

## A Clinician's Rationale for the Study of History of Medicine

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### Original Article

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**Abstract:** History of medicine does not receive the coverage it deserves in medical school curricula, or during graduate medical training, in part, because of its lack of impact on direct clinical care. This is particularly disturbing for the specialty of anesthesiology not only due to its colorful history, but also because ours is the only major medical discipline to have developed entirely in the United States. We examine four commonly cited reasons for the study of history in general, and comment on whether these lessons are applicable to medicine and anesthesiology. We provide compelling reasons why studying history is important to clinicians.

**Background:** Humans are the only species to be aware of their past. Our future is largely unknown, and the present is fleeting. Thus, almost everything that is known with certainty falls within the realm of history. Thus one would expect society at large, and physicians and anesthesiologists in particular, to be history enthusiasts. As the facts suggest otherwise, one wonders whether history is regarded much like art, music, and fine cuisine – more adornment than an essential and integral part of education in any discipline, especially medicine.

Among other elements that comprise the discipline, history writing can be considered a narrative of words, deeds, ideas, conflicts and sufferings from the past that have been subjected to verification.(1-4) Students of history interpret these events to learn causality as well as their importance. As our world becomes increasingly dependent on science and technology, as the body of literature in every field explodes in quantity, and as specialized skills are required in almost every occupation, an existential question emerges – is there a need for someone working in the sciences to be familiar with history? The question is particularly important in the field of medicine in view of the commonly held belief that historical study rarely brings about a change in current practice. We examine some reasons commonly cited in support of the study of history, in order to determine whether these societal benefits can be extended to science in general and to medicine in particular.(5)

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## I. Learning from the past

This is perhaps the most commonly offered reason and its logic appears to be infallible. It is one of many aphorisms by Jorge Agustin Nicolas Ruiz de Santayana y Borrás, also known as George Santayana (1863-1952), and he wrote '*Those who cannot remember the past are condemned to repeat it.*'(6)

The history of religious communities, rulers, and nations provides scant evidence that we avoid mistakes from the past. More people have died as a result of religious differences than a desire by a nation to expand its territory. Suppression of human rights and undemocratic rule by despots and totalitarian regimes continue into modern times and offer ample evidence of man's inhumanity towards man. Separation of power between state and religious institutions is not the norm in the majority of nations, and even in secular states, religious conflict and intolerance are far too common.(7;8) The world of economics and finance shows many instances of speculation followed by downturns. Rome,(9) Great Britain,(10) Nazi Germany,(11) and the Soviet communist empire(12) have risen and fallen, and historians believe that failure of leadership, greed of the ruling classes, and over-reach play a major role in the fall of an invincible empire.

In science and medicine existing information builds on previously established principles. New findings may alter our approach and understanding, and these remain the hallmarks of the scientific method of observation and experimentation. Astronomers find new planetary systems and Pluto is no longer considered a planet.(13) Exploration of Martian terrain suggests the presence of water and the existence of extraterrestrial life.(14) The wave theory of light has been revised in quantum physics,(15) and hypothesized subatomic particles have been documented to exist.(16) In perioperative medicine, a topic beyond the scope of this article, we have learned to improve techniques to avoid perioperative infection, obtain optimum control of comorbidities, use prophylactic agents to prevent cardiovascular complications, as well as take measures to decrease postoperative pain and reduce the risk of nausea and vomiting.(17)

One major lesson from the controversy about credit for the discovery of anesthesia is the importance of publishing one's findings promptly. This is exemplified by the difficulty Crawford W. Long experienced in gaining recognition for his contribution. Publishing an article in 1849, seven years after having successfully used ether for a general surgical procedure, did irreparable harm to his claim, suggesting that the idea of publishing his results may have come as an afterthought.(18)

The introduction of curare in 1954 led to many changes in anesthetic practice, especially controlled ventilation with a secure airway. A classic article teaches us the importance of clearly identifying cause and effect. It was suggested that patients who received neuromuscular blockers had a higher mortality rate.(19) This did not make sense, and clinicians later realized that patients received neuromuscular blockers while breathing spontaneously during maintenance anesthesia via mask. Had the patients received general endotracheal anesthesia, the relatively benign nature of the neuromuscular blockers would have been evident.

