

MEDICAL EDUCATION

Lessons for Physicians from Flint's Water Crisis

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Abstract

Physicians form a vital front in recognizing unusual clinical presentations that could herald a health threat. In the Flint water crisis, physicians can be credited with playing critical roles in both uncovering the crisis and providing leadership when government failed to respond effectively. Yet most physicians in Flint were not formally trained in advocacy or leadership and might have recognized the health implications of the crisis more quickly had they received formal environmental health training. Furthermore, connections to other professional disciplines—and to the community—are vital for effective responses to environmental health threats. We explore some lessons learned in Flint that might help expedite resolution of future environmental health crises, particularly those involving aging infrastructure and diminished or dysfunctional regulation or oversight.

Introduction

The Flint water crisis, in which the municipal drinking water of Flint, Michigan, was contaminated with lead, microorganisms, and other toxins, has been extensively covered in the media. This event was described by Michigan's Governor Rick Snyder as "a failure of government at all levels" [1] and resulted in the potential exposure of roughly 100,000 people to these harmful substances. Besides a variety of substances, *Legionella* was found in the water, which was associated with a more than fourfold increased case incidence in Genesee County in 2014 and 2015 as compared to the years immediately preceding the water switch in April 2014 [2-5]. In fact, to date, the director of the state health department and four other government officials have been charged with involuntary manslaughter, and at least 15 other officials (including Michigan's medical executive chief, who is a physician) were also charged with felony and misdemeanor counts [6, 7].

In view of these administrative failures, the alleged cover-up [8], and the conflicts of interest for governmental leaders involved in the ongoing criminal investigation, it is not surprising that there has been a lack of coherent official leadership in the response to the crisis. The authors are part of a small group of physicians who, along with other health

and nonhealth professionals—and in the face of obfuscation by government officials [9]—continue to provide health recommendations and advocacy for the citizens and agencies of Flint [10–12]. In the remainder of this article, we focus on the roles and the additional training of physicians that will be required to deal with similar current and future challenges to patients' health. But first we ask, How could such a disaster happen in modern America? We believe a fundamental contributor to the crisis was the failure to recognize and value connections, particularly those that nurture clinicians' curiosity and caring, such as personal connections and professional connections among cross-disciplinary clinicians.

Geographic and Professional Divides

Persistent racial and class segregation have increasingly isolated older cities like Flint from centers of power and capital resources. From the 1960s to the present, the City of Flint was pushed into bankruptcy by the loss of more than 72,000 General Motors Company jobs, a 50 percent decrease in its peak population of almost 200,000 due to wealthy (generally white) residents moving to the suburbs, and cuts in funding from the state for municipalities [13, 14]. In the shadow of the historical and pervasive institutional racism that helped to bring us to this state, the city was placed under an emergency financial manager in 2011 [15]. All decision-making power was removed from locally elected officials, including the emergency manager's decision in June 2013 to switch the city's water source from Lake Huron to the Flint River, putatively to save \$5 million in under two years [16, 17].

In addition to geopolitical divides, there is also the problem of physicians' feeling disconnected from members of the communities they serve. Particularly in relation to underserved populations, there is a significant difference in average income and education between physicians and their patients [18], and many physicians do not live in the communities where they work. The effects of systemic poverty and stigma can also create a distance that makes it hard to recognize our connection to each other.

Another divide exists between medicine and public health. When medicine had little to offer for specific disease treatment, sanitation and population-wide hygiene measures accounted for most progress in mortality reduction. This changed when antibiotics were developed and it became possible to effectively treat individual patients, contributing to specialization and decreased cross-disciplinary knowledge [19]. Additionally, the success of public health has resulted in its absorption into normal governmental function, with the unintended consequence of giving a rationale for physician inattention to the health of the population as a whole. Unfortunately, this tunnel vision risks narrowing the area of physician concern to a point at which we no longer recognize a public health problem that needs our attention. While no one person or profession can do everything, if we physicians are unaware of when interdisciplinary effort is required, we will not be able to

perform our essential duty of keeping our patients healthy. In fact, the Flint water crisis would not have been revealed without interdisciplinary knowledge.

The Necessity of Interdisciplinary Collaboration in the Flint Water Crisis

The medical community did not recognize a number of events that occurred after the switch from Lake Huron to Flint River water as the warning signs of an impending health crisis. While many long-time Flint citizens were skeptical about drinking water from the industrially polluted Flint River, we saw the mayor and other governmental officials drink it at the water treatment plant [20], and most physicians accepted the official, but inaccurate, narrative. When the General Motors Company declared that the water was too corrosive for auto parts [21], most physicians didn't seem to understand that corrosion of the machinery could also mean corrosion of metal pipes, including lead service lines and fixtures, and none spoke up. When a more than fourfold increase in cases of Legionnaires' disease occurred in 2014-2015 [5], most physicians seemed not to understand that such outbreaks are almost always related to the municipal water until the complete information was disclosed by public health agencies almost a year and a half after the initial outbreak in 2014 [22, 23].

