Anesthesia History Association

Annual Spring Meeting
Chico Hot Springs Resort
Paradise Valley, Montana
April 12-14, 2018

In memory of
Burdett "Burt" Dunbar, M.D.
1938-2018
Physician - Historian - Friend

Anesthesia History Association 2018 Annual Spring Meeting
Chico Hot Springs Resort, Paradise Valley, Montana
Meeting Schedule

Thursday, April 12

1:00 – 4:00 PM	Main Lodge Lobby – Chico Hot Springs Resort
1:00 – 4:00	Meeting Registration (hotel lobby)
3:00	Hotel check-in (officially) begins
4:00	Bus boards to go from Chico Hot Springs Resort to the Museum of the Rockies
5:30 – 8:30 PM	Museum of the Rockies (Bozeman)
5:30 – 8:30	Private after-hours access to the Siebel Dinosaur Complex
5:30 – 7:00	Catered reception
7:00 – 8:00	Lecture in Hager Auditorium (Ronan Donovan, photographer)
8:30	Bus leaves from Museum of the Rockies to Chico Hot Springs Resort
9:30 PM	Arrive back at Chico Hot Springs Resort

Friday, April 13

7:00 AM – 3:30 PM	Chico Convention Center
7:00 – 8:00	Breakfast
8:00 – 8:30	Welcome
8:30 - Noon	**Abstracts Session 1** (see detailed schedule)
Noon – 1:00	Lunch
1:00 – 2:00	Patrick Sim Memorial Lecture (Dr. Raymond Roy)
2:00 – 3:30	**Abstracts Session 2** (see detailed schedule)
6:00 – 9:00 PM	Chico Convention Center
6:00 – 6:30	Reception
6:30 - 7:30	Dinner
7:30 – 9:00	Lecture (Dr. David Peck, medical historian)

Saturday, April 14

7:00 AM – Noon	Chico Convention Center
7:00 – 8:00	Breakfast
8:00 – 9:00	Lecture (Dr. Alan Muskett, physician writer)
9:00 – 11:30	**Abstracts Session 3** (see detailed schedule)
11:00 – 11:30	2018 C. Ronald Stephen Anesthesia History Essay Contest Winner Dr. Daniel Hansen
11:30 - Noon	Closing Comments Dr. Christa Riley – 2019 AHA (Richmond, VA) Dr. Kentaro Dote – 2021 ISHA (Kobe, Japan) Dr. Raymond Roy – AHA President
1:00 – 8:00 PM	Yellowstone National Park
1:00	Bus boards at Chico Hot Springs Resort
2:30	Picnic lunch at Mammoth Hot Springs
8:00	Return to Chico Hot Springs Resort

Anesthesia History Association 2018 Annual Spring Meeting
Scientific Sessions
Chico Convention Center

	Presenter	Title
Abstracts Session 1		
Room A		
8:30 – 9:00	Guildner	Analgesia Inhaler Self Administering Vintage 1800s
9:00 – 9:30	Bryan	Patient Triage and Aerial Transportation: Lessons Learned from the Spanish Civil War
9:30 – 10:00	Riley	The Only Beneficiary of War is Medicine. History of Trauma Resuscitation Contributions from Military Conflict
10:00 – 10:30	Break	
10:30 – 11:00	Makino	Japanese Museum of Anesthesiology: Conditions and Outlook of Museum Collections
11:00 – 11:30	Scamman	Audio-Video Archiving at the Wood Library-Museum
11:30 – 12:00	Wilkinson	Frankis T. Evans; A Regional Phenomenon
Room B		
8:30 – 9:00	Owens	The Birth of Pain Medicine as a Subspecialty in Anesthesiology
9:00 – 9:30	Grzesik	Managing Anesthetic Waste Gasses – Techniques Past and Present
9:30 – 10:00	Budwany	Why Palliative Care?
10:00 – 10:30	Break	
10:30 – 11:00	Schroeder	Ralph M. Waters' 1936 Travel Diary
11:00 – 11:30	Woods	Correspondence from M.T. "Pepper" Jenkins to A.H. "Buddy" Giesecke: What is the Role of a Former Chair in His Own Department?
11:30 – 12:00	Mulroy	The Colorful Legacy of Daniel C. Moore, MD, 1918-2015
Abstracts Session 2		
Room A		
2:00 – 2:30	Mandabach	The Early History of Laryngoscopy
2:30 – 3:00	Greenberg	Evolving Considerations for Malignant Hyperthermia
3:00 – 3:30	Roy	Anesthesia Time Capsule. The Opening of Anesthesia Residents' "Green Tackle Boxes" after 40 Years