Prior to Ether Day, William Thomas Green Morton had successfully anesthetized Eben H. Frost on September 30, 1846.(20) Ether had been administered during the evening hours, on a rainy

day, with illumination provided by an open flame. The warm, humid environment and removal of ether from the vicinity may have avoided a fiery outcome, but fires and explosions from ether occurred on a regular basis for the next century. It is difficult to explain why it took so long to recognize the importance of this deadly hazard.(21) The likely explanation was that the events remained infrequent, perhaps due to adequate ventilation, high humidity, or removal of the ether container from the operating field.

The risk of postoperative myocardial infarction in patients who had suffered one within the preceding 6 months was extremely high in the 1970s. Mortality after a postoperative myocardial infarction in these patients approached 50%.(22) Anesthesiologists and surgeons were extremely reluctant to perform non-emergent operations on such patients. As applied myocardial physiology came to be better understood over the subsequent decades, intensivists have now learnt that it is not the interval from the previous myocardial infarction that matters, but how well the myocardium is protected or revascularized.

## **II. Document outstanding events from the past, and attribute credit accurately.**

Recordings made while events occurred, especially when more than one point of view is expressed, provide details about what happened, allow clear identification of roles played by individuals, and help us understand how the present has emerged from the past. Opinions and observations from individuals with differing viewpoints, affiliations, and motives help scholars ascribe credit appropriately.

In the absence of written documentation and historic images, we are forced to rely on the vagaries and inaccuracies of oral tradition. While oral tradition plays an important role in many matters related to preservation of culture, its role in historic documentation is limited due to the possibility of errors introduced by subsequent generations or narrators. This is particularly important if the only version of events is perpetuated by oral tradition. Mythological epics from many countries began in the oral tradition and it is virtually impossible to determine whether any of these individuals ever existed. On the other hand, the written tradition begun by early historians such as Herodotus(23) and Thucydides(24) allow scholars to subject their written accounts to scrutiny and allow for an accurate depiction of events that occurred in the past and the roles played by many individuals. We can infer what caused the success or failure of military expeditions, the reasons for revolts and revolutions, the reasons why explorers travelled to the far corners of the world, as well as how religious and societal practices and values have evolved over time.

The absence of documentation prevents us from determining whether Hippocratic tradition is the result of efforts of one individual, or if it reflects a school of thought. Likewise, many ancient Indian and Chinese medical practices are difficult to attribute to one individual or era, since, in some instances names ascribed to individuals are later found to be titles conferred by authorities. Several prominent physicians have been addressed by the same name, sometimes separated by centuries.(25) Verifiable recordings of contributions by all individuals who participated in the discovery of insulin will allow historians to ascribe credit for its discovery accurately.(26) Examination of experimental data or the lack thereof, allows detection of scientific fraud. A re-examination of Mendel's experimental findings by noted statistician Sir Ronald Fisher suggests

that his data may have been fabricated.(27) The controversy about the discovery of anesthesia remained unresolved during the lifetimes of the claimants, but is more easily settled precisely because the names, places, and dates of primary events are accurately known. Humphry Davy deserves credit for first suggesting that nitrous oxide possessed analgesic properties. William Edward Clarke should be credited with the first use of ether for a dental procedure, while Crawford Williamson Long deserves credit for the first use of ether during general surgery. Horace Wells deserves credit for the first use of nitrous oxide during dental surgery. Charles Thomas Jackson deserves credit for suggesting to William Thomas Green Morton that ether might be used as an anesthetic, while Morton deserves credit for conducting experiments on ether, demonstrating its efficacy publicly, and for spreading word about its efficacy throughout the medical community.(28)

### III. Nature of Change and Progress

Many aspects of societal, cultural, and scientific change are part of a continuum, such that the past blends into the present, just as the present inevitably blends into the future. Cultural and societal trends and preferences change over time, and may even exhibit cyclical change as evidenced in economic indices. Political, individual, and religious emancipation have undergone slow and steady progress, yet major geographical differences persist. Slavery, poverty, hunger, suppression of religious and personal freedom are assumed to be problems of the past in many countries, but the absence of these remains a distant hope for most of humanity.

