Diagnosis and Treatment of Cholera in the United States

Are We Prepared?

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Objective.—To assess cholera recognition and treatment by US health care workers in the largest cholera outbreak in the United States this century.

Design.—We reviewed the medical records of passengers from a flight on which a cholera outbreak occurred. To determine the availability of oral rehydration solutions, we surveyed treatment facilities and referral pharmacies.

Setting.—On February 14, 1992, more than 100 passengers on a flight from South America to Los Angeles, Calif, were infected with toxigenic *Vibrio cholerae* O1.

Subjects.—Fifty-four of 67 passengers who sought care in California and Nevada.

Results.—We reviewed the records of 54 passengers, including 39 with diarrhea and 15 without symptoms. All 17 persons who sought treatment before the outbreak was widely reported by the media had diarrhea. For 12 of these persons, recent travel to South America was noted, but only those four whose records listed cholera as a possible diagnosis were immediately hospitalized. Seven sought care again within 3 days; three were dehydrated, two of these three were hospitalized, and one of these two died. None of the 26 patients suspected to have cholera received appropriate fluids; severely dehydrated patients did not receive Ringer’s lactate solution and those not severely dehydrated did not receive an oral rehydration solution. None of the facilities and pharmacies involved stocked World Health Organization oral rehydration salts solution, the preferred solution for treating cholera and other diarrheal diseases.

Conclusions.—Treatment of cholera in the United States was suboptimal. Oral fluids appropriate for the treatment of cholera and other diarrheal diseases were generally unavailable. Widespread cholera in the developing world means that US physicians should be prepared to treat “imported” cases. Physicians evaluating patients with diarrhea should obtain a travel history, should consider cholera in patients returning from countries with endemic or epidemic cholera, and should instruct patients in appropriate use of World Health Organization oral rehydration salts solution or other oral rehydration solutions containing 75 to 90 mmol/L of sodium. Pharmacies and medical facilities should stock these solutions.

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EACH YEAR millions of Americans travel to Latin America. Since January 1991, when the cholera epidemic began in Latin America, more than 100 cases of cholera associated with travel to Latin America have occurred in the United States. As the cholera epidemic continues, more persons with cholera are likely to seek medical care in this country.

On February 19, 1992, the County of Los Angeles (California) Department of Health Services received reports of five persons with diarrhea whose stool cultures yielded *Vibrio cholerae* O1. All were passengers on a flight that left Buenos Aires, Argentina, on February 14, stopped in Lima, Peru, and landed in Los Angeles that evening. Eventually, 75 of the 836 passengers from this flight developed diarrhea and had laboratory evidence of *V. cholerae* O1 while they were in the United States. Others developed illness en route to other destinations. Ten persons were hospitalized, and one man died. Cold seafood salad prepared by a caterer in Peru was implicated as the source of the infection.

We reviewed the medical records of passengers who sought care in California and Nevada to assess how well US health care workers recognized and treated cholera. After finding that no passenger aboard this flight who sought care as an outpatient was treated with an appropriate oral rehydration solution, we surveyed the emergency departments and pharmacies in the hospitals where passengers were treated to assess the availability of oral rehydration solutions appropriate for the treatment of cholera.

**Materials and Methods**

We identified passengers who had sought treatment by reviewing customs
disembarkation cards, interviewing passengers who called the County of Los Angeles Department of Health Services, and contacting other health departments in California and Nevada. We then located medical records by contacting the facilities that passengers reported having used. Using a standard form, we abstracted information from medical records in clinics and hospitals. Health care providers were not contacted.

We considered cholera as being suspected if it had been listed as a possible diagnosis in the medical record of a patient with diarrhea. A patient was considered to be severely dehydrated if described as such in the medical record.

We reviewed results of cholera stool cultures and serologic tests obtained by health departments and medical facilities. Laboratory evidence of infection was either a stool culture that yielded toxigenic *V cholerae* O1 or a vibriocidal reciprocal antibody titer greater than 1:640.