Room B

2:00 – 2:30	McNiece	Succinylcholine-Induced Hyperkalemia in Children: The Case that Led to the Studies
2:30 – 3:00	Thompson	An Anesthetic for the General
3:00 – 3:30	Kovac	Disease and Medicine on the Lewis and Clark Expedition 1804-1806

Abstracts Session 3

Room A

9:00 – 9:30	Mandabach	The History of Volatile Anesthesia
9:30 – 10:00	Dote	The Three Bigelows and Japanese Anesthesia, Medicine and Arts
10:00 – 10:30	Bryan	Teamwork in Makeshift Hospitals during the Spanish Civil War: Politics Resulting in Limited Anesthetics
10:30 – 11:00	Break	

Room B

9:00 – 9:30	Martin	Anesthesia Care with the Harvard Medical School Unit at the American Ambulance Hospital of Paris in 1915
9:30 – 10:00	Roy	Harold Holt Bradshaw, MD
10:00 – 10:30	Huang	Impact of the Identification and Disclosure of Adverse Effects on the Life Cycle of Succinylcholine
10:30 – 11:00	Break	

Abstract accepted but unable to attend:

	Smith	The Prodigious Film Maker of Anesthesiology: Dirk Wales

2018 C. Ronald Stephen Anesthesia History Essay Contest Winner:

	Hansen	"Without the Slightest Hitch" – A Brief History of the First Successful Orotracheal Intubation

Patient Triage and Aerial Transportation: Lessons Learned from the Spanish Civil War

Background: The Spanish Civil War contributed to the advancement of critical care in many ways. This war was the first in which civilian injuries and deaths outnumbered those of the soldiers. Two advancements included a new ranking system for wounded patient treatment and the development of transporting patients in aircrafts.

Aim: We aim to describe the development of a triage system and aerial transportation of critical patients during the Spanish Civil War.

Triage: Triage was improved in the Spanish Civil War. While the patients on the verge of death, who could be stabilized, might still be treated first, a new method of prioritization was developed. Those minimally wounded and who did not need extensive care would be sent back to the battlefield, those with more serious wounds that were not immediately life threatening would wait to be treated, and those expected to die would only receive palliative care. They developed improvised hospitals under big rock overhangs and in caves, where triage, blood transfusions, field surgery, along with casts for wounds and fractures were carried out, as close to the frontline as possible. The stretchers would carry patients into the cave after being sorted at the triage station by "serious, medium, and wait, it can go back." The caves also protected the wounded soldiers from bombings or attacks from Franco's forces.

Transport: Because of Spain's mountainous terrain, ground transportation during the Spanish Civil War was not efficient. To circumvent the problem, Germany began using Junker-52 bombers to transport injured soldiers back to their hospitals in Germany. The Germans learned that many patients were put at risk by experiencing altitude sickness, airsickness, hypothermia, and symptoms from low atmospheric pressure. This led to further exploration of the management of patient safety during aircraft transport.

Conclusions: The Spanish Civil War initiated a wave of advancement in critical care by effectively redefining triage as they adapted to the severe conditions of the war. Despite the risks involved with aircraft transport, this spurred a new way of thinking about transportation of critically ill patients.

