

Antisepsis and women in surgery: Transitions in Eakins' paintings



The Gross Clinic, by Thomas Eakins, 1875.

Photo by Geoffrey Clements/Corbis/VCG via Getty Images



The Agnew Clinic, an 1889 oil painting by American artist Thomas Eakins.

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The *Gross Clinic* (1875) and *The Agnew Clinic* (1889) by Thomas Eakins (1844–1916) face each other in the Philadelphia Museum of Art, in a hall large enough to accommodate the immense canvases. The subdued lighting in the room emphasizes Eakins's dramatic use of light. The dark background and black frock coats worn by the doctors in *The Gross Clinic* emphasize the illuminated head and blood-covered fingers of the surgeon, and a bleeding gash in pale flesh, barely recognizable as a human thigh.

Across the room, the entire canvas of *The Agnew Clinic* seems to glow, the surgeon and his assistants all in white. The patient, a woman, is placid under anesthesia, her healthy right breast in full view. Unlike the companion piece, surgery is hidden, the only evidence being small splatters of blood on linen and the surgeons' gowns.

For the viewer, especially a surgeon, the paintings are breathtaking images of the past and future of surgery. Eakins's message is clear: "We are now iconographically in the age of Lister,"¹ writes Gert Brieger (AOA, David Geffen School of Medicine at the University of California;

Los Angeles, 1986, Alumnus), emeritus professor of history of medicine at Johns Hopkins, referring to Joseph Lister (1827–1912), pioneer in the use of antiseptics in surgery.

The interpretation fits so well that each surgeon risks being consigned to a period of surgery to which neither belongs; Samuel D. Gross (1805–1884), to the dark age of surgery, patients screaming during operations performed without anesthesia, and suffering slow, agonizing deaths from hospital gangrene, and D. Hayes Agnew (1818–1892), to the modern era of aseptic surgery. In truth, Gross was an innovator on the vanguard of surgical practice. Agnew, as lead consultant in the care of President James A. Garfield after he was shot in 1881, had been denounced because antiseptics had not been used.

Appropriate to his prominence in American art, Eakins' scholarship covers all aspects of his artistry, antecedents, and influences. Receiving less attention are the subjects themselves, two of the foremost surgeons of their time. Why were surgeons immortalized by the greatest American artist of the 19th century? As Brieger notes, the two portraits span the era of antiseptic surgery, one of the great advances in medicine.¹ Eakins, a master of Realism, perceived another trend that would forever change the field: The entry of women in surgery.

A comprehensive book on Eakins and *The Gross Clinic* is *Thomas Eakins: The Heroism of Modern Life*, by Elizabeth Johns, art historian at the University of Pennsylvania.² Sidney Kirkpatrick, a bestselling author, has a more recent biography of Eakins, *The Revenge of Thomas Eakins*, with added background on *The Agnew Clinic*.³ The definitive biography of Eakins and his works remains Lloyd Goodrich's two-volume *Thomas Eakins*.⁴



Samuel D. Gross, MD, circa 1875. PD-US-expired

Samuel Gross, MD

Gross was one of the few American physicians with an international reputation.⁵ He was brought up on a Pennsylvania Dutch farm near the Lehigh Valley town of Easton. He attended school in a log cabin, and read the Old Testament. After a frustrating experience trying to learn medicine from one of Easton's practitioners, he absorbed himself in study at private academies in Wilkes-Barre and Lawrenceville, New Jersey.

He discovered an aptitude for languages, polishing his German and English, then mastered Latin, Greek, French, and enough Italian to read technical articles. After an unsatisfying apprenticeship under an indifferent doctor, Gross enrolled at Jefferson Medical College in 1826 as a student in its inaugural class.⁶

From the beginning of his career, Gross was devoted to academic publication. During his first years in practice he translated texts on anatomy, obstetrics, typhus, and operative surgery from the original French and German, and authored a text on the diseases of bones and joints. Dissatisfied with his practice in Easton, in 1833 Gross found work in Cincinnati, first at the Medical College of Ohio, then two years later at the short-lived Medical Department of the Cincinnati College as chair of pathological anatomy.

