



Oliver Twist asking Mr. Bumble for more food. Illustration by George Cruikshank. Lordprice Collection / Alamy Stock Photo

Pediatric gunshot wounds, Charles Dickens, and *Oliver Twist*

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Treating children who have sustained a gunshot wound (GSW), unfortunately, is not a rare situation. About 20,000 children present to emergency departments every year in the United States with firearm-related injuries.¹ A recent review of the Kids' Inpatient Database found that firearm-associated orthopaedic trauma involved 96 children per 100,000 admissions, up from 73 children per 100,000 admissions in 2003.²

This increase may be related to the fact that the United States is awash in firearms. Citizens of the U.S. comprise approximately four percent of the world's population but own approximately 46 percent of the entire global stock of civilian firearms.³

A recent pediatric gunshot wound case is reminiscent of the hero of the Charles Dickens novel, the main character in the Broadway play, and the star of the 1968 film *Oliver Twist*.

Charles Dickens (1812–1870) published *Oliver Twist* in monthly installments from 1837 to 1839. Oliver was the first child protagonist in any English novel. Oliver was an orphan living under near starvation conditions in a workhouse outside of London. Older children put him up to asking the stern Mr. Bumble for more gruel (a thin porridge), "Please sir, I want some more."⁴

Oliver's request for more food was unprecedented and came as a shock to Mr. Bumble and the entire workhouse staff (as can be seen from the expression on the adult's

faces in Cruikshank's illustration. For this bold-faced defiance of authority, Mr. Bumble punished Oliver, then sold him into servitude to an undertaker. Oliver escaped from that bad situation only to fall prey to a gang of thieves led by the evil villain Fagin. During a botched home robbery, in which Oliver was forced to participate, he was shot by the butler of the home.

Although there are no accurate statistics from the early 19th century, many children, like Oliver, must have been victims of GSWs. Armies and navies used children in various noncombat and combat capacities, and many people on both sides of the Atlantic had firearms in their homes. Dickens was an astute observer and chronicler of 19th-century life, so it is likely that he either heard of, or witnessed, a child who had been shot.

Dickens relays important details about Oliver's GSW—he was shot in the left arm; the bone was shattered; he suffered extensive blood loss. Oliver's arm was useless, and after escaping his pursuers, he languished overnight in a ditch, unconscious, and exposed to the harsh elements of the British night. In the morning, Oliver was so weak that he could barely stand up, but he managed to stagger to the doorstep of the very house that he and the gang of thieves had attempted to rob the night before, and collapsed on the doorstep. Fortunately, the home belonged to the kind Mrs. Maylie (who turns out to be his maternal aunt). Unknowing of the relationship, Mrs. Maylie takes Oliver in out of kindness, and retains the brilliant and benevolent surgeon Mr. Losberne to treat the orphan.

It is interesting to reflect back to how surgeons managed GSWs when *Oliver Twist* was shot in 1838. They had no emergency medical service, body imaging, no anesthesia,

no antiseptics, no antibiotics, no blood transfusions, and no understanding of shock, post-traumatic stress, or ballistics. The first children's hospitals in the world, the Hospital for Sick Kids on Great Ormond Street in London, and the Children's Hospital of Philadelphia (CHOP) in the U.S., did not open until the mid-19th century. A common treatment for many patients with GSWs was amputation (photographs of the piles of limbs outside surgical dressing stations during the American Civil War attest to this).⁶

The French surgeon, Ambrose Paré (1510–1590), recommended abandoning the use of boiling oil to cauterize war wounds (a terrible treatment) and to amputate wounded extremities to convert a complex and contaminated wound into a simple wound that could heal by secondary intention.^{5,6} The Scottish surgeon, John Hunter (1728–1793) in his *Treatise on Gun-shot Wounds* advocated a more conservative approach to GSWs. He noted the importance of maintaining drainage, or suppuration, during the weeks after the GSW to foster healing.⁶

