

The Anlet

Anesthesiology's Response to the Needs of the Armed Forces in World War II

Laurie Wright, M.D.,* David Waisel, M.D.,† Douglas Bacon, M.D., M.A.‡

TO address a shortage of wartime physician-anesthetists, the Subcommittee on Anesthesia of the National Research Council, the anesthesia experts for the military, established short training courses for physicians throughout the United States. These typically 12-week courses were "to instruct medical officers . . . in the fundamental principles and standard procedures in anesthesia . . . to prepare medical officers to take charge of the anesthesia sections of the various types of hospitals of the US Army."¹ The men who graduated became the celebrated "90-day wonders" who provided much of the anesthesia care during the war.² Considering that these future physician-anesthetists³ had little experience with anesthesia, course instructors not only had to teach them about anesthesia but also had to teach them about wartime anesthesia. Unfortunately, the course instructors, some of the leading physician-anesthetists in the country, had little experience with World War II anesthesia. Because many of the short courses were held at home institutions of members of the Subcommittee on Anesthesia, which consisted of Ralph M. Waters, M.D. (Professor and Chair, Department of Anesthesiology, University of Wisconsin, Madison, Wisconsin, 1884-1979), Emory A. Rovenstine, M.D. (Professor, Department of Anesthesiology, New York University, New York, New York, 1895-1960), John S. Lundy, M.D. (Pro-

fessor and Chair, Department of Anesthesiology Mayo Clinic, Rochester, Minnesota, 1894-1973), Henry K. Beecher, M.D. (Henry I. Dorr Professor of Anesthesiology, Harvard Medical School, Anesthetist-in-chief, Massachusetts General Hospital, Boston, Massachusetts, 1904-1976), Paul M. Wood, M.D. (Secretary-Treasurer of the American Society of Anesthetists, 1894-1963), and Lewis S. Booth, M.D. (Attending Physician Anesthetist Roosevelt and Doctor's Hospital, 1885-?), they become acutely aware of this problem.

Lundy devised the *Anlet* newsletter to address this deficiency. Graduates of the 90-day course at the Mayo Clinic, where Lundy taught, wrote to him about their experiences with wartime anesthesia. Likewise, graduates from the University of Wisconsin wrote to Waters, and these letters were shared between Lundy and Waters. It led to the realization that the course of instruction was not meeting the needs of the graduates in the field. Combined with feedback from Colonel Ralph Tovell, M.D. (Chair of Anesthesia, Hartford Hospital, 1901-1967), the Anesthesia Consultant for the European Theater of Operations,§ Lundy thought the letters and recommendations should be combined into a publication for distribution to the 90-day programs.

The purpose of the *Anlet* was stated in the first *Anlet*, published June 1, 1943: "This is an experimental newsletter. Its purpose is to assemble excerpts of letters from anesthesiologists, especially those who are in military service, and to distribute them primarily to anesthesiologists who are engaged in military educational work."⁴ Therefore, the *Anlet* was sent to each training program. Directors of the program sent letters back to Lundy, thus making it possible to change elements of the 90-day course of instruction to meet the needs of the physician-anesthetist in the field.

The *Anlet* was first published June 1, 1943, as *Anlet, N.R.C.* In the contraction *Anlet*, the *AN* stood for Anesthesia and the *LET* stood for Letters. *N.R.C.* stood for National Research Council. The initials *N.R.C.*, however, erroneously suggested that *Anlet, N.R.C.* was an official publication of the National Research Council. As such, *N.R.C.* was replaced with the initials *A.A.*, which stood for Anesthesia Abstracts. The first edition of *Anlet, A.A.* was published August 1, 1943. From June 1, 1943, through August 20, 1945, Lundy published eight issues and 141 letters that disseminated information on the "problems facing the [wartime] anesthetist and how they have been met, either successfully or unsuccessfully."⁵ Although *Anlet* periodically included other fodder, such as an abstract of the seminal article by Harold

Additional material related to this article can be found on the ANESTHESIOLOGY Web site. Go to <http://www.anesthesiology.org>, click on Enhancements Index, and then scroll down to find the appropriate article and link. Supplementary material can also be accessed on the Web by clicking on the "ArticlePlus" link either in the Table of Contents or at the top of the HTML version of the article.

* Resident in Anesthesiology, ‡ Professor of Anesthesiology and Medical History, Mayo Clinic College of Medicine. † Assistant Professor of Anesthesiology, Harvard Medical School.

Received from the Department of Anesthesiology, Mayo Clinic College of Medicine, Rochester, Minnesota, and the Department of Anesthesiology, Children's Hospital of Boston, Harvard Medical School, Boston, Massachusetts. Submitted for publication June 1, 2004. Accepted for publication March 5, 2005. Supported by intramural funding from the Department of Anesthesiology, Mayo Clinic, Rochester, Minnesota, and Boston Children's Hospital, Boston, Massachusetts. In addition, Dr. Waisel received a Wood Library-Museum Fellowship during which the series of *Anlets* was discovered.

Address reprint requests to Dr. Bacon: Department of Anesthesiology, Mayo Clinic, 200 First Street Southwest, Rochester, Minnesota 55905. Address electronic mail to: bacon.douglas@mayo.edu. Individual article reprints may be purchased through the Journal Web site, www.anesthesiology.org.

§ Letters between Lundy and Tovell, who graduated from the Mayo Clinic residency and stayed on staff until the late 1930s, exist in the Mayo Foundation Archive, Rochester, Minnesota, and cover many of the issues of training and placement of the graduates from the 90-day courses.

Griffith, M.D. (Professor and Chair, Department of ANESTHESIOLOGY, Magill University, Montreal, Canada, 1894–1985), “The Use of Curare in General Anesthesia,”⁶ the letters were the meat of the publication. Many of the letters described cases, anesthetics, and living conditions. Contributors were from Australia, England, the South Pacific, North Africa, New Guinea, Persia, Tunisia, China, France, Sicily, India, Italy, Belgium, Germany, and the Philippines, as well as Canada and the United States. By reviewing the editions of *Anlet, A.A.*, we have found a number of themes about what World War II physician-anesthetists needed to know. (Additional information regarding this is available on the ANESTHESIOLOGY Web site at <http://www.anesthesiology.org>.)

Lessons

Physician-anesthetists encountered variety of machines, including Heidbrink, Boyle, Gwathmey, Nuffield Ether Vaporizer, and the Army Model McKesson Gas machines. Many had to be jury-rigged, suggesting that physician-anesthetists had to have a basic understanding of not only anesthesia machines in general but also the particular issues with each machine. Here are some examples in which respondents educated teachers not only about problems with different machines but also about what must be done for them. The 4-1915 model No. 1 Gwathmey machine would only take B-tanks, and a physician-anesthetist reported having to retrofit yokes to permit gasses to go from large cylinders to the machines. He had to make a trunk to carry the machine and large cylinders. He also had to make “a soda lime canister out of a #2 tin can, part of a grease gun and part of a navy mask.”⁷ The Heidbrink machines were no better. “Heidbrinks [sic] are packed in a little hand trunk, but strangely enough, the mask, bag and tubing are not packed with the machine and so the latter has been useless to us . . . so Major B took the tubing of a gas mask and inside of a football and the oxygen mask off our large oxygen