Passionate in his study of anatomy, he spent hours every day dissecting both normal and diseased bodies. At both Easton and Cincinnati, he received specimens and bodies from colleagues who knew of his interest. He published his findings in 1839 in the two-volume work, *Elements of Pathological Anatomy*, the first work on morbid anatomy in English. Immediately popular, Gross's text went into three editions before it was made obsolete by the development of microscopic pathology in the 1850s.⁶

A national and international figure at 34 years of age,

medical schools across the United States came to Gross with offers of professorships. He accepted two: the first at the University of Louisville in 1840, then his alma mater, Jefferson Medical College, in 1856. At the latter, he wrote two more widely influential texts: in 1859, the first of what would be six editions of the comprehensive textbook, *System of Surgery*;⁷ and in 1861, *Manual of Military Surgery*, used by both sides in the Civil War.

His clinical reputation rested on conservative surgery, the approach of avoiding amputation, specifically in osteomyelitis.¹ If the child survived the acute infection, removal of devitalized bone hastened healing and allowed the regeneration of the remaining bone, thereby preserving a functional limb.⁷ This was the operation that Eakins portrayed in *The Gross Clinic*.¹ When antibiotic therapy cured osteomyelitis without surgery, conservative surgery became obsolete.

Gross led the American Surgical Association in 1880, the first professional organization in the U.S. devoted to the advancement of surgical science. He was its first president.¹ Today, the association continues as the leading academic forum in the field.

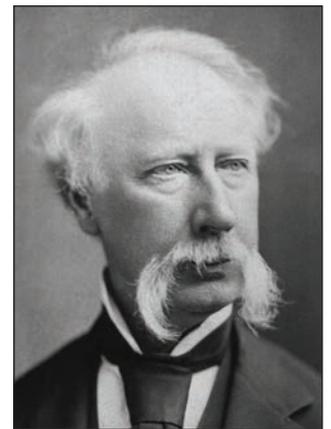
D. Hayes Agnew, MD

Thirteen years junior to Gross, D. Hayes Agnew was also in Philadelphia, at the University of Pennsylvania School of Medicine. In contrast to Gross' modest background, Agnew's family was prominent in Lancaster County, Pennsylvania, able to trace its lineage through four centuries of landed gentry in Scotland to 13th century French nobility.⁸

At 18-years old Agnew attended medical school at Penn following in the footsteps of his father, also a physician and Penn graduate. In 1848, he taught at the Philadelphia School of Anatomy, a private facility.⁸

He joined the University of Pennsylvania in 1862, attaining the top rank as professor of surgery in 1871. He published the textbook, *Principles and Practice of Surgery*, that had two editions—1878 and 1889.

At the apex of his career Agnew was called as the lead consultant to assist in the care of U.S. President James A. Garfield after he was shot in the flank on July 2, 1881. In the early morning hours of July 4, a special train sped Agnew from Philadelphia to Union Station in record time.⁸ The President, in hypovolemic shock, had undergone repeated



D. Hayes Agnew, MD, circa 1890. PD-US-expired

probing of his wound for the bullet by his primary surgeon, the surgeon general of the Navy, then by both Agnew and his fellow consultant, Frank Hamilton of New York. The group decided not to operate after Garfield appeared to rally later that evening.⁸

The President began to die a slow, agonizing death from sepsis, two subsequent operations doing little to slow his deterioration. Death came on September 19, 1881, two-and-a-half months after he was shot. Postmortem examination found a ruptured splenic aneurysm as the terminal event. The bullet was nearby, encysted, adjacent to a non-healed fracture of the first lumbar vertebra. Pus had tracked from there through the retroperitoneum to the groin.⁸

Daily bulletins on Garfield's condition were on the front pages of both the lay press and the medical newsletters.⁸ Fascinated by the drama of a President's life in the balance, the public became familiar with arcane medical jargon.

