



The Smallpox Epidemics in America in the 1700s and the Role of the Surgeons: Lessons to be Learned During the Global Outbreak of COVID-19

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Abstract Today's COVID-19 pandemic offers many similarities with previous pandemics hitting our country. In particular, the smallpox epidemics during the 1700s threatened the lives of multitudes and created panic and fear in the society, similar to the situation caused by the coronavirus. Remedies that were instituted, especially inoculations, were met with opposition and even violence when first introduced. The newspapers were filled with headlines reflecting the disputes. There was a “six feet rule” during the smallpox epidemics, although it had a different meaning than today. Politicians and other leaders of the society were engaged in the war against the infection. Boston became involved in the fight against the smallpox by Dr. Zabdiel Boylston's and Rev. Cotton Mather's introduction of inoculations. When George Washington realized the benefits of the procedure and ordered mass inoculations of the Continental Army, it became an important factor in winning not only the fight against smallpox but the Revolutionary War as well. Looking back at history, realizing that we have survived previous outbreaks of devastating diseases, can provide hope during the current pandemic.

Introduction

Since late 2019 and early 2020, the world is being hit by the coronavirus pandemic with devastating health and economic consequences. Some of the highest death rates are seen in the USA [1]. During times like these, it may be sobering to remember that America has been able to survive similar events before. In the 1700s, worldwide eruptions of smallpox threatened the lives of multitudes, although other epidemics such as cholera, yellow fever, plague, and influenza played havoc as well. Boston was in the crosshairs of smallpox on several occasions, but also became a place that helped leading the way out of the darkness.

Although many of the events surrounding the fight against smallpox in the 1700s have been described previously, the similarities between those days and the current COVID-19 pandemic have not been called to attention before. The resemblances are many, including the panic in afflicted communities, controversies regarding treatment and prevention, angry disputes spilling over into newspaper headlines, and need for quarantines. Another similarity is the heroic efforts by frontline healthcare providers. In particular, many surgeons were crucial for preventing the ravage of smallpox, but their role in ending the epidemics of the 1700s is not well known.

The purpose of this report is to illustrate the resemblance between events during today's pandemic and those that were seen in the society during the smallpox epidemics three hundred years ago. The efforts by pioneering surgeons that helped stop the outbreaks and ultimately eradicate the disease are also highlighted.

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Smallpox: a feared enemy

Smallpox was a dreaded disease. Epidemics hit Boston on several occasions during the 1700s [2]. The repeated outbreaks of 1721, 1752, 1764, and 1775 were particularly severe. Death rates were high. In the epidemic of 1721, the fatality was nearly 15% among those who contracted the malady. Of the approximately 11,000 Bostonians at the time, 842 (almost 8%!) died [2, 3].

Even among survivors, the suffering was immense. Some of the clinical features attest to the atrocity of the affliction as described in a quote reported by Forman [3]: “The head is swollen to a monstrous size, the eyes are entirely closed, the lips swollen and of a livid color, the face and surface of the whole body are covered with matured pustules, from which issue purulent matter; the miserable being has the appearance of a putrid mass, and scarcely the semblance of a human form remains.”

No wonder people panicked when they realized a new eruption was on their doorstep. The epidemic of 1764 saw its first victims in the North End of Boston during the winter month of January [3, 4]. The initial cases were reported in *Boston Post-Boy* on the second and in the *Boston Evening Post* on the sixteenth day of the year. The number of cases grew rapidly. The initial death rates were staggering with ten of the first twelve victims succumbing to the infection [4]. When the spate was finally over, almost 18% of unprotected sufferers had died [2, 3].

Many of the measures instituted to stop the scourge were similar to what we have seen during the coronavirus pandemic. Schools were closed. Harvard suspended classes during the rest of the outbreak [3]. People who had the means, fled to safer grounds in the countryside. When one of Paul Revere’s children became infected, the family was quarantined—with a guard posted outside the house! The “six feet rule” was in place but had a different meaning than today. As reported by Di Spigna [4], any family with an infected member was instructed to “hang out on a pole at least six feet in length, a red cloth not under one yard long, and a half yard wide, from the most public part of the infected house.”

The history of inoculation in England and the colonies

It was an ancient observation that individuals who had survived smallpox seldom got the disease again, and if it happened, the infection normally caused only mild symptoms. Those were observations that had led to inoculation as a way to induce immunity and prevent the epidemics.

