worldwide, Salyers says. In

addition, given the elaborate research protocol required, it is unlikely a university laboratorian creating anthrax would go undetected no matter how "standoffish" he or she was.

"I'm just telling you what you have to go through if you were crazy enough to be a bioterrorist," Salyers says. "If a deranged scientist tried to do this in a university laboratory, red flags would be going up all along the way."

Recipe for disaster

The first step — cultivating the bacteria and producing spores — is something that almost any microbiologist could do, she says.

"But you get this slush, and that is not going to hurt anybody," she says. "There are people who will tell you that you can do this the hard way with a mortar and pestle and grind it up in the laboratory. But it is clear that the powder that was in the letters was a much higher quality than that."

The anthrax "slush" must be ground into a fine powder to be capable of getting past human respiratory defenses. "The machinery for doing this is mostly in military research laboratories," Salyers says. In addition, sophisticated treatment of the spores must be done to defeat their general property of clumping and sticking together.

"You would want to treat the spores so that they don't stick together and also so that you get a preparation that is very volatile — goes into the air and stays in the air," she adds.

Regardless of whether the mailer worked in a military lab or other facility, there is growing consensus that the attacks were not the work of foreign terrorists.

"The current thinking among many people is that this is a domestic event that kind of occurred in the slipstream of 9/11," says **William Schaffner**, MD, ASM member and chairman of preventive medicine at the Vanderbilt University School of Medicine in Nashville, TN.

"The [FBI profile] characteristics don't seem terribly surprising. They seem akin to the kind of characteristics that were part of the picture of [the Unabomber] Ted Kaczynski — a disgruntled person who is very bright, and in this instance, has a substantial amount of professional and technological expertise in order to carry this off."

[Editor's note: Those who think they may have information relevant to the case can contact the FBI via telephone at (800) CRIME TV — (800) 274-6388 — or via e-mail: Amerithrax@FBI.gov.] ■

Bioterrorism forensics: The burden of proof

If bug does not fit, you must acquit?

Already asked by federal investigators to assist in finding the anthrax mailer, the American Society of Microbiology (ASM) is taking the next step and discussing the emerging science of bioterrorism forensics.

Despite an impressive array of scientific methods, primarily used in health care epidemiology and outbreak investigations, linking a pathogen to a terrorist will not be easy.

"You want to trace it back to the 'smoking gun,' says **Abigail Salyers**, PhD, ASM president and a professor of microbiology at the University of Illinois in Urbana-Champaign. "We know how to tell what bullet came from what particular gun. But when it is bacteria, viruses, or other microorganisms we really don't have established forensics for that."

To address the issue, the ASM will hold meetings later this year that may result in a booklet on how to use molecular epidemiology techniques to establish a chain of evidence rather than identify the source of an outbreak, she says.

The methods typically used by outbreak investigators include DNA fingerprinting and pulsed-field gel electrophoresis. But using such methods to link a bioterrorist to a biological weapon would be unprecedented, Salyers notes. "Suppose they find somebody [who] might have perpetrated the [anthrax attacks], and they find some spores on that person or the immediate environment."

"Trying to prove that that is the [exact strain] will be unprecedented. It is not just a question of finding the person. It is a question of what are going to be the legally binding types of evidence," Salyers explains.

Another problem in the anthrax attacks is the separation of act and outcome, she says. As opposed to a bomb exploding and leaving an immediate impact, the anthrax mailer had time to dispose of evidence after the mailings.

"You have a perpetration of an act and the consequences of the act separated by nearly a month," she says. "There has been a lot of time for the perpetrator to cover up tracks. This is very different from putting nerve gas into a subway system, where the cause and effect are very close together," Salyers adds. ■