The debate intensified after Garfield died. Were the President's wounds necessarily fatal? Was his care botched? Charles Guiteau, Garfield's assassin, and his attorneys tried to take advantage of the second-guessing. "We admit the shooting of the President," they said in court, "not the killing."⁸

A major issue was whether the President's infections could have been prevented had antiseptic precautions been taken. William Hammond, surgeon general during the Civil War, argued that the bullet should have been removed within 48 hours of injury under Listerism.⁹ John Ashhurst, Jr., Agnew's colleague at Penn and a Civil War surgeon, defended his associate and claimed that carbolic acid would have done more harm than good.⁹

The Garfield case gave Agnew unwanted notoriety. Through it all, he tried to maintain "a dignified silence,"⁸ but was shaken by the furor. His colleagues and students continued to admire him. His nickname in his later years was "the Dear Old Man,"¹⁰ a sobriquet made more meaningful by the name of its originator, Samuel W. Gross, son of the great surgeon.

Thomas Eakins

A pariah, Eakins "is considered the finest portrait painter our nation has ever produced."³ His father's wealth allowed him "[to never have] to depend on painting for a living."²

High school courses in human anatomy gave Eakins early contact with Philadelphia's surgeons. He might have aspired to become a surgeon as a medical student at Jefferson, but his father's influence diverted him toward the fine arts.³ He was close to Jefferson's surgeons who taught the anatomy courses at the Pennsylvania Academy of the Fine Arts where he studied from 1862 to 1865. He attended their lectures,

dissections, and surgical operations, including some by Gross. He likely did the same at Parisian medical schools when he was at the École des Beaux-Arts from 1865 to 1869. When he returned stateside in 1870, he was a prosector at the Academy under another Jefferson surgeon, William W. Keen (AΩA, Sidney Kimmel Medical College, 1903, Honorary).¹

For Eakins, knowledge of anatomy was as essential to painting as it was to surgery. "To draw the human figure," he said, "it is necessary to know as much as possible about it, about its structure and its movements, its bones and muscles, how they are made, and how they act."¹

His career had a slow start. He saw opportunity when plans for a world's fair in Philadelphia were announced, a celebration of the 1876 centennial of the Declaration of Independence. In spring 1875, fair officials called on artists to submit their best work as part of a juried exhibition of American art. Most artists chose to show their older pieces.⁵

Eakins chose Gross, one of the most prominent surgeons in the world. He dashed off an initial study that included all of the compositional elements of the final painting.⁵

The selection committee rejected *The Gross Clinic* as simply too shocking for the public. Thanks to the intercession of Gross, the painting was shown at the fair, but it was relegated to a corner of an unimaginative recreation of a military hospital ward.³

New York critics continued the opprobrium of his *magnum opus* when it was shown in the city three years later. Said one, "[The] scene is so real that they might as well go to a dissecting-room and have done with it."¹¹ To the *Times*, Eakins had no justifiable artistic motive to include the mother, "who covers her face and by the motion of her hands expresses a scream of horror."¹¹

In 1877, Eakins started a tumultuous nine-year term teaching at the Academy, which culminated in his dismissal in 1886 when he stripped the loincloth off a male model in a women's life drawing session. Ostracized by the Philadelphia art establishment, he went into a deep depression. In spring 1889, the Penn graduating medical class raised funds to offer Eakins a commission of \$750 (nearly \$20,000 today) to paint a commemorative portrait of Agnew to mark his retirement as professor. Inspired, he saw the prospect of a large companion piece to *The Gross Clinic*. He accepted the job on the condition that he could



Thomas Eakins, *Self-Portrait*, 1902. National Academy Museum, New York



Joseph Lister, MD, 1902.
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Lister carbolic acid sprayer. The College of Physicians of Philadelphia Digital Library, accessed February 20, 2019, <https://www.cphpdigitallibrary.org/items/show/2596>

paint a grand composition on the scale of *The Gross Clinic*.⁵

The unveiling would be at Penn's commencement ceremonies on May 1, rechristened "Agnew Day" in his honor. Eakins pushed himself over three months to finish the painting, laboring the final 96 hours day and night.³ Once, he was found asleep on the floor at the foot of the canvas.⁴ At one of the most memorable commencement exercises in medical history—William Osler, who was leaving Penn for Johns Hopkins, gave the valedictory speech *Aequanimitas*¹²—the portrait was unveiled to a "deafening clapping of hands."⁸

Despite its reception at Penn, the painting was rejected for shows in Philadelphia and New York. However, Chicago's 1893 World Columbian Exhibition displayed both clinic paintings in its main exhibit hall.

