

# The Effect of Chemical Incidents on Hospitals:

An Interview with Stephen Grant, MD, Lexington Medical Center



For more information, access these reports:

- [Collision of Norfolk Southern Freight Train 192 With Standing Norfolk Southern Local Train P22 With Subsequent Hazardous Materials Release at Graniteville, South Carolina January 6, 2005](#)
- [Public Health Consequences from Hazardous Substances Acutely Released During Rail Transit](#)

*At 2:39 a.m., on January 6, 2005, Graniteville, SC was the scene of a deadly train derailment. Three chlorine tankers derailed and one ruptured, releasing between 46 and 90 tons of chlorine. In this interview with ASPR TRACIE, Dr. Stephen Grant described the initial chaos in the emergency department and how the medical response was managed in this incident that led to 9 fatalities, 554 people receiving treatment at hospitals, and 75 admissions.*

**John Hick (JH):** *Take us back to that night—describe the hospital and staffing when the crash occurred.*

**Stephen Grant (SG):** At the time of the incident, Aiken Regional Medical Center was undergoing reconstruction. We had 180 beds, which included 14 emergency department (ED) beds and five express beds. That night, we had 141 inpatients and one ICU bed available. We didn't have any decontamination areas—that



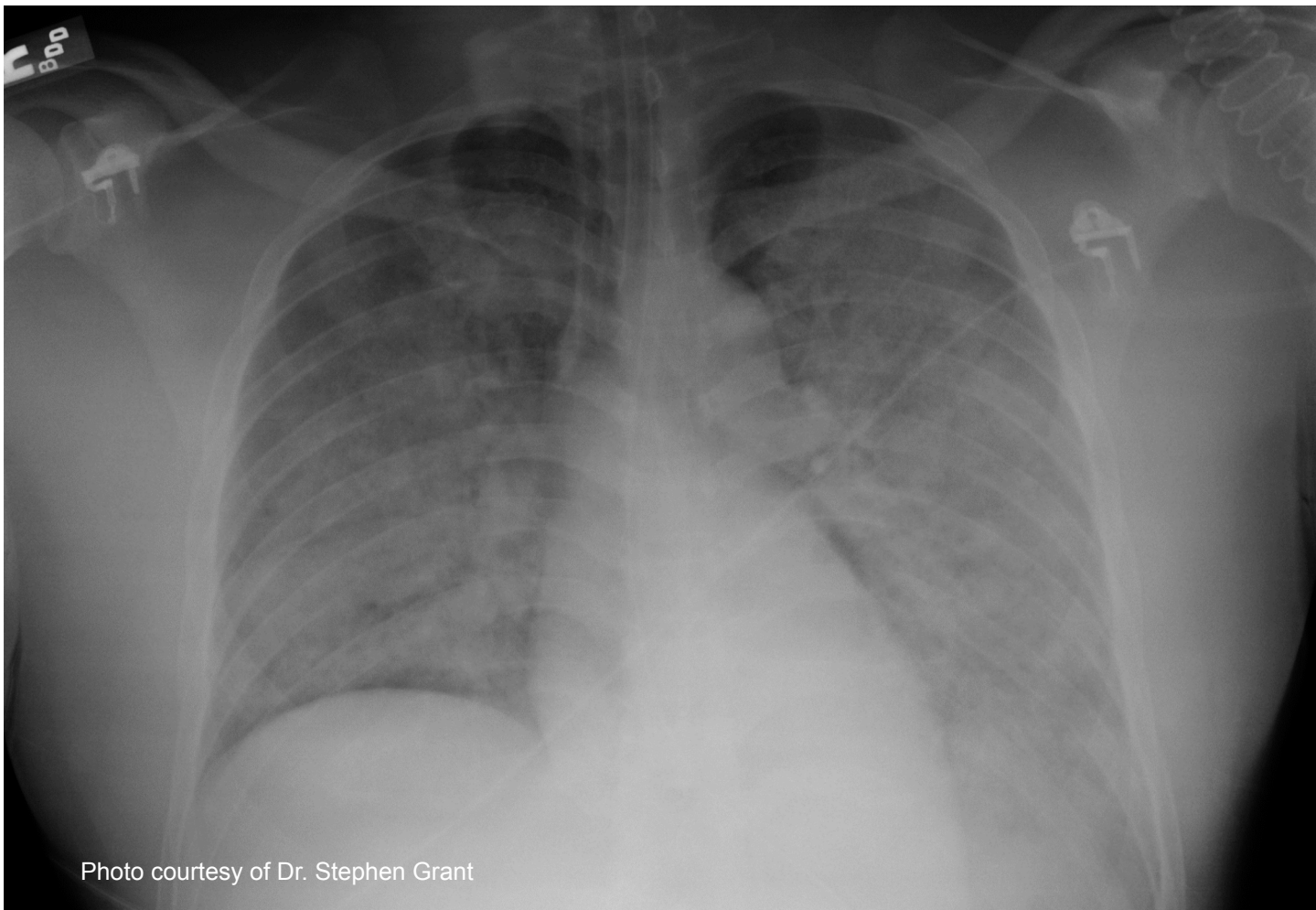


Photo courtesy of Dr. Stephen Grant

was part of the construction. We had one overnight doctor, five ED nurses, a few technicians, and two respiratory therapists working. I was called in to assist and stayed until about 4:00 the next afternoon.

***JH: How were staff first notified about the incident?***

**SG:** About 15 minutes after the derailment, the ED received the call from Aiken County Dispatch/Emergency Medical Service (EMS). Patients showed up within minutes—many of them

self-evacuated—and the ED very quickly became a scene of mass confusion. Patients complained of burning eyes and throats, chest discomfort, and shortness of breath. At first, we didn't know what toxin or chemical we were dealing with. The initial report listed sodium nitrate, and later we were told it was methanol. A lot of time was wasted because of this miscommunication—those on the scene actually knew it was chlorine, but it took a while for that message to reach the ED.