Inoculation against smallpox had been practiced for centuries in places like Greece, Armenia, and northern Africa before the method made its debut in England in the early 1700s [5, 6]. The impetus to introduce inoculation in England originated in the Ottoman Empire in 1718 when the wife of the British ambassador pleaded with Dr. Charles Maitland, a Scottish surgeon stationed at the British Embassy in Constantinople, to inoculate her five-year-old son [7, 8]. She described the successful procedure in letters to friends, “The small-pox, so fatal, and so general amongst us, is here entirely harmless by the invention of ingrafting, which is the term they give it” [9]. Later, after having returned to England, the ambassador and his wife requested Maitland to inoculate their four-year-old daughter [10]. Because of the successes, the procedure caught on in England and the rest of Europe and, with some delay, also in the colonies [6, 8].

The inoculation was performed by introducing pus (containing smallpox virus) from ripe pustules of a victim into a superficial skin incision (or directly into a vein) of the person to be inoculated [5, 8]. This typically resulted in a “mild” controlled case of smallpox, still severe enough to make the individual suffer from significant illness with fevers, malaise, back- and headaches, nausea, vomiting, and eruption of skin lesions. These signs and symptoms could last for several weeks or even months. Although most survived, inoculation could also result in death. Inoculation rendered the individual more or less immune to the disease in the future. Even if the inoculated person was infected with smallpox later in life, the risk of death from the disease was substantially reduced.

Inoculation causing controversies and violence in Boston

Inoculation was introduced in Boston by Dr. Zabdiel Boylston (Fig. 1) during the 1721 epidemic [11, 12]. Dr. Boylston was the first American-born surgeon in the colonies and a pioneer in his vocation [13]. The Rev. Cotton Mather (Fig. 2), who had heard about the procedure from his West African servant-slave Onesimus and read extensively about the method, convinced Boylston to start inoculations during the smallpox outbreak of 1721.

The procedure was initially met with outrage and anger by the community, mainly because it was considered dangerous and could kill. The clergy was strong in their opposition; they thought smallpox was God’s way to punish sinful people, and trying to prevent the malady was to interfere in God’s plans. The local populace became polarized, and angry words and threats were flying in the newspapers [14] (Fig. 3), not unlike what we see today.



Fig. 1 Dr. Zabdiel Boylston pioneered inoculations to protect Boston during the smallpox outbreak of 1721



Fig. 2 The Rev. Cotton Mather, who had heard about inoculation for smallpox from his West African servant-slave Onesimus, talked Dr. Boylston into trying the method during the epidemic of 1721

Indeed, so strong was the opposition to inoculation that Boylston had to go into hiding. Despite that, he was arrested. On one occasion, his wife and children were threatened by a hand-grenade thrown into their home. Mather also got into trouble. His home was firebombed with a message attached to the missile reading: “Cotton Mather, You Dog, Dam you, I’ll inoculate you with this, with a Pox to you.” [4].

Boylston sailed to London in 1725 to give a report before the Royal Society about the inoculations he had performed in Boston 1721 and 1722 [12]. A couple of years later, he published the results of only six deaths among 247 inoculated individuals (a mortality of 2.4%, almost ten times lower than among unprotected people) [15].

The interest for the inoculations performed in the colonies was great in the motherland. In 1759, Benjamin Franklin responded to a request from Dr. William Heberden of London for an update by reporting the results from a new smallpox outbreak in Boston in the early 1750s [16]. He reported that among 5059 un-inoculated white people, 452 had died (a death rate of 8.9%), whereas among 1974 inoculated individuals, only 23 (1.2%) had died. The corresponding mortality rates among blacks were 12.8% and 5.0%, respectively.

When it was time for the 1764 epidemic to hit, inoculation had become more accepted. Governor Bernard ordered the formation of a group of doctors to arrange for inoculation of Bostonians. *Boston Gazette* advertised on March 5 that inoculations would be available—free of charge for those who could not pay—from that day until the mid of May [3].

Hero physicians

The group of physicians offering their services, while risking their own lives, included several surgeons. Dr. Joseph Warren, a young and aspiring surgeon at the time, was one of them [3, 4]. He would later become one of the leading Patriots, calling the alarm, dispatching Revere on his midnight ride, and dying prematurely at Bunker Hill. Warren was joined in his fight against smallpox by his mentor and teacher, Dr. James Lloyd, and by Dr. Benjamin Church [17], both prominent local surgeons.

The inoculations took place in a smallpox hospital established at Castle William on a strategic island just south of Boston. The inoculated were watched “day and night” by Warren and his colleagues [3] and were not released until the last skin eruptions had healed. The time in the hospital could stretch six to eight weeks. When released, the patient was given a certificate “setting forth that such a person is so cleaned and freed from infection, as not to endanger others” [4].

