Ghost Attack: The East Providence Carbon Monoxide Mass Casualty Incident

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ABSTRACT

A routine call for a common medical emergency was expeditiously identified by the responding emergency medical service as a multiple victim carbon monoxide exposure. The event circumstances, exemplary fire department emergency medical services response, and ensuing hospital emergency department response are described.

KEYWORDS: carbon monoxide, East Providence Fire Department, detector

INTRODUCTION

On January 23, 2016, a 911 call was placed from the Holy Ghost Brotherhood Hall in East Providence, Rhode Island, requesting emergency medical service response for a patient who had collapsed in a bathroom. The facility, within a block of the East Providence Fire Department headquarters, was hosting a large social event with approximately 250 attendees. Fortuitously, the firefighter entrusted with equipment purchases had decided to augment fire engine-based carbon monoxide detectors with smaller units affixed to all of the response team basic equipment bags. This foresight and the skilled incident management by the responding agency were to prove lifesaving.

EMERGENCY MEDICAL SERVICES RESPONSE

As the initial units responded from the nearby station, the carbon monoxide detectors on the equipment bags began to alarm. While the EMTs attended the patient for whom the 911 call had been placed, arrangements for confirmation readings, general building monitoring, and additional fire engine resources were made. During this period, other event attendees developed symptoms concerning to the emergency personnel and, with confirmation of elevated CO levels, a Level One Mass Casualty Incident was declared via Fire Alarm and the decision to evacuate the building was made. The event Master of Ceremonies was tasked with assisting fire department officers in this task, complicated by a language barrier and an ongoing snowstorm. The building furnace was shut down, the building ventilated and searched for additional victims. Outside, EMS co-oximetry evaluation was performed on attendees and decisions regarding ambulance transport or issuing instruction to seek care based upon measured levels, vital signs, and any symptoms reported. Cars parked in the facility lot were searched for previously unrecognized victims. Three East Providence Fire Department ambulances, and ambulances from Barrington, Cranston, North Providence, Pawtucket, Providence, Warwick, Warren, and Seekonk transported 26 patients. Subsequently, units from Bristol, Lincoln, Attleboro, and Central Falls transported patients who had gone home and become ill. Local area hospitals were alerted. Additional persons were advised to seek evaluation at hospital emergency departments. Within approximately 30 minutes, the evacuation of the scene was complete. The building was found to have no functioning CO detectors and a furnace malfunction was confirmed as the cause of the event.

HOSPITAL RESPONSE

Rhode Island Hospital (RIH) and The Miriam Hospital (TMH) emergency departments received patients. Advance informal hospital notification occurred when the emergency medicine attending assigned to LifePACT Critical Care transport team noted texting and Twitter EMS traffic indicative of a mass casualty incident scene response increment. Arranging for notification of Hasbro Children's Hospital emergency department, he went to the RIH emergency department to notify staff and monitor the situation evolution by scanner, hospital capacity and patient tracking information system units in the emergency department medical communications center. The capacity and PTS units were part of a statewide disaster information system developed after the Station Fire disaster. Formal EMS notification occurred prior to physician and nursing shift change and resulted in a decision to activate Code Triage at RIH. An anticipated decision to reduce staffing due to the snowstorm and reduced departmental census was reversed. A patient triage plan was developed for those groups of patients arriving by ambulance or by private vehicle. A Massimo co-oximeter, sometimes used to assess patients with potential exposure, was available for use at RIH and TMH. It was decided to evaluate all patients arriving by ambulance, send those with symptoms and/or carboxyhemoglobin level > 20% to critical care rooms, those with intermediate levels to urgent care areas, and to evaluate all ambulatory patients in the waiting area, assigning those with symptoms or a carboxyhemoglobin reading > 10 to immediate care. Occasional challenges were encountered tracking field levels, emergency department triage levels, and resolving potential discrepancies. Serum carboxyhemoglobin levels were performed on 16 patients. Empiric treatment was continued for the standard required two half-lives with some variation in laboratory / monitoring measures applied along with clinical evaluation. The providers contacted the New England Regional Poison Center. Recommendations were hyperbaric oxygen therapy for pregnant patients with current carboxyhemoglobin level > 10%, those with chest pain, EKG changes or troponin elevation and carboxyhemoglobin > 15%, and for those with syncope, neurologic symptoms or carboxyhemoglobin >25%. Normobaric 100% oxygen was recommended for other symptomatic patients with close monitoring and reassessment. No patient was transferred for hyperbaric oxygen therapy.

Overall, 35 patients were treated and all released. Six patients presented at The TMH emergency department. All were treated with 100 % oxygen and observed until levels normalized.

DISCUSSION

Carbon monoxide poisoning continues as an insidious threat with protean symptoms, too easily ascribed to other causes, many much less serious. Carbon monoxide (CO) poisoning is responsible for up to 50,000 emergency department visits and 5000 to 6000 deaths per year, making it one of the leading causes of poisoning death in the United States (1, 2). Accidental CO poisoning likely causes around 500 deaths annually; the number of intentional CO poisoning deaths approximately 10 times higher (1). Overall, case-fatality rate for CO poisoning ranges from 0 to 31 percent (3).

Unlike intentional poisoning, unintended poisoning demonstrates both seasonal and regional variation, and is most common during winter months in cold climates (4). Morbidity, predominantly due to late neurocognitive impairment, persists beyond initial stabilization in significant proportion of victims (5).

Smoke inhalation is responsible for most inadvertent cases of CO poisoning. Other potential sources of CO include poorly functioning heating systems, improperly vented fuel-burning devices, gasoline-powered electrical generators (2), and motor vehicles operating in poorly ventilated areas (3). CO poisonings following open-air exposure to motorboat exhaust have also been reported (6). In addition, underground electrical cable fires produce large amounts of CO, which can seep into adjacent buildings and homes (7). An increase in carbon monoxide exposures has been reported to occur in the immediate aftermath of hurricanes (4).

This toxic exposure continues despite public safety regulations mandating detectors, at least in new construction. Detectors are relatively inexpensive and their maintenance simple although battery changes are required. Despite the potential reduction of accidental exposure deaths by 50%, and cost-effectiveness data overwhelmingly supporting their universal use, detectors are present in only about 30% of homes (8). Carbon monoxide poses a particular danger to firefighters despite training, monitoring, and use of self-contained breathing apparatus. The astute equipment purchase and deployment decisions clearly transformed the responders' perception of the East Providence event from an isolated common emergency medical phenomenon to one with significant morbidity and mortality risk, not only to the index patient but to those other exposed event attendees.

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