History teaches us that while many aspects of our daily living change over time, human nature doesn't. Ambition, greed, and the need to dominate and control others are primal characteristics that have not undergone any perceptible change over millennia. Inertia, acceptance of the status quo, and vested interests of those in power are major factors that resist change. The evolution of modern western society owes its beginnings to widespread educational and economic opportunities. Individuals and institutions that wield power rarely give it up voluntarily.

Advances in science and medicine clearly progress in a stepwise manner as knowledge from the past guides practice, research, and development. The role of powerful institutions in suppressing scientific and medical advances is exemplified by the resistance of the Church in accepting the heliocentric view of our planetary system,(29) and in resisting treatment of pain during childbirth.(30) The extent to which religious objections suppressed use of labor anesthesia is not known, but acceptance was greatly advanced after Queen Victoria accepted chloroform during the birth of Prince Leopold in 1853. Sir James Y. Simpson also cleverly used Biblical passages to suggest that God was the first anesthetist when Adam was put to sleep during the creation of Eve.(31-34)

Some changes follow a steady linear progression, as with lessons from the germ theory of disease, antibiotic resistance, immunization, preventive health, screening for detection of early disease, among others. At other times, progress takes a quantum leap, as illustrated by the introduction of anesthesia, the discovery of antibiotics, and the concept of organ transplantation. Another interesting facet of progress in medicine is that while some discoveries are a result of a deliberate search, others arise from fluke observations or errors. These include the discoveries of penicillin by Alexander Fleming,(35) radioactivity in uranium by Antoine Henri Becquerel,(36)

the elucidation of the role of ions in cardiac physiology by Sydney Ringer,(37) the discovery of the chemotherapeutic potential of mustard gas by Stewart Alexander,(38) among others. Yet another fascinating aspect of change in medicine is that of the three phases in the acceptance or popularity of newly introduced procedures, products, drugs, or techniques. The initial enthusiastic response is followed by a decline when side effects and complications become apparent, and this is followed later by a realistic use of the new findings. A variant of this phenomenon is the resurgence of older techniques as the promise of the new technology is not realized. The pulmonary artery catheter is not used as frequently now due to complications and a failure of this invasive procedure to improve outcomes during routine care of the critically ill.(39) The largely unmet promise of nanotechnology(40) and molecular cell biology(41) also remains to be realized.

Improvements in airway devices are usually incremental, but occasionally a result of a conceptual change in approach. The laryngeal mask airway [LMA] introduced by Archie Brain in 1985 has changed routine general anesthesia, been very useful during failed tracheal intubation, and is used for airway management by non-anesthesia personnel in the field.(42) What is not widely known is that Beverley Leech had proposed a similar device, a cuffed pharyngeal airway, in 1937.(43) For reasons that are unclear, we had to wait almost half a century for the LMA, something that might not have happened had we been more aware of the contributions of our predecessors.

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#### **IV. Instills Pride and Identity**

We exist in groups, be they chosen for us, or ones we choose to create for ourselves. We are the products of the time we have spent with our family, our schools, our workplace, our friends and associates, and our activities. These associations color us, and if all memory of these associations were erased, we would risk becoming individuals without individuality. In short, without history we lose our identity. Achievements of members of the groups we are affiliated with – family, school, community, institution, state or nation affects the way we perceive ourselves. We evaluate the role we may have played in these achievements and derive satisfaction from it. We feel proud when we or our group succeeds, and many factors determine our reactions when we are not successful.