References

1. Rhodes R. (2015) Hell and Good Company: The Spanish Civil War and the World it Made. New York, NY: Simon & Schuster Paperbacks.
2. Defalque, R. J., Wright, A.J. Contributions of the Legion Condor to the Wehrmacht's surgical care during WW2. *International Congress Series*. 2002; 1242:255-260.
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Teamwork in Makeshift Hospitals during the Spanish Civil War: Politics Resulting in Limited Anesthetics

Background: The Spanish Civil War was fought between the military rebels led by General Francisco Franco and his fascist Nationalists versus the elected Republican Government backed by socialists and the communists from many European nations and North America. There was a lack of medical equipment and resources, which was further exacerbated due to the bloodshed and massive number of casualties. Medical teams needed to adapt to quickly provide surgery and treat injuries to both military and civilians alike. Using ingenuity for medical care, such as the use of limited anesthetics in makeshift hospitals, resulted from the Spanish Civil War.

Aims: Discuss the challenges in delivering anesthetic care and surgical procedures in the operating room during the Spanish Civil War.

Teamwork during Anesthesia: Because of the wartime conditions, teamwork amongst hospitals and care staff was very difficult. Crosses could not be painted on the roofs of the hospitals to notify outside care staff and injured soldiers because they would become bombing targets for the enemy. All operations were moved into basements, where there were no windows to be broken by debris. Robert Macintosh, a well-known anesthesiologist, described the conditions of the anesthetic care during the war. He states that all they had available was chloroform, ether and an Ombredanne inhaler. They even ran out of anesthetics and thus could only use spinal blocks or sedation for all operations. He also describes the limited use of endotracheal intubation during the war: ''the Catholic nun who usually gives the anaesthetics was frightened at the passage of a tube. The patients are not given atropine, and on induction with ether in the Ombredanne inhaler, they secrete an enormous amount of mucous, so that when a tube is passed, a good deal tends to be carried in with the tube, and makes the airway not free and somewhat noisy." Macintosh's experiences from the Spanish Civil War, especially the lack of resources and need to improvise to find solutions, inspired his research thereafter. He brought endotracheal intubation into use in Spanish medicine, but its use was still very limited following the war. Because of his effective communication, later anesthesiologists had access to more resources such as cocaine, ethyl chloride, Magill's forceps, Mayo airways, and others to improve patient care during the war.

Conclusions: The establishment of teamwork in makeshift hospitals (old schools, monasteries, caves in mountain sides), during the Spanish Civil War was a precursor for that used in wars today, such as the current situation in Syria where there is also limited availability of anesthetics. Despite the extensive carnage during the war, the humanity and medical care rendered to patients was exemplary even compared with present standards.

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Why Palliative Medicine?

Background: My interest in palliative medicine (PM) began while observing my grandfather during his last weeks of life. I was impressed by the care that the anesthesiologist-led PM team provided to make him comfortable.

Features of Palliative Care: The PM team consists of physicians, advanced practice nurses, nurses, social workers, chaplains, psychiatrists, and physical therapists. The goal is to address all areas of the care of patients with serious illnesses. A retrospective study from MD Anderson showed that PM teams found many more symptoms than the primary team and were able to manage those symptoms within 72 hours.[1] Patients that receive PM care have a better quality of life at reduced costs whether they die in the hospital or are discharged home. [2] PM care in conjunction with oncologic treatment of metastatic non-small cell lung cancer improves quality of life, improves documentation of resuscitation preferences and increases survival by two months.[3] Palliative care is less restrictive than hospice care and PM patients often receive curative therapy alongside palliative care. All hospice care is palliative, but not all palliative is hospice care.

Does Palliative Medicine Fit Into the Scope of Anesthesia Practice? Although most anesthesiologists are not specifically trained in PM, skills that anesthesiologist have that are applicable to PM include interventional pain management, sedation near the end of life, weaning and discontinuing mechanical ventilation, and organ donation.

What Are Requirements for Specialization in Palliative Medicine? PM becomes necessary when symptom management becomes complicated and multiple variables influence goals of care conversations. Best estimates suggest that there are currently 1,700 to 3,000 full-time PM specialists in the United States. The American Academy of Hospice and Palliative Medicine (AAHPM) reported in 2010 that 10,810 FTEs in PM are required. As the baby boomer generation ages, the number of PM physicians required will increase. In 2006, the ABA acknowledged subspecialty training in hospice and PM (one year fellowship). By 2014 there were 117 anesthesiologists board certified in hospice and palliative medicine. There are approximately 100 PM fellowship programs in the United States.