We contacted by telephone the emergency departments in the health facilities in which passengers were treated and asked whether they stocked any of the following oral rehydration solutions: World Health Organization oral rehydration salts (ORS) solution, Rehydrolyte (Ross Products Division, Abbott Laboratories, Columbus, Ohio), Pedialyte (Ross Products Division, Abbott Laboratories, Columbus, Ohio), or Ricelyte (Mead Johnson Nutritional, Bristol-Myers Squibb Co, Evansville, Ind) (the name of Ricelyte has been changed to Infalyte). We then contacted the outpatient pharmacies of the facilities or, if there was none, the pharmacy nearest to the facility and asked about the availability of the same solutions.

**Results**

We identified 67 passengers who sought care in California and Nevada and reviewed the records of 54 (81%) of them. The location of the treatment facilities for eight passengers could not be determined, and five requested records could not be obtained.

A press release was issued on February 19, 5 days after the airline flight arrived in the United States. Seventeen patients, all ill, were evaluated before the outbreak was well publicized; 16 before the press release and one just after (who was evaluated by health care workers who were not aware of the outbreak) (Figure). Of the 37 persons treated after the outbreak was well publicized, 22 were ill with diarrhea and 15 were asymptomatic.

All passengers were tested for cholera by at least one method; 36 had laboratory evidence of cholera infection (Figure). Seven passengers had positive stool cultures only, 14 had elevated vibriocidal titers only, and 14 had both positive stool cultures and elevated titers.

**Evaluation of Patients Seen Before the Cholera Outbreak Was Publicized.**—

Of the 17 patients evaluated before the outbreak was well publicized, cholera was not suspected in 13 (Table). All 13 had diarrhea, one was dehydrated, and fewer than half had vomiting or leg cramps. Although for most patients the history recorded travel from Latin America, none of the 18 mentioned exposure to cholera. Two of the 13 passengers had elevated serum creatinine levels. None was hospitalized initially. However, seven returned for further care. On the second visit, three were severely dehydrated, two of these three had renal failure and were hospitalized, and one of these two subsequently died. The one patient noted to be dehydrated on initial presentation had been instructed simply to “take fluids.” On return, her serum potassium level was 2.5 mmol/L and she was hospitalized for electrolyte replacement. All five patients who developed renal failure were initially evaluated before the outbreak was publicized.

Cholera was recorded in the differential diagnosis in the medical records of four patients who were evaluated before the outbreak was well publicized (Table). All four had diarrhea, severe dehydration, and vomiting. Three had leg cramps, all mentioned traveling from Latin America, and two mentioned having been exposed to patients with cholera in Peru. All were immediately hospitalized. Their treatment is described below.

**Treatment of Patients in Whom Cholera Was Suspected.**—Twenty-six ill passengers in whom cholera was suspected were evaluated: four severely dehydrated patients seen before the press release and 22 patients without severe dehydration seen afterward. All four with severe dehydration received normal saline solution. One patient whose electrolyte levels were abnormal after 4 days of intravenous therapy then received ORS after the instructions for preparation were given to the hospital pharmacy. Three of the four severely dehydrated patients developed renal failure, two of these three required short-term dialysis, and one of these two was discharged with an indwelling catheter for long-term dialysis. Of the 22 without documented severe dehydration, five were treated with Ringer’s lactate solution and one received normal saline solution. None was treated with ORS.

Twenty-five patients (96%) suspected of having cholera were treated with at least one antimicrobial agent for a median of 7 days. Twenty (80%) of these 25 patients received an antimicrobial agent recommended for cholera treatment: doxycycline, tetracycline hydrochloride, or trimethoprim-sulfamethoxazole.

**Evaluation and Treatment of Asymptomatic Passengers.**—Fifteen asymptomatic passengers were evaluated and treated after the news media reported that cholera was associated with the airline flight and requested that passengers contact the health department. In 10 patients (67%), blood counts and electrolyte levels were checked. Thirteen patients (87%) received an antibiotic for a median of 10 days.