As with individuals, members of other groups such as families, societies, institutions and nations also derive satisfaction and pride from outstanding achievements. Often, one successful outcome is followed by another and little by little, greatness is achieved. Outstanding results arise from persistent hard work, availability of resources, team effort, and effective leadership. Historical documentation of events allows for remembering these events, and the resulting pride creates an identity in individuals, groups, institutions, society, and nations. It also allows others to learn from and emulate successful strategies.

Individuals and institutions deliver medical care and participate in teaching, as well as research and development. The arenas of medical education, charity work, community involvement, ethical standards, basic and laboratory research, and the delivery of high quality medical care are determined directly or indirectly by preceding generations of care providers, teachers, researchers, and leaders. Positive aspects of earlier performance invariably instill a sense of pride

in succeeding generations, create high expectations and motivate members to continue to excel. In many ways, nothing succeeds like success.

### **Discussion:**

Despite the lack of any direct clinical implication, the study of history offers clinicians many lessons and advantages. Analytic aspects of the disciplines of history and medicine bear many similarities. These include a study of evidence and determining whether a cause and effect relationship can be established. Conflicting evidence may require that revisions be made to established knowledge. There is compelling evidence that the disciplines of science and medicine are built on achievements of the past, and that we do learn from history. The arenas where history often seems to make the situation worse are those of national and religious conflict. The reasons for this failure are the same – human nature has not changed over time and the primal desires of greed, egoism, and the need to control others overcome the capacity of rational thought and peaceful coexistence. Historical documentation is important not only in recognizing outstanding achievements of individuals, groups, institutions, society, and nations, but also in accurately crediting individuals and groups for such achievements. We learn that although most scientific achievements arise from goal directed efforts, some result from accidental observations. We also learn that mighty individuals, institutions, and nations may fall. Here too, human nature prevents us from learning from the past. Lastly, history teaches us that our past experiences build pride and a sense of identity in us. Without this memory of past associations and achievements we would live in a vacuum, ignorant of one's identity.

Of all creatures, man alone is aware of the past. Everything that is known falls under the realm of history. When one considers that the future is mostly unknown, and that the present is fleeting, one comes to the sobering conclusion that everything that is known with any sense of certainty falls within the domain of history. Medicine has a fascinating and colorful history, while that of anesthesiology is especially so. It is the only specialty to have almost developed entirely in the United States, most likely because events that led to its discovery occurred within a very narrow period in the 1840s. Although general anesthesia is a unique American contribution, pre-1846 traditions of relieving pain during surgery, fracture reduction, and labor date back millennia; moreover, these have origins in almost every ancient civilization. The local anesthetic properties of cocaine were first described by Carl Koller in Germany,(44) mesmerism had its roots in Germany,(45) and acupuncture in China.(46)

To fully take advantage of the insights and benefits available from the study of history, we propose that clinicians become more aware of the history of anesthesia and medicine. Those entrusted to teach anesthesia should take every opportunity to add a historical perspective and depth to everyday teaching in the finest traditions of Sir William Osler.(47) In the operating room one could discuss the development of monitors, airway equipment, or the evolution of anesthetic agents. Formal lectures and book chapters could begin with introductory comments about history. Additionally a variety of techniques could be employed in the informal setting to teach anesthesia history using 'alternate methods.' A great way for anyone wishing to get interested in the fascinating history of anesthesia is to read the historical narrative *Ether Day - The strange tale of America's greatest medical discovery and the haunted men who made it*, by

Julie Fenster.(48) Three additional comprehensive resources provide detailed information about most topics related to anesthesia history.(49-51)

Enthusiasts may participate in history related activities sponsored by the Anesthesia History Association [US], the History of Anaesthesia Society [UK], the Wood Library-Museum of Anesthesiology, and history related events at the annual meetings of the American Society of Anesthesiologists

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