

AND THE WATER KEPT RISING: THE VIRGINIA HEALTH AND MEDICAL RESPONSE
TO HURRICANE FLOYD

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INTRODUCTION

Hurricane Floyd generated the most complicated health and medical response for a declared State of Emergency recorded in Virginia. The event was prolonged, resource intensive, and complicated by differing operational requirements in four phases:

- (1) Hurricane approach and impact. This phase was a routine alerting and warning response to a hurricane approaching Virginia overland from North Carolina.
- (2) Water outage response to Portsmouth. Health and medical efforts during this phase concentrated on problem identification and characterization (St. Andre 2000).
- (3) Emergency medical and health response to flooding in Franklin. The largest and most complicated effort was the combined deployment of Emergency Medical Services Task Forces and the on and off-site efforts of public health resources to meet a variety of health issues in the impact area (Winter 2000).
- (4) Critical Incident Stress Management response to North Carolina. In this phase Virginia Critical Incident Stress Management resources mobilized and deployed to North Carolina under the Emergency Management Assistance Compact (Morrow 1999).

THE STORM

To Understand Hurricane Floyd You Have to Understand Hurricane Dennis

The impact of Hurricane Dennis created conditions that magnified the impact of Hurricane Floyd. Hurricane Dennis did not cause widespread destruction, with the major impact a tornado causing localized damage in Hampton (Commonwealth of Virginia, Department of Emergency Services 1999a). However, Dennis started 13 days of sustained rain—totaling 15 inches or more through southeastern Virginia. As Hurricane Floyd approached, the two major rivers in the area, the Nottoway and Blackwater, were at three-quarters bank, with saturated ground (Sammler 2000).

The flooding history of the region suggested this was a cause for concern. The last major flood in the City of Franklin occurred in 1940 as the result of four major rainfall events in a three

week period. This resulted in the region's historical flood with the Blackwater River cresting at 21.9 feet, approximately 10 feet above flood stage in Franklin (Sammler 2000).

The Meteorological Impact

The initial assessment of Hurricane Floyd early on 16 September was that it was a non-event. The main concern in Franklin was that the combination of rain and wind would result in tree falls. At the state level, the emergency operations center staff breathed a sigh of relief as winds did not exceed 60 mph, although there was a realization that rainfall was substantial (Kline 2000).

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Hurricane Floyd deposited six or more inches of rain over the entire Blackwater watershed and much of that of the Nottoway River. On September 16th this resulted in a rapid rise in the amount of water in the rivers and their tributaries, an 8 foot rise in the Nottoway being typical. The Blackwater River crested at 26.4 feet in Franklin (4.5 feet above the previous historic flood of 1940) and the Nottoway at 27 feet. It took two weeks for the rivers to recede below flood (Sammler 2000).

The Impact on Jurisdictions

Hurricane Floyd's effects were felt in the eastern one third of Virginia. For the first time in recent history, a hurricane isolated the Hampton Roads region (Foresman 2000). On the Peninsula, Interstate 64 and US Highway 60 were closed by flooding. On the south side of Hampton Roads US Highway 460 and State Routes 10 and 35 were blocked by flooding. US Highway 58 remained open, but could not be easily accessed by response forces coming from the north because Interstate 95 south of Petersburg was closed by flooding.

The first impact of the flooding on September 16th was the loss of potable water delivery to the City of Portsmouth and part of the City of Chesapeake. A dam failure in the Portsmouth City reservoir (actually located in the City of Suffolk) flooded the water plant and disrupted water supply to over 120,000 persons. Initial estimates were that it would take 7 to 10 days to reestablish water service (Commonwealth of Virginia, Department of Emergency Services 1999b and 1999c).

On the morning of September 17th it became obvious that the City of Franklin was the most severely impacted Virginia jurisdiction. At approximately 4:00 am the City Emergency Operations Center on the second floor of the Public Safety Building was relocated to temporary

facilities in a fire station on higher ground. City Hall was inundated with nine feet of water on the first floor with the loss of all City records. Telephone communications were lost—the only remaining circuits were amateur radio high frequency and tenuous cellular telephone service.