**Oral Rehydration Solution Availability Survey.**—We surveyed all 18 emergency departments, eight outpatient pharmacies in the hospitals where passengers were treated, and 11 pharmacies nearest to these facilities. None
stocked World Health Organization ORS solution; one emergency department (6%) and three pharmacies (16%) stocked Rehydralyte, three emergency departments (17%) and eight pharmacies (42%) stocked Ricelyte, and 13 emergency departments (72%) and 16 pharmacies (84%) stocked Pedialyte.

Comment

Failure to consider cholera and to follow basic rehydration principles for treating diarrheal diseases increased the morbidity and mortality among this group of airline passengers. Among the 39 ill passengers who sought medical care, five (13%) developed renal failure and one died. Before widespread publicity about this outbreak, physicians considered cholera in the differential diagnosis only when a patient presented with severe dehydration and a history of travel from Latin America.

Patients suspected of having cholera were not treated appropriately. Those with severe dehydration were not treated with the recommended intravenous solution. The recommended intravenous fluid for patients with severe dehydration from cholera is Ringer’s lactate solution.23 Normal saline solution does not contain the electrolytes needed to correct the profound bicarbonate and potassium deficits that occur with cholera.4 Ringer’s lactate solution should be followed by ORS once the patient is able to drink.2

Patients without severe dehydration who could have benefited from ORS did not receive it. World Health Organization ORS solution or Rehydralyte are recommended for patients with mild-to-moderate dehydration.23 These are the only two oral solutions that contain the proper concentrations of electrolytes adequate to replace the losses that occur with cholera. Without the benefit of ORS, three patients discharged from emergency departments became severely dehydrated; another became hypokalemic.

Failure to use or recommend home use of these solutions may be attributed to the fact that they are not available in many emergency departments and pharmacies.

Although antimicrobial agents recommended for treating cholera were given to most ill patients, they were prescribed for more days than necessary. Recommended antimicrobial therapy includes one 800-mg dose of doxycycline or 3 days of either tetracycline hydrochloride (500 mg four times daily) or trimethoprim-sulfamethoxazole (160 mg of trimethoprim and 800 mg of sulfamethoxazole twice daily).24

Asymptomatic passengers received antimicrobial therapy. Treatment is not normally indicated for asymptomatic cholera-exposed persons.4 However, chemoprophylaxis may be justified when an outbreak of cholera occurs in a closed group that has had a common exposure. For chemoprophylaxis to be effective, antimicrobial therapy must be administered during the first 5 days after exposure, the incubation period for cholera. All asymptomatic passengers in this outbreak were seen after the fifth day.

The principles for treating patients with any acute watery diarrhea are the same: assessment of the degree of dehydration, replacement of the fluid deficit, and replacement of ongoing losses. Patients with mild-to-moderate dehydration should have their fluid deficit corrected with World Health Organization ORS solution or Rehydralyte.25 The absence of these fluids from treatment centers suggests that patients with noncholera diarrheal diseases are also not getting appropriate care. Severely dehydrated patients require rapid intravenous fluid resuscitation. Home replacement of ongoing fluid losses should be done with an appropriate oral rehydration solution. Soft drinks (eg, Gatorade, Quaker Oats, Chicago, Ill) and other high-sugar solutions (soft drinks) are not appropriate.

With appropriate treatment, patients with cholera are not likely to develop renal failure or die once they have sought medical care. We recommend that clinicians ask about recent travel and consider cholera as a possible diagnosis for persons with diarrhea, with or without dehydration, who have traveled in areas with endemic or epidemic cholera. Continuing medical education courses can review the recommendations for treatment of cholera and other diarrheal diseases, focusing on the correct use of fluids and antibiotics. Patients who do not require hospitalization but for whom cholera is in the differential diagnosis should be instructed in the appropriate use of ORS or Rehydralyte and advised to seek medical attention again should symptoms worsen. Pharmacies and medical facilities should stock appropriate oral rehydration solutions, which are manufactured in the United States.27

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References