Art critics and the public were no more accepting of explicit images of surgery than they were in 1876. "[Mere] excuses for depicting the horrors of the dissecting table," wrote one. "[Most] reprehensible,"³ wrote another.

Weda Cook, the contralto immortalized in another Eakins masterpiece, *The Concert Singer* (1890–1892), described the effect of the rejection of *The Agnew Clinic*. "They call me a butcher," Eakins said, tears in his eyes, "and all I was trying to do was to picture the soul of a great surgeon."³

Antisepsis and asepsis

Temporally on opposite ends of the antiseptic era, the clinic paintings depict the diametrical responses to antisepsis. Before Joseph Lister, surgeons struggled with the problem of hospital gangrene, devastating wound infections that killed half its victims.¹³ From the research of Louis Pasteur, the French chemist who discovered that airborne organisms soured milk and spoiled wine, Lister

believed that microbes in the air were responsible for infecting open wounds. In 1865, he reasoned that dressings soaked in a carbolic acid solution, a chemical used to deodorize raw sewage in Carlisle, might be similarly effective in killing microbes after surgery.

He became convinced that he had solved the problem of hospital gangrene when only two of 11 patients with compound fractures so treated died, a rate of only 18 percent, for an injury with a mortality of 50 percent.¹⁴ In 1871 he began to spray carbolic acid over the surgical field.¹⁵ The atomizer that produced the mist became the icon of "Listerism," the term used to describe the carbolic acid solutions, poultices, and sprays he used in surgery.

However, skeptics soon emerged. Lister was constantly tinkering with his system, making it complicated and difficult to employ. Many doubted its effectiveness. James Simpson, professor of midwifery in Edinburgh and famous for the introduction of chloroform anesthesia in Britain, found hospital gangrene to be a problem of large urban hospitals, not facilities in rural communities, and least of all among practitioners who practiced in patients' homes.¹³ Lister's *bête noire* on antisepsis, R. Lawson Tait, performed more than 100 ovariectomies during the 1870s without an infective death, without using antiseptics.¹⁶

Lister battled back. Failure to duplicate his results, he said, was because his exacting procedures were not followed. Under his system, hospital gangrene had disappeared from his service. Moreover, it allowed relaxation of many of the traditional strictures against overcrowding and routine cleaning.¹⁷ Visitors noted "a great want of general cleanliness" on Lister's wards. However, Lister continued to perform surgery wearing his soiled frock coat into the 1870s.¹⁸

It took only a few months after Lister's 1867 publication before carbolic acid was tried in America by surgeons who heard about it in the British medical press and among young surgeons who trained with Lister in Glasgow.¹⁹ The debate over Listerism crossed the Atlantic. Gross, the voice of the American establishment, dismissed it. "Little, if any, faith is placed by any enlightened or experienced surgeon on this side of the Atlantic in the so-called carbolic acid treatment of Professor Lister,"²⁰ he wrote. He suggested covering wounds with oil would be a better treatment, because it would exclude air from coming in contact with the wound. Gross's patients paid the price for his obstinacy. In 1882, his mortality figures were alarmingly similar to those seen in pre-Listerian Edinburgh and

London—for herniotomy, 47.6 percent; for amputation of the thigh, 42.8 percent.⁷

Agnew embraced the new approach to surgery. In his 1878 text he gave a practical explanation for trying it: “Whether the germ theory of suppuration be correct or not, no harm can come of giving the patient the benefit of a doubt in using the antiseptic precautions of Mr. Lister.”²¹ He also wrote:

[The] success has been so much more satisfactory than that obtained by the ordinary plans, that to decline the use of antiseptic dressing would be, in my judgment, to withhold from a patient the benefit of one of the most important resources of the art.²¹

This makes his eschewing antiseptics in the Garfield case three years later even more perplexing. Perhaps chastened by the experience, the 1889 edition of his book shows a complete devotion to Listerism, which he mistakenly calls asepsis. He wrote:

The great advance, that which constitutes the most notable surgical feature of the century, is the doctrine of asepsis, based on the presence of microorganisms as the leading cause of inflammation and its products.²²

His enthusiasm perhaps caused him to overlook the discovery of anesthesia in 1842.

Asepsis was coined by Gustav Neuber in 1886 to describe a strict regimen of sterilization, sterile procedure, and anti-contamination motivated by the findings of Robert Koch (1843–1910). Asepsis proved the next advance in the control of surgical infection. Agnew’s practice, thoroughly Listerian, was a step behind. It was simply too soon, before rubber gloves (Halsted, 1889),²³ wide adoption of superheated steam to sterilize instruments and linen (Koch, 1881),²⁴ and the publication of authoritative texts by Curt Schimmelbusch and Carl Beck that codified aseptic surgical procedures derived from direct bacteriological research (1894 and 1895, respectively).^{25, 26}

Notwithstanding the imagery of *The Agnew Clinic* as the future of surgery, Agnew was far behind in the use of surgical gowns. From a survey of 1,000 historical photographs of surgical operations, Lu Wang Adams, an anesthesiologist at Wake Forest University, determined that 50 percent of surgeons were wearing gowns by 1876.²⁷ A decade later, an 1886 photograph shows the professor and

his assistants still in black frock coats.¹⁰

Agnew’s hands in his portrait are nearly spotless, making it appear as if he is wearing gloves. His hands are, in fact, bare. Once the viewer accepts the painting as a monument to asepsis, the error is easily made.²⁸ Eakins reluctantly acceded to the professor’s demand that his image be free of blood, although the artist sneaked small drops on his gown and a reddish stain over the midriff from leaning against the field.³

Women in surgery

A woman in *The Gross Clinic*, consistently identified in Eakins scholarship as the mother, hides her face and contorts her arms and hands in an involuntary spasm of horror. Kathleen Foster, curator at the Philadelphia Museum of Art, says that she is a stand-in for the lay viewer who does not have the knowledge, training, or standing of Gross and his assistants.⁵ The intensity of her reaction contrasts with the dispassionate activity of the assistants in the foreground, and the shadowy figures in tiers behind the main figures—all male.

In *The Agnew Clinic*, a woman stands in the group performing surgery to the right. Her white apron identifies her as a full participant. She is engaged, not cowering in the corner. She is the compelling figure on the right side of the canvas, balancing Agnew on its left.⁵ She is the only woman, aside from the patient, and her face is the only one that is uplifted so we see all her features, aside from Agnew’s.²⁸ She is poised and her demeanor is placid. Her nurse’s hat evokes Athena’s helmet.

Amy Werbel, art historian at the State University of New York

Fashion Institute of Technology, notes that the nurse is a pronouncement of the arrival of women in surgery.²⁹ The nurse is Mary Clymer, enrolled in the Training School for Nurses at the Hospital of the University of Pennsylvania in 1887, its second year of operation. An intelligent young woman, she won the school’s Florence Nightingale award as first in her class of 1889.