John Adams, the future president, 29 at the time, traveled to Boston in April of 1764 to be inoculated [3]. This was the first time Warren and Adams met. Adams wrote to his then fiancée Abigail and described Warren as “a pretty, tall, Genteel, fair faced young Gentleman.” They would remain friends until Warren’s death in 1775.

The actions by the surgeons during the smallpox inoculation campaign of 1764 generated thankfulness and

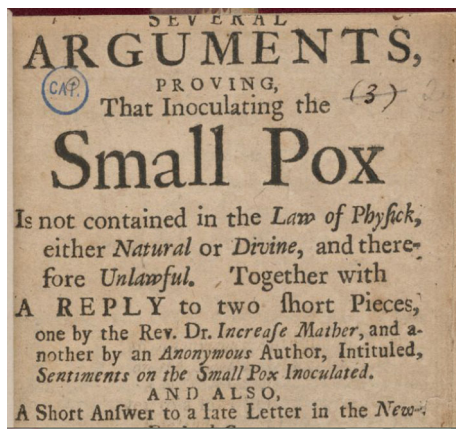


Fig. 3 The smallpox inoculations during the 1721 outbreak in Boston created headlines in the press and controversy in the society

admiration. The Bostonians declared the doctors heroes for risking their lives and providing care free of charge to those who could not afford the physicians' fees [3, 4].

Dramatic effects of the inoculations

The inoculations reduced the ravage and death toll from the “speckled monster” in dramatic ways. Historians have calculated that the case death rate was reduced from 15 to 2% during the 1721 epidemic and from 18% to less than one percent during the outbreak of 1764 [2, 3]. The inoculation saved almost 2000 lives in Boston during the epidemics of the 1700s. Despite these overwhelming results, opposition against the procedure persisted for decades, even among members of the medical establishment.

It is noteworthy that there may have been some justification to the skepticism expressed by certain individuals. In 1723, Dr. Isaac Massey of London (an outspoken opponent of the inoculations) published a letter to a colleague, Dr. James Jurin (a strong advocate of the procedure), pointing out that the death rates among un-inoculated individuals may have been much lower if they had been “treated with equal Care with those that are inoculated; but to form a just Comparison, and calculate right in this Case, the Circumstances of the Patients, must and ought to be as near as may be on a Par” [18]. In this early cry for randomization, Massey had a point; inoculations in the early days of the method were provided mainly to people from the upper classes with access to better nutrition and overall medical care than individuals from the general population. Despite Massey's concerns, time would prove that the inoculations (and later vaccinations) were indeed effective in preventing deaths from smallpox and even eradication of the disease.

The outbreak of 1775 in the besieged Boston and conspiracy theories

In 1775, it was time for the next flare-up of smallpox in Boston. The city, which at the time was occupied by the British, was under siege by Washington and his growing Continental Army [19]. During the new scourge, large numbers of Bostonians contracted the infection, but the Redcoats were spared. Many soldiers in the British army had been inoculated before leaving Europe or were immune to the disease after having been exposed to the virus during outbreaks that were more common in England than in the colonies during the early 1700s [8, 20].

Rumors were rampant that the British were plotting to smuggle infected New Englanders out of the city to spread the disease among the rebels [3]. Although some of this may have been “fake news,” the conspiracy theories scared many colonists living around Boston.

When the British finally left the city on March 17, 1776, Washington only allowed soldiers who had previously had the disease to enter the town [21]. In those days, a blood test to determine the presence of antibodies was not available, but it was enough to look the person in the face to determine if he was ready to re-enter the work place. The scars gave it away. Even Washington had pockmarks on his face as a memory of the infection he contracted during a voyage to Barbados in his youth [22].

Washington ordering mass inoculations, saving the continental army and the revolution

Despite the effectiveness of inoculations suggested by the results during the outbreaks in Boston, the society, including medical people, had a hard time to accept the facts. Washington had become convinced; however, that inoculations would be the only way to protect the army [22, 23]. It was a risky proposition because soldiers would be out of commission for weeks after the procedure, and the enemy would most certainly take advantage of the weakened rebels. In fact, because of those risks, the Continental Congress had issued a proclamation in 1776 that prohibited inoculation in the army [23].

Early in 1777, Washington had lost his patience and ordered William Shippen Jr., the Surgeon-General of the Continental Army, to inoculate all soldiers coming through Philadelphia [23]. Later, during the 1777–1778 winter camp at Valley Forge, Washington decided that all remaining unprotected soldiers should undergo the procedure [22–24]. Historians have credited these decisions as crucial for saving the army, and ultimately the revolution.

Concluding remarks

The many similarities between events during the 1700s and today's onslaught by the coronavirus are remarkable. Looking back at history during the time of a new pandemic can be comforting. Boston and the country have been there before and survived—and will do it again.

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