Conclusion: As I continue my training, I am reminded of the gift that PM gave my grandfather and my family…not just a procedural intervention, but three weeks of pain-free, quality time!

References

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The Three Bigelows
and Japanese Anesthesia, Medicine and Arts

The Bigelow Family is a famous pedigree in the United States, particularly in Boston. Among others, Jacob, Henry Jacob, and William Sturgis are well-known. To date, however, rather few reports have been published concerning the relationships of the three individuals to Japan. Therefore, I investigated the relationships of the three noteworthy scholars to Japan.

Sources : Using books of medical history and from internet sites concerning the three Bigelows (Jacob, Henry Jacob and William Sturgis), they were investigated and information about their relationships to Japan was collected.

Results and Discussions:

1. Jacob Bigelow (1787 –1879): Jacob Bigelow was a 19th century physician in the USA. He is said to have first introduced the invention of general anesthesia to Europe. Specifically, when he heard about ether anesthesia from his son Henry Jacob, he immediately wrote a letter dated November 28 to Francis Boott, telling him about this anesthesia. The letter reached England in about 3 weeks. On December 19, 1846, James Robinson (a friend of Boott) carried out ether anesthesia (for tooth extraction) for the first time in England. Jacob Bigelow is also known as a botanist. "*American Medical Botany*" is the first multi-colored encyclopedia of plants published in the USA. He used his unique "aquatint" method for this book. This book was also imported to Japan. At present, in Japan, three copies of the book are available at university libraries. This book may have influenced the medical botany practiced in Japan during the latter half of the 19th century.

2. Henry Jacob Bigelow (1818 –1890): Henry Jacob Bigelow became a physician, as desired by his father. He selected the career of a surgeon. In 1846, he attended the well-known public demonstration of surgery using ether. The invention of general anesthesia, which he witnessed, was immediately introduced to Europe and also to Japan in 1850. "Insensibility during Surgical Operations Produced by Inhalation" (1846) is a famous paper written by him, but whether or not this paper was introduced to Japan is unknown.

3. William Sturgis Bigelow(1850 - 1926): William Sturgis Bigelow is the most well-known among the three aforementioned members of the Bigelow Family in Japan. He, born into a famous family of physicians, but he abandoned his career as a physician and eventually became a scholar of the arts, particularly Japanese art. He was strongly affected by the story about Japan heard from Edward Morse and he went to Japan. He collected paintings, swords, sculptures, etc., unique to Japan and donated his collection to Museum of Fine Arts Boston. Without him, the Japanese collection at Museum of Fine Arts Boston might have been much inferior to and totally different from the present one. He

supported paintings and other artworks unique to Japan which had been considered as having no value at the end of the 19th century.

Conclusions : Relationships of the three Bigelows to Japan were investigated. Jacob Bigelow's monograph "*American Medical Botany*" may have influenced the medical botany practiced in Japan during the latter half of the 19th century. Henry Jacob Bigelow was involved in the invention of general anesthesia in 1846. This invention was immediately introduced to Europe and later was also introduced to Japan in 1850. William Sturgis Bigelow became a scholar of Japanese art, giving up his career as a physician. Without him, the Japanese collection at Museum of Fine Arts Boston might have been much inferior to and totally different from the present one. He supported paintings and other artworks unique to Japan at the end of the 19th century.

Evolving Considerations for Malignant Hyperthermia

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Mortality secondary to malignant hyperthermia (MH) decreased markedly with the introduction of IV dantrolene in 1979, however, it may be higher than commonly reported and the complication rate remains substantial at 35%.[1,2,3] Recently, the epidemiology and presentation of MH have changed. Overall incidence is increasing while fulminant cases have become less frequent.[2,4] Further, mortality is substantially higher when a crisis begins at an outlying facility as compared to a routine admission.[2] Half of all crises resulting in death may originate in an ambulatory setting.[5] Regardless of the setting, minimizing the time between MH diagnosis and dantrolene administration is critical. Multiple studies demonstrate the correlation between time to dantrolene administration and increased risk of morbidity and mortality.[3,6]