The economic impact of Hurricane Floyd on the City of Franklin was potentially catastrophic. The Union Camp paper plant (the largest employer) suffered millions of dollars of damage. Of 182 businesses formerly located in the downtown business district, some 110 to 120 have indicated a desire to return. Estimates are that no more than half will actually make this move (Brown 2000). Given accepted rules of thumb for the viability of businesses struck by catastrophes, as few as 50 will survive the next three years. The loss of tax revenue is potentially crippling for a city that suffered extensive damage to its governmental facilities (government official 2000).

THE RESPONSE

The Organizational Structure

Responsibility for managing health and medical emergency response is delegated in Virginia to the Department of Health. The Commissioner of Health has assigned coordination of this role to the Office of Emergency Medical Services. During disasters the Office of Emergency Medical Services dispatches a Liaison Officer to the State Emergency Operations Center. All resource tasking and tracking functions are performed in an Emergency Support Center which functions as a medical emergency operations center in the office space of the Office of Emergency Medical Services. In addition, the Emergency Support Center coordinates with other offices within the Department of Health and other agencies for support in the full variety of public health functions.

The Water Emergency

The initial health and medical response to Hurricane Floyd was triggered by a call from the Department of Health's Liaison Officer at the State Emergency Operations Center (EOC), indicating the EOC had received a request for drinking water assistance from the City of Portsmouth but that the tasking had been completed. A routine check revealed the issue was not resolved and there was confusion as to who was responsible for managing water supply issues. The City staff felt that it was the responsibility of the Director of the Western Tidewater Health District. However, the Health District Director's position was that his Office did not have water supply specialists and had no normal water supply mission (government official 1999). Not only was there a reasonable disagreement over responsibilities, but water supply needs were not being adequately addressed.

The water supply needs were solved by a combination of bottled water and the unexpectedly rapid return of the water plant to service, in part due to forethought on the part of the staff in shutting down power. However, this phase highlighted a deficiency in local planning. The Health District had not been involved in writing the City's Emergency Operations Plan. The Plan copied responsibilities assigned to the Department of Health in the Commonwealth of

Virginia Emergency Operations Plan, even though the local Health District lacked staff expertise and resources to undertake many of the plan's roles.

Throughout the hurricane's aftermath, problems that would not go away plagued the Emergency Support Center staff. The Portsmouth water crisis generated one of these. In the City three clinics provided dialysis service to kidney failure patients, requiring approximately 45,000 gallons of water each day. The Health District staff located dialysis sites for all patients in Norfolk, Chesapeake, and Virginia Beach and arranged their transportation to treatment. The issue was closed by the evening of September 16th, or so it appeared. However, a local dentist and political figure determined the deployment of a military desalinization plant to Portsmouth was critical to provide water for dialysis to prevent widespread mortality in the kidney patient population. Over the next three days this proposal was elevated to generate Congressional inquiries, repeated requests for information from Federal Emergency Management Agency and Public Health Service staffs, and approximately 40 telephone calls. There were no reported cases of delays in dialysis for patients and no increase in mortality (Commonwealth of Virginia, Department of Health 1999a).

The Initial Emergency Medical Services Response

On the evening of September 16th, the Office of Emergency Medical Services placed two Emergency Medical Services Disaster Task Forces on 12 hour state of alert for deployment based on reports the Blackwater River was five feet out of its banks at its crossing of US Highway 460. The Office had eight volunteer Task Forces, each of which was committed to provide a standard package of one Basic Life Support Ambulance, one Advanced Life Support Ambulance, one Crash/Rescue Truck, and one Quick Response Vehicle. Task Forces are self-sufficient to as great a degree as possible for deployments of up to 72 hours. The mission of a Task Force is to provide the equivalent of a complete rescue or ambulance station to relief local resources which have been exhausted by a prolonged event (Commonwealth of Virginia, Department of Health 2000b).

Task Forces are deployed in conjunction with a Coordination Team, a two person team with the mission of coordinating Task Force actions, a liaison to local government, and arranging logistics support. Coordination Teams have a secondary mission of providing augmentation to the emergency medical services function in a local emergency operations center (Commonwealth of Virginia, Department of Health 2000a). As a result, Coordination Team members are chosen for a breadth of experience and the ability to make effective decisions under pressure.