Oliver prospered under the care of Mrs. Maylie and Mr. Losberne. Undoubtedly, Mr. Losberne would have been proud of his successful treatment, and Dickens wrote that he went on to receive recognition and fame. It is no great stretch of the imagination to think that Losberne would want to publish Oliver's case in the *The Lancet*. The paper might look something like this, as modeled after other papers published in 1840:

The Lancet: London Monday, June 1, 1840

Essays in Surgery

Successful management of a missile injury to the extremity of a nine-year-old-boy

To the Editor of the *The Lancet*:

Not being aware of many cases of intact survival, that is without amputation, after a child had sustained a grievous wound to the extremity by a missile, I am anxious, through the medium of your journal, to inform you of a case brought to my attention in the winter of 1838. I was called upon to attend to a grievously wounded orphan of nine-years-old who had been shot in the area of his left arm. The orphan had languished unconscious, being exposed to the elements of the cold and the damp. The missile had penetrated the arm, shattered the skeletal element, and rendered the extremity useless. He had lost copious amounts of blood, and the lad was near death when first encountered. It was immediately decided not to amputate the arm based on the recommendations of the eminent Mr. John Hunter whose opinions are taken as preferable to those of the French surgeons who have

advocated amputation in such cases. The wound was cleansed with warm wine and probed in such a fashion that the ball was discovered and extracted. The extremity was splintered, and dressings were changed *bis in die*. The lad suffered terribly from fever and ague and lapsed in and out of consciousness for many weeks. He wasted much of his girth and muscle. The drainage of blood from the wound was replaced by copious amounts of laudable pus during the second and third weeks. As Mr. Hunter had recommended, the wound was kept open for drainage. Laudable pus continued to flow until the sixth week when the wound delivered smaller amounts of serosanguinous discharge. By the eighth week, all discharge had ceased. Three months from the time that the lad had been shot, he was able to demonstrate movement of the extremity without a single cause for concern. I believe that it is reliable to attribute the success of this case to the resistance to amputation, to the satisfactory extraction of the ball, and to the strict splintering and dressing changes as advocated by other correspondents to this esteemed journal. I further submit that of importance to the satisfactory resolution was the care given to his daily bodily comforts and to the administration of adequate nutrition and fluids during his prolonged convalescence.

Respectfully submitted Mr. Losberne, Surgeon,
Chertsey, London

As an aside, one might wonder why surgeons were called "Mister" in Great Britain. The answer lies in the history of English medical education. Traditionally, physicians were gentlemen, whose families could afford to pay for a university education where they mostly listened to lectures on medical theory, and at graduation they received a medical doctorate degree, permitting them to be addressed as "doctor." Those aspiring to be a surgeon were usually from a more economically disadvantaged background and received less formal education. They served as an apprentice, like other tradesmen, and after passing an examination they received a diploma. Without a university degree, surgeons were addressed by the less distinguished title of Mister.

After the field of surgery came of age, the pragmatic surgeons were eager to be distinguished from the theory-oriented physicians, so they chose to keep the title Mister as a badge of honor.⁷

Modern weapons

Today weapons and GSWs are classified by the speed of the bullet when it leaves the muzzle of the weapon—either low, medium, high, or hyper-high velocity. The muzzle



A 1830 caplock pistol with a muzzle velocity of 850 feet/second.
INTERFOTO / Alamy Stock Photo



Glock handgun. Tony Watson / Alamy Stock Photo



Low velocity gunshot wound to the leg that shattered the bone but did little soft-tissue damage. Photo courtesy of author.

velocity of the bullet is important because it determines the amount of damage done by cavitation as the bullet passes through the tissues. The higher the velocity, the greater the damage done to the tissues.

The GSW sustained by Oliver in 1838 most likely came from a caplock pistol, a low velocity weapon that was popular in London at the time. Dickens writes that there was, “a flash—a loud noise—a smoke” which is consistent with the firing of a caplock.⁴ That means that Oliver’s arm sustained minimal cavitation damage, improving his prognosis.