Dantrolene is poorly soluble in water, which has created problems for its IV administration.[7] Consequently, reconstitution and administration of the initially approved formulation are time consuming and labor intensive with multiple vials necessary for a single dose.[1,8] When first used to treat MH, thirty minutes of mixing was required to prepare IV dantrolene.[9] Recently, a novel dantrolene sodium nanosuspension (DSN) was developed to address these shortcomings. DSN forms a microcrystalline dispersion when reconstituted and is ≈150x more concentrated than DS.[7] DSN requires significantly less time and less diluent to reconstitute and administer than DS.[7] Time to treatment is decreased and time for additional clinical evaluations and supportive measures necessary to reduce morbidity and mortality in MH is gained.[10]

Table: Comparison of DSN and DS

	DSN	DS
Dantrolene per vial	250 mg	20 mg
Volume of sterile water for injection to reconstitute	5 ml	60 ml
Preparation and administration of a 250-mg dose		
Vials to be reconstituted	1	13
Reconstitution and administration time	< 1 min.	> 15 min.
Sterile water for injection	5 ml	750 ml
Staff needed	1	≥ 2
Mannitol administered	125 mg	37,500 mg
Final concentration of dantrolene	50 mg/ml	0.33 mg/ml

A novel high concentration low volume DSN provides an opportunity to improve treatment of MH by decreasing time to dantrolene administration potentially resulting in better patient outcomes and increasing time available for other aspects of patient care.

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Managing anesthetic waste gases – techniques past and present

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Background: The importance of anesthetic gases vented into the operating room and hospital was not recognized until the mid to late 20th century. Women who worked in operating rooms and dental offices reported higher rates of miscarriages.[1,2] It was believed that exposure to anesthetic gases was the likely cause, however a cause and effect relationship could not be established. Operating room personnel also complained about the odor and flammability of ether, while halogenated anesthetics caused headache, especially during orofacial procedures in children when uncuffed tracheal tubes were used. The importance of scavenging waste anesthetics has assumed greater importance as toxicity of these agents has been recognized, and environmental engineers and other professionals have designed many ways to minimize the hazards posed by contamination from waste anesthetic agents.

Sources: Published material in the public domain will be consulted for this study.

Results: Initial reports of miscarriage in women exposed to trace anesthetic gases were investigated, but the effect of stressful lifestyle could not be separated from toxicity of agents as the causative factor.[2] The cost of volatile agents and increased sophistication of anesthetic delivery systems allowed low flow anesthesia, and increased use of cuffed tracheal tubes also reduced the amount of anesthetic agents released inside the operating room and the vicinity of hospitals. Hospital engineers have developed active and passive scavenging systems to minimize the release of anesthetics inside the operating room[3], but the problem of release into the vicinity of hospitals persists. Charcoal filters and other chemical or physical means of degrading anesthetic agents into non-toxic chemicals would be the ideal solution[4], but the costs of such an undertaking may be prohibitive.

Conclusions: Current mechanisms of handling waste anesthetic gases do not address the real problem, but instead, merely relocate where these agents get released – not in the operating room, but outside the hospital. A definitive solution is not being explored.

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Small Brass Chloroform Analgesia Inhaler - Vintage 19th Century

Donated by Charles W. Guildner II, MD to the UNMC McGoogan Library of Medicine
Received by Dr. Nancy Woelfl, Director March _____, 2009

This little gem of a piece came into my hands from my Dad, Charles W. Guildner, MD a 1927 graduate of University of Nebraska College of Medicine, who practiced country medicine in Kenesaw, Nebraska beginning in 1929.

It is my belief that he came into possession of the Inhaler from the practice he took over, that of Dr. Nowers, who had practiced in Kenesaw for many years, dating well back into the 1800s. Its actual origin or who designed and made it is not known to me. As far as I have been told, it was used primarily for obstetrical analgesia.

The design is simple but ingenious. The patient holds the inhaler in one hand, the warmth of the hands replacing the "heat of evaporation" of the volatile analgesia agent as it is used.

The bottom of the device is filled with lead so that when the patient becomes sleepy, possibly letting go of the inhaler, it would fall away from the nostrils by its weight.