The first request for assistance to Franklin was relayed to the Emergency Support Center at approximately 0930 on September 17th. Two Task Forces (Crater 6 and Metro 11) and Coordination Team One were on the road by 1100. Additional resources were dispatched shortly thereafter, including Lord Fairfax 1, South Central 5, and Northern Virginia 8. On Sunday, September 19th, Thomas Jefferson 2 and Northern Virginia 10 were added, with the high point of available resources including 7 Task Forces with 70 personnel, 24 vehicles, 2 support trailers, and 2 boats (Commonwealth of Virginia, Department of Health 1999a).

Operations of the Task Forces in Franklin included the full range of normal emergency medical services requests for assistance. Because of the small size of the City and the large number of resources, the Task Forces were combined into a single large resource pool, a departure from their normal operating procedure of working as units. Two specific taskings, one procedural innovation, and one clear problem area offer potential lessons for future disaster operations:

... Staffing shelters with emergency medical services providers is an inappropriate use of high value mobile resources. The shelter in Franklin housed approximately 170 persons at any time, with over 700 being sheltered in the first week (St. Andre 2000). The District Health Director strongly insisted that the shelter needed regular coverage by an Advanced Life Support Ambulance, a level of service not normally available in the community and not justified by actual needs for emergency assistance. A decision was made to support this request in order to prevent a public disagreement among Health Department representatives. Education is clearly needed to ensure all elements of the health and medical system understand appropriate resource use.

... Evacuating a long term care facility is a difficult process under the best of conditions. Task Forces South Central 5 and Metro 11 were assigned to perform a night evacuation and transport the residents to a new shelter in Isle of Wight County. When they arrived at the shelter they found one public health nurse, a stack of folding chairs, and a large empty room—no other preparations had been made to open or manage a special needs shelter. Due to the leadership of the Task Force Commanders, feeding, bedding, and other critical services were arranged, averting a potentially unsatisfactory outcome. The clear lesson is that Task Forces need to be prepared not only to be self-sufficient, but to also assist others in roles for which they are not normally assigned.

... In a jurisdiction where internal telephone service, including 9-1-1 access is no longer available, how do the emergency medical services find out about emergencies? In this case the solution was to dispatch ambulances to circulate on a regular patrol pattern through districts so that persons needing assistance could flag down a vehicle. This approach, although crude, appears to have worked well, and was quickly nicknamed by the crews “trolling for patients.”

... Communications were suboptimal. The Task Forces deployed with too few portable radios capable of using the statewide disaster mutual aid frequency (155.205 MHz FM). Long haul communications from Franklin to the Emergency Support Center depended on an overloaded cellular system. Although amateur radio operators have received extensive credit for solving the communications needs of this incident, they were located in the City Emergency Operations Center with no access for state resources to use them to pass reports, logistics requests, etc. The clear lesson learned is that the Task Forces must be self-sufficient in their wide area communications assets and not rely on already overwhelmed local systems (Vaughan 1999, York 1999).

Emerging Public Health Issues

Although the City of Franklin was the focus of attention, flooding occurred throughout the counties east of Interstate 95 and south of the James River. In Sussex County a historic rural church graveyard flooded, with human remains being displaced. This did not become a high interest issue and was quickly resolved through the provision of technical advice from the Office of the Chief Medical Examiner to the local jurisdiction and its funeral directors.

However, a meat packing plant in Surry County did provide another prolonged problem. The owner of the plant had continued to pack meat during the flooding in order to be able to ship a large order on Monday, September 20th, in spite of an order issued by the Health District that prohibited the use of well water in flooded areas due to concerns over possible contamination of the wells. Eventually, it was determined that the plant's well was a deep well and had not been infiltrated by surface water, with the result that the meat could be shipped. Again, this issue attracted the attention of a wide variety of participants, resulted in an extensive amount of telephone coordination, and was briefed at the national level in at least one conference call (government official 1999).