***JH: How did you manage that many patients with respiratory symptoms?***

**SG:** It was 2005, and we didn't have the pulse oximetry capacity we have now, but we brought what we had into the ED. That was the line we drew—if people had low O<sub>2</sub> levels, they were brought into the ED. The other patients were parked in the triage waiting room area. The traditional treatment for chlorine gas exposure is



decontamination, oxygen, bronchodilators, and mechanical ventilation as needed. At first, it was difficult to decide between who to intubate versus who to provide humidified oxygen. After a couple of hours, we got a call from Lexington Medical Center (where I currently work), as they started to receive patients. They were using inhaled sodium bicarbonate and found that it was easing symptoms and preventing patients from needing intubation. It's important to note here that there are no controlled studies on treating this type of patient, so like much of the toxicology literature, it's a matter of case reports and conjecture. In this instance, it relieved patients' symptoms.

We didn't perform formal decontamination at first—we didn't have the people or the supplies for that. Once the police arrived, they helped set up a barrier and decontamination area across the street, on the USC Aiken campus. Aiken Public Safety and EMS hosed patients down and gave them scrubs, then sent them over if it was determined they needed further treatment.

We also didn't formally register our patients. In fact, we probably treated patients who were never registered. We used paper-based triage and lab slips and hard copies of X-rays.

***JH: Did you run into issues with capacity specific to the number of intubated patients and critical care resources you needed?***

**SG:** We called a trauma alert and that freed up capacity. Canceled same-day and elective surgeries, freeing up 20 beds. The post-anesthesia care unit (PACU) became our satellite intensive care unit (ICU). PACU was staffed by pulmonologists and hospitalists and held intubated and sicker patients. Pediatricians, internists, and day surgery nurses treated non-acute cases in the day surgery area. Express care beds were used for secondary triage/observation.

We found that once patients were stabilized, the anesthesiologist could manage the ventilators and respiratory issues until we got patients to the PACU. We had pediatricians handle more mild exposures as they would treat a patient with asthma. By 4:00 P.M. (a little more than 12 hours after the crash), 24 patients were admitted—they all either had beds or were in the PACU.

***JH: We know that chlorine can have delayed effects—did you see patients who deteriorated?***

**SG:** Yes, we had a second surge of patients over the next two days with mild to moderate symptoms.

"Nine persons, including the train 192 engineer, died from chlorine gas inhalation as a result of the accident. Of the eight civilians who received fatal injuries, six were employees of Avondale Mills facilities to the west and north of the accident site, one was a truck driver at one of the plant facilities to the west of the site, and one was in a residence south of the site."

[National Transportation Safety Board Railroad Accident Report RAR-05/04](#)

Several re-presented with hypoxia and pulmonary edema that was not present initially. Thankfully, they all did well. No patients were admitted after the first day and after day 4, the number of patients steadily declined.

***JH: Did you have all of the ventilators you needed?***

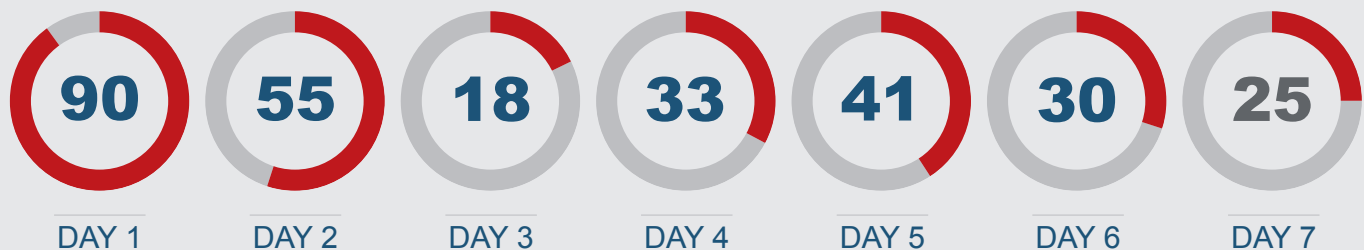
**SG:** Yes, and because we cancelled other procedures, we were able to use surgical ventilators, too.

***JH: How did you manage patient transport?***

**SG:** We actually mobilized school buses for transport—they were stationed at the decontamination



## CHLORINE PATIENT ED NUMBERS (AIKEN):



center across the street (pre-established in our county disaster plan) and took patients to other hospitals (who had advance notice and were ready to take patients into ED). With enough notice, one hospital was able to provide rows of wheelchairs and had oxygen ready for incoming patients.

**JH: Was your hospital in danger of needing to evacuate?**

**SG:** While we were put on alert for the possibility, the wreck happened in a valley, there was very low wind, and we were located on a hill.

**JH: Is there anything you would have done differently?**

**SG:** Looking back, I can say I would have put an ED representative, like a charge

nurse, at the command center. Communication was challenging. We did not know it was purely chlorine and nothing else for a couple of hours. There were four chemicals on the train.

**JH: Have the patients been followed to see if they exhibit delayed respiratory effects?**

**SG:** Yes, the Division of Acute Disease Epidemiology and the regional and county offices of the South Carolina Department of Health and Environmental Control worked with the Centers for Disease Control and Prevention [to examine the effects of exposure and determine who was at risk for long-term effects](#). It is hard to

define damage without baseline data—if your lungs are initially damaged, they won't improve. This was a very healthy population to begin with—there was a low number of smokers, for example. I did some research on people who had been exposed to chlorine gas during World War I, and it appears as though the intensity of the exposure is related to the chronicity of the scarring. ■