The prongs of the inhaler are designed just large and close enough together, making it very difficult to become lodged in the nostrils should the holding hand no longer be in contact with the inhaler.

A wad of cotton is placed into the chamber to absorb the chloroform so that there is no free liquid to spill.

A hole and shaft is placed through the center of the inhaler so that during inspiration, air may be drawn in over the chloroform saturated cotton, thus delivering the vapor to the patient.

My dad used this little gem for home rural deliveries from about 1929 until 1944 when he moved his practice to Hastings, Nebraska and discontinued doing home deliveries.

I had no idea of the existence of the Inhaler until 1959, during my first year of residency in Anesthesiology at the University of Wisconsin when Dad gave it to me. I showed it to Dr. O.S. Orth, Anesthesia Department Chairman. He was still demonstrating Chloroform analgesia at that time as Halothane was becoming available. He suggested we explore the effectiveness of the Inhaler with both of

these volatile analgesia agents on obstetrical patients. He was as fascinated by the design of this device as was I. Its effectiveness was evident very quickly, but, as Chloroform was being phased out and Halothane rather costly for an unclosed system, we did not persist in using the device other than for demonstration of the device itself.

When I entered private practice in Everett, Washington, on several occasions, I demonstrated the use of the device to my colleagues, using Halothane, purely from an historic perspective, retiring it from any further use in 1962.

I am sure that Dad would be pleased that this lovely little treasured piece of anesthesia history will now find its place at our UNMC alma mater in the historical collections of the McGoogan Library of Medicine, both my Dad and I having known Dr. McGoogan very well.

Charles W. Guildner II MD UNMC 1957

"Without the Slightest Hitch" – A Brief History of the First Successful Orotracheal Intubations

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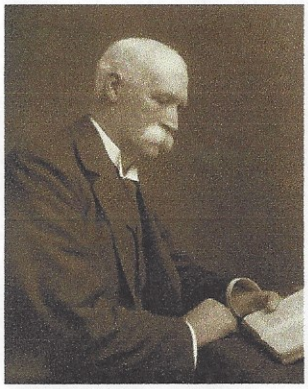
Abstract:
Despite the significance of its impact, most clinicians are unaware of the history of orotracheal intubation. Myriad ailments have affected the upper respiratory tract for much of human history resulting in untold suffering and mortality[1]. Ancient peoples explored therapeutic interventions without enduring success[2]. The slow march of medical discovery, in conjunction with ongoing need for successful interventions in cases of upper airway compromise, set the stage for the first orotracheal intubation(s). In the late 19th century, Europe was in an explosive period of medical advancement. The Scottish surgeon, Sir William Macewen, theorized the possibility of inserting a breathing tube through the mouth into the windpipe (trachea) and endeavored to attempt it. In 1880, he reported a series of four successful orotracheal intubations which opened a new chapter in anesthetic and surgical history[3,4]. The impact of his new technique is far reaching and profound.



Sir William Macewen

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Impact of the identification and disclosure of adverse effects on the life cycle of succinylcholine

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Background: New therapies are created to address specific problems and enjoy popularity as they enter widespread clinical use. Broader use can reveal unknown adverse effects and impact its life cycle significantly. Succinylcholine, a depolarizing neuromuscular blocker, was the product of decades of research surrounding the ancient compound, curare. It was introduced into practice in the 1940s by Burroughs Wellcome Company (BW Co.) and was welcomed due to its rapidly acting muscle relaxation effects. Global clinical use revealed adverse effects, in particular, hyperkalemia and malignant hyperthermia.

Sources: Primary literature search using online and archived documents was conducted at the Wood Library-Museum of Anesthesiology, Schaumburg, Illinois. We consulted documents submitted by BW Co. to federal authorities, through the freedom of information act (FOIA), Food and Drug Administration (FDA) reports, promotional advertisements, package inserts, published articles, and textbooks.