This lack of recognition of connections between drinking water and health started to change when Flint residents were notified by county public health officials of increased levels of total trihalomethanes—byproducts of disinfection—in the municipal water [24]. The knowledge that some of these derivatives are actually carcinogenic led some physicians living in Flint, who were dealing with their own rusty-colored, foul-smelling water, to finally realize that we needed to learn more about [drinking water and health](#) if we were to instruct our patients appropriately [25].

A chance congruence finally occurred: an area pediatrician with both a public health and an environmental health background had a social discussion with a water engineering friend who told her that there was no corrosion control in the Flint municipal water and that the water might be leaching lead from the older pipes into the drinking water. Her friend suggested that she look into pediatric blood lead levels [26], and she and her team did this with the help of a local public health geographer. This interdisciplinary collaboration was ultimately able to connect elevated blood lead levels to the areas that were showing the highest levels of lead in the water (as discovered by other water engineers and citizen scientists), ending months of squabbling over testing protocols [27] and misleading practices and communications by city and state agencies [28]. Local physicians and a coalition of health providers and purchasers were able to issue a clear warning to residents and local officials in both governmental and nongovernmental agencies. Finally, almost a year and a half after Flint's water supply was switched, a local health emergency was officially declared by the county health department in October 2015 [29]. It would be another three months before the state government, and subsequently the federal government, declared an emergency [30]. It was only through

this serendipitous cross-education and interdisciplinary collaboration that the contamination of Flint's water was brought to light.

The Flint water crisis has illuminated crucial roles for physicians in environmental health and in public health, in general. We must be involved in [surveillance](#) of unusual presentations of illness; we must provide culturally competent medical care to all of our patients, especially those in communities that bear a disproportionate share of risk and poor health outcomes; we must recognize the sociocultural and environmental underpinnings of health and illness; and we must be able to assist disaster response teams in times of emergency. Perhaps most importantly, we must use our position to forge alliances to advocate with our patients at both an individual and a policy level. These functions can only be adequately accomplished with knowledge of public health and environmental health in particular.

The Need for Physicians to Receive Both Public Health and Environmental Health Training

There is a strong consensus that we should educate trainees in public health. The Centers for Disease Control and Prevention in collaboration with the Association of American Medical Colleges (AAMC) and other organizations have signed on to a collaborative set of population health competencies for medical students, including elements of environmental health [31]. Graduate medical education organizations have also embraced this need [32, 33]. Short of adding a year for a master's degree in public health (MPH), many educational institutions have attempted to implement enhanced training in environmental health via its integration into other learning activities, electives, summer internships [34], and certificate programs [35], but medical curricular time is scarce. Despite a clear call from many medical organizations to teach environmental health [36], the 2013 AAMC graduate survey still shows more than one-third of graduates reporting inadequate exposure to the topic [37].

We certainly must better train our future colleagues, but in this time of increasing environmental health challenges [38, 39], this endeavor will not suffice for immediate problems. Practicing physicians must also be willing to learn about specific problems when they arise locally and to collaborate with experts in fields outside of medicine to effectively address these problems. While established physicians can obtain a degree in public health, this is often impractical. In Flint, we did not have time for such formal training, and as we recognized each new health problem related to the Flint water crisis, we needed to actively pursue information gleaned through individual reading and by reaching out to experts. A key component of this endeavor was collegiality and a shared sense of purpose. Numerous health responders in the community have reported to us that there was a point at which they might have given up pursuing this learning if it hadn't been for encouragement from, and also for fear of disappointing, their colleagues. For Flint physicians, our Genesee County Medical Society has played a key role in

maintaining connections and the fabric of this endeavor. This role is important to ponder in view of the declining membership in organized medicine [40], as it would have been difficult to maintain our connection without this existing infrastructure.

Finally, there is the issue of physicians' attitudes about their responsibility beyond the clinic walls. While concerns about a cover-up and inadequate response by government officials remain, physicians must consider the following questions: Why did the *Legionellosis* outbreaks not raise more concern? Why were we not curious about General Motors needing noncorrosive water for its machinery and the city *not* needing noncorrosive water for its people? Why is it acceptable for anyone, anywhere, to drink brown, smelly water?

The Way Forward

Knowledge and skill in public health, and environmental health in particular, are crucial, but not sufficient. Physicians have a duty—and also significant power and prestige—to effectively [advocate](#) for the health of our patients and, by extension, for the health of the broader community. Undergraduate, graduate, and continuing medical education also needs to inform medical personnel of the necessity of their engagement and of the relationships and attitudes needed to effectively advocate for the public's health. We must expand our perimeter of concern and look for the connections between disciplines, and even more so between people. The Flint water crisis would not have been exposed when it was without these connections, and in this time of decaying infrastructure, increasing socioeconomic disparities, climate change, and other environmental health threats, we need the analytical tools, the intellectual curiosity, an expanded network of other content experts, and—most of all—the ability to listen to, and advocate for, the communities we serve.

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