No details are given as to how she learned her role as a surgical scrub nurse, but according to Werbel, “she was among the first, if not the very first, nurse to perform specialized duties in the surgical amphitheater.”²⁹ “Allowed to prepare table



for operation,” the student wrote in her notes, “Saw and assisted with two operations. Saw...diseased bone removed without much loss of blood and prepared antiseptic dressing for wound.”²⁹

Charles Rosenberg, professor of history of science at Harvard University, writes that women as “nurses made hospital practices possible.”³⁰ It is impossible to consider any surgical history without considering the contribution of nurses, say Julie Fairman and Patricia D’Antonio, historians at the University of Pennsylvania. “Nursing [is] not a separate part or subsection of medical history, but rather one that is deeply embedded in the relationships and social order of clinical practice.”³⁰

For the field to develop, surgeons needed women working as surgical nurses who could deal with the demands of complex instrumentation, sterilization procedures and autoclaves, and the demands of increasingly complicated operations. Amputation knives and saws gave way to finely tooled forceps, probes, dissecting scissors, and clamps, each specific for its task. Assistants were valued less for their brawn to hold unanesthetized patients down, and more for quick-witted intelligence in providing the correct instrument for each step of complicated operations, and diligence in making sure they were properly cared for and ready for the next case.

Eakins captures the tangible evidence of the necessity of the surgical nurse. Surgical instruments in *The Gross Clinic* lie in a wooden case to the surgeon’s right. They are at odd angles because they have been used and dropped there at random.

To Agnew’s left in *The Agnew Clinic* is a closed metal case that one supposes to contain instruments. Except the ones in the surgeon’s hands, instruments are not seen. Barely seen between the nurse and the surgeon’s left elbow is the corner of a metallic surface, probably the tray of instruments. Eakins captures a slight furrow in Clymer’s brow that reveals her concentration. A close look at her eyes shows that she is not looking off in some middle space; she is focused on the surgical field. She is an engaged participant, anticipating the next step of the operation.

Agnew had to overcome his virulent sexism. J. William White, a successor to Agnew’s professorship at Penn, remembered:

He never approved of the co-education of the sexes, nor of the medical education of women under any circumstances, believing that any possible advantages to them were far more than counterbalanced by what he thought would be the inevitable loss of dignity and delicacy resulting from the

association of the sexes under such conditions and from the character of their studies.¹⁰

In fact, he had a quite restricted view of the education of women:

He was never an advocate of what is now called the higher education of women in any direction. He admired the domestic virtues, and at one of the last dinners he ever gave, remarked that a woman should be taught housekeeping, hygiene, and belles-lettres. After that, he said, the more she knew the worse off she was.¹⁰

Eakins believed that a woman could not achieve greatness as an artist, even though he attended the Academy alongside Mary Cassatt, and served as director of its school when Cecelia Beaux, the highly successful portrait artist, was a student there.³ Despite his bias against female artists, he insisted that women have equal access to the curriculum and resources of the facility to fully develop their talent.⁵

Protection from harm

In their current installation at the Philadelphia Museum of Art, the facing canvasses create a space with special resonance for surgeons. A surgeon in Tulsa has reproductions of both framed in his office. Another in Sayre, PA, remembers being inspired by *The Agnew Clinic* every day as he walked to class at Penn. A chief of surgery at a children’s hospital in Philadelphia recalls the spectacular presence of *The Gross Clinic* at Jefferson during his time on faculty.

However, the vast majority of viewers of the paintings are not surgeons. The operation irresistibly becomes the focus, uncompromising in its depiction of blood, with violence implied by spatters of red on the surgeons themselves. It is disturbing to see a swarm of men armed with



Mary Clymer, 1889. Gift of Clymer family via Isabella Stainsby Harrison. Alumni Association of the Hospital of the University of Pennsylvania School of Nursing collection, Barbara Bates Center for the Study of the History of Nursing, School of Nursing, University of Pennsylvania

knives, forceps, and retractors. There are rows of spectators, all men, evoking the understandable discomfort of being naked in public, a vulnerability emphasized because the patient in *The Agnew Clinic* is a woman, the operation is a mastectomy, and one man is actually draped over the unconscious female body.²⁹

The women in the paintings therefore have an important role. The mother in *The Gross Clinic* shows the natural fear of the lay viewer. In *The Agnew Clinic*, the nurse embodies calm and competence. Along with antisepsis and the integration of women in the field, there is a third transition in Eakins's clinic patients. There is someone devoted to protect the patient from harm, a core concept of medical professionalism.

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