Results: Initial clinical testing in human in 1952 found no adverse effects on cardiovascular or respiratory systems. Large-scale clinical trials in 1953 found abnormally long recovery times among some patients; the discovery of abnormal pseudocholinesterase enzyme activity wasn't fully demonstrated until the early 1960s. In 1960, animal studies reported a transient increase in plasma potassium; further experiments in 1969 clearly demonstrated succinylcholine-induced hyperkalemia in burn patients. Malignant hyperthermia was first described in 1966. Similar cases of elevated temperatures and muscle rigidity were described globally but the underlying mechanism wasn't elucidated until the 1990s. Standard anesthesia textbooks didn't report major side effects of succinylcholine until 1960, and included newly documented side effects with each edition. BW Co.'s packaging contained warnings as early as the 1950's but were later updated in 1962 and beyond to reflect the newly discovered hyperkalemia and malignant hyperthermia.

Conclusions: BW Co. didn't appear to suppress the side effects reported after succinylcholine's market entry; it updated promotional and packaging material in a timely manner to reflect newly discovered adverse effects. These side effects, though alarming and made clinicians more wary, did not seem to heavily impact succinylcholine's use, given its various desirable properties. It is still a choice muscle relaxant used today but there are efforts to develop superior agents to replace succinylcholine.

References:

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Title: Disease and Medicine on the Lewis and Clark Expedition 1804-1806

Aim: To understand disease and medicine on the expedition and how Lewis and Clark were successful to complete their mission with only one death.

Background: Almost all care for health and disease in 1800's America was at home. Mothers nursed patients and family through most illnesses and accidents. More serious complaints were treated by apothecarists, herbalists, midwives and physicians. Medical information was obtained from Farmer's almanacs, newspapers, cookbooks, health and military manuals. While they complemented other health healers, many people were suspicious of physicians. Physicians were not common in 1803 and a physician was not present on the expedition.

Methodology: Review journal writings of Lewis and Clark as well as current day publications.

Results: Meriwether Lewis learned basic medical practice and recipes from his mother who was a skilled herbal healer. In 1803, Philadelphia was the center of science and medicine in America. Thomas Jefferson instructed Lewis to seek medical advice from Dr. Benjamin Rush. Drugs and medical equipment was obtained from Gillaspy and Strong, a pharmacy in Philadelphia. Dysentery and GI upset were common from drinking water from the Missouri River. On August 19, 1804, Sargent Charles Floyd was taken very sick, dangerously ill and died from what is believed to be "bilious cholick" and appendicitis. In Camp Mandan during the winter of 1804-1805, frostbite and hypothermia were common. Mercury was given for venereal disease. Sacagawea was pregnant and gave birth of a son Jean Baptiste. To speed a difficult labor, Lewis dosed her with a concoction made with crushed rattlesnake rattles. During portage through the Great Falls, "men developed infections on their blistered hands, suffered from heat stroke, hailstorms, prickly pear cactus and plagues of masquitoes." Boils, skin and eye infections were very common. In June 1805, when Sacagawea was ill with fever, Lewis bled her and gave her "two doses of barks and opium." He continued medicines for several days and added "diluted nitre" (saltpeter). In the "humoral theory'" fevers were treated by rest, warming or cooling baths, bleeding or purging. In June 1805, when Lewis had a "violent pain in the intestens" and a high fever, he made himself a "simple drink from chokecherries." He drank two pints of this drink, which he wrote reduced his fever and relieved his pain. Lewis also treated fevers with Glauber salts (crystalline sodium sulfate), Rush's pills ("thunder clappers") and soaking feet in warm water. When the men changed their diet from meat to fish on the Columbia River, they suffered GI upset. In April 1806 near present day Portland OR, the men encountered smallpox. On May 24, 1806, when the baby Jean-Baptiste was sick, Lewis administered cream of tartar and onions and "gave the child a clyster in the evening." A sweat lodge was used in May 1806 for William Bratton's illness of pain. On August 1806, Lewis endured a flesh wound due to a gunshot accident. Preventive military medicine was used extensively to treat illness and promote frontier healing.

Conclusion: The Corps of Discovery was successful and completed their mission with only one death due to good luck, the kindness of strangers and the presence of Sacagawea with her son so

that hostile Indians did not think the Corps was a war party. The carefully chosen young men were strong, experienced soldiers and woodsmen. Complementing personalities of Lewis and Clark led to proper preparation and military discipline resulting in excellent camaraderie and esprit de corp.

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