A recent pediatric patient also sustained a low-velocity GSW that shattered the bone but did little soft tissue damage. Although the exact weapon is unknown, most likely it was one of the more popular handguns such as the Glock.⁸

The Glock is a polymer framed, semiautomatic pistol that was invented by the Austrian engineer Gaston Glock in the early 1980s. It is light weight, easily concealed, with a muzzle velocity of 1,230 feet/second (low velocity,) and can be purchased for approximately \$250 on the Internet.

Post-traumatic stress

Both Oliver and the recent pediatric patient were fortunate to recover from the direct physical effects of the GSW, but both struggled with post-traumatic stress.

Oliver endured more trials and tribulations and eventually was rescued from his horrible social situation. It was the kind and gentle Mr. Brownlow who adopted Oliver and helped him reunite with his Aunt Maylie. Mr. Brownlow eventually remembered that he had prior knowledge of Oliver’s father, and helped Oliver recover his portion of a fortune from his father’s estate. All lived happily ever after in a country estate outside London.

Interesting to think of what would happen if Oliver had been shot in 2020. The following is a hypothetical vignette, not to trivialize the impact of GSWs on children which is physically and emotionally huge, but to highlight how far the medical and social management of trauma has progressed in the last 150 years.

Imagine that modern-day Oliver is discovered on the doorstep of a home. The occupants of the home

immediately call 911, and the dispatcher sends the city's paramedics who arrive quickly. They do their Airway, Breathing, and Circulation evaluation, administer oxygen by nasal cannula, start intravenous fluids, and rapidly transport Oliver to the local Level I pediatric trauma center.

Seven minutes after the 911 call, Oliver enters the trauma bay, unresponsive, hypotensive, with shallow breathing. The trauma team descends upon the wounded boy in an amazing orderly fashion.

He has a peripheral pulse detectable only by Doppler. He gets a large bore intravenous cannula, he gets a transfusion of whole blood, he gets vasopressors and intravenous antibiotics, and they insert a Foley catheter. Compression dressings control the bleeding from the GSW.

After the initial resuscitation, Oliver begins to regain consciousness. He reveals some of the details of the unfortunate event, and mentions his social situation, and he gets a tetanus shot. Volume replacement improves his vital signs as well as his sensorium. The trauma team does a secondary survey and documents a normal neurovascular status.

The orthopaedic chief resident re-examines the extremity, reviews the images, and makes the diagnosis of a stable isolated comminuted fracture with retained metallic fragments. She calls her attending, they review the images over a secured Internet site, and decide that Oliver does not need surgery.

The chief resident applies a posterior splint that permits access to the wound for dressing changes. She leaves the trauma bay and returns to the emergency department to evaluate a 15-year-old soccer player with knee pain after being slide tackled.

The next morning, the social worker gets involved, and in few days locates a foster family who welcomes the homeless boy into their home. Oliver leaves the hospital in a cast, with an appointment at the outpatient clinic, and the possibility of a new life under the care of his court-appointed foster parents.

It is not unreasonable to think that his foster parents fall in love with Oliver. They decide to adopt him. Eventually, Oliver's mother, a tech savvy entrepreneur, encourages him to join 23andMe and to send off a saliva sample for genetic analysis. Three months later, the results are posted online, and both Oliver and his Aunt Maylie, who independently had sent in her sample, discover the match and reconnect. After weeks of joy and celebration, Oliver's foster father, who happens to be a forensic accountant, discovers Oliver's fortune in Apple and Google stocks. All live happily ever.⁹

Surgeons often despair that as a society we remain the same in 2020 as we were in 1987, 33 years ago, when

Nelson et al., wrote that, the firearm is so ingrained in the American experience that one must conclude "gunshot injuries and fatalities are simply a part of the cost of living in America today."⁹

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