Within Franklin a host of public health concerns emerged. The flood waters themselves were grossly contaminated with agricultural chemicals and fuel oil released when local businesses in the City's downtown flooded. This created a requirement to decontaminate everyone who entered the water, reportedly including a news media reporter who stood in the flood waters while she narrated a story warning people to stay on dry land (Vaughan 1999).

Mosquitoes became a significant problem throughout the area--landing counts reached 100 per minute, apparently as a result of large amounts of standing water remaining from Hurricane Dennis. Aerial spraying was coordinated to suppress the growing mosquito population, but rapidly became the subject of public concern. To attempt to communicate when and where spraying operations would be conducted a mosquito hotline was established, staffed by a single individual and operated from 8:00 am to 5:00 pm Monday through Saturday (government official 1999).

This solution was rapidly overwhelmed by call volume. On the first day 250 calls were logged--estimated to be two thirds of the calls actually received. After five days the call rate fell to 40 to 50 calls a day, with the total number logged reaching 1200. Public inquiries included:

- when spraying was being conducted?
- what agent was being used?
- what were the health effects for humans?
- what were the health effects on pets?
- why was the agent being used chosen?
- what would be the impact on the bee population?

The public information effort was complicated by the size of the problem, with over a million acres in Virginia being targeted for spraying. Because of weather and other factors,

including the need to empty agent from the tanks to prevent crystalization, on some days spraying actually happened in areas that were not expected to be sprayed. As a result of these considerations, there were unexpected impacts, specifically on the bee population, with one bee keeper being featured in television news reports with a bag of 40,000 dead bees (government official 1999).

Clean-up operations in Franklin also generated health concerns. Flood water in buildings created the potential for mold growth—the mold itself caused burns and respiratory tract infections. To address this problem, building owners were advised to remove everything that had been wet, including wall surfaces to above the water line and deposit it outside to dry and be disposed of. Basic clean-up supplies, consisting of bleach, gloves, and masks were made available by Health Department staff walking the streets and through mass care feeding stations (Winter 2000).

An unusual clean-up problem presented itself in three peanut warehouses. One warehouse housed 10.2 million pounds of peanuts. As a result of the flooding, these peanuts started to ferment, releasing methane gas in potentially explosive amounts (St. Andre 2000).

Integrating the Response

The Emergency Medical Services Coordination Team was overwhelmed by a wide variety of demands for its skills. Individuals from the Team were immediately assigned to manage emergency medical services and even fire operations for the City (York 1999). Eventually every available Coordination Team member was drafted to provide as many as six staff members on site. The net result was to drain individuals from the Emergency Support Center and increase the workload in that facility. As a result the Office of Emergency Medical Services has identified a critical need for additional individuals to be recruited and trained for this role.

A significant development in the flooding response was the deployment of a Virginia Department of Forestry Incident Command System overhead team. The large number of agencies and resources on scene suggested the need for a structure to manage day to day operations. The Incident Command System team established a unified command structure for field operations and produced regular Incident Action Plans throughout the response phase (Vaughan 1999). This was the first such deployment, and its success suggests that this resource will be used in future events.

Integration of public health response was less successful. The Health District Director and his staff coordinated their services with local officials and delivered services in the impact area. Health resources participated in a multi-agency team that determined the reentry plan and inspected each building for safety (St. Andre 2000, Winter 2000). But operations of the Department as a whole were not coordinated through the ESF-8 Emergency Support Center and the state Emergency Operations Center. As a result much of the expenditure involved has

proved to be non-reimbursable (government official 2000). And, at the state level, when the Office of Emergency Medical Services had exhausted its capability to staff the state Emergency Operations Center, there was no trained pool of backup personnel from other Department offices. Those individuals who did serve in the Emergency Operations Center felt that they lacked the necessary experience and information needed to be effective (government official 2000).

The Prolonged Emergency Medical Services Response

On the fifth day of the emergency medical services response (September 21, 1999), the Office of Emergency Medical Services started withdrawal of its Task Forces. The decision to withdraw resources was based on several factors.

... First, the situation in Franklin had stabilized and recovery was starting. Task Forces are an emergency response resource designed to allow local resources to recover and reconstitute. They are not intended to sustain a jurisdiction indefinitely.

... Second, the potential existed for another hurricane to strike Virginia, either in the near term (there was a hurricane in the Gulf of Mexico forecast to possibly cross Florida and enter the Atlantic) or later in the hurricane season. Task Forces needed time to recover and restock.

... Third, the Office's resources were exhausted, and no additional Task Forces were available for deployment to continue coverage (Vaughan 1999). Even Task Force Tidewater 12, a unit in training, had been committed to assist in the transition period as resources were withdrawn.

Based on this and previous deployments, two common experiences can be identified that deserve further investigation. Even though the Task Forces arrived with a specific mission of relieving exhausted local emergency medical services resources so that they could rest, the local resources never stopped operating. This reluctance to rest may result from a sense of pride and an unwillingness to be seen as not being able to support their community (Vaughan 1999).

Paradoxically, local agencies were extremely reluctant to release Task Forces, citing a critical need for emergency medical services resources. A critical look at total workloads reveals that call volumes did not justify the large investment of resources (in five days Task Force ambulances responded to 40 calls for assistance). In addition, the presence of multiple Advanced Life Support vehicles provided a service level not previously available in the City or surrounding rural areas. The reluctance to release resources led to Medical Transport, a commercial service, providing additional coverage through November 2nd (Blow 2000).

The North Carolina Response

On September 30th the Virginia Office of Emergency Medical Services initiated response to a North Carolina request for Critical Incident Stress Management assistance in the eastern part of the state under the Emergency Management Assistance Compact (Green 1999). Virginia has a robust Critical Incident Stress Management system with regional teams in each of twelve

Emergency Medical Services Regional Council areas. These teams respond to acute incidents in the council area. However, no structure was in place to respond to events in other regions or other states. As a result the Office of Emergency Medical Services Critical Incident Stress Management Program Manager and her staff were forced to recruit individuals willing to go to North Carolina and then assemble ad hoc strike teams. During October, three Virginia teams were sent to North Carolina for three to five day deployments.

There is a need for Critical Incident Stress Management Strike Teams that can deploy out-of-state. However, the problem is larger--there is an equal need for teams to deploy within the state, to meet needs for mutual aid or to support the Emergency Medical Services Disaster Task Forces. Currently one team, sponsored by the Western State Hospital of the Department of Mental Health, Mental Retardation, and Substances Abuse Services, is capable of deployment. The Office of Emergency Medical Services is organizing Critical Incident Stress Management Strike Teams on the same basis as the Emergency Medical Services Task Forces. Identical deployment and support structures will be used (Commonwealth of Virginia, Department of Health 1999b).

The anecdotal experience of Teams in North Carolina suggests it may be prudent to reexamine our approach to Critical Incident Stress Management in prolonged disasters that are exhaustion events. The structured debriefing used in acute incidents was not well received by emergency services providers in the North Carolina impact area; informal conversational defusings were more successful (Morrow 1999). Research is needed to determine if this was an unusual outcome, perhaps resulting from personality factors, or if it is a common occurrence.

OTHER LESSONS LEARNED

The phenomenon of problems that will not go away deserves attention. A shopping behavior was observed during which Federal officials would contact the Department of Health's Liaison Officer in the state Emergency Operations Center. If this revealed no ongoing problems, the same official would call the Emergency Support Center to elicit a problem statement (or vice versa). If neither source revealed a significant issue, a different official from the same functional area would make the same set of calls after a time delay. Some of these requests were justified as being needed for executive level briefings. This behavior extended for as much as three days after a specific incident was marked closed. This generated extra work for the health and medical staff and contributed to stress. It is uncertain whether this experience may be explained by personality or event related factors.

The organizational model of Task Forces, Coordination Teams, and supporting command and control structure clearly works well as a means to mobilize, deploy, coordinate, and account for resources. The same model is being adopted for Critical Incident Stress Management Strike Teams, and serves as a potential model for public health strike teams. The success of the existing Task Forces is based on their being permanent organizations with standard training and procedures.

However, insufficient resources were available for prolonged operations or to meet the impact of a second disaster. All components of the system need more personnel and resources, and specific problem areas such as communications need to be addressed. The current recruiting target of 24 Task Forces may or may not be adequate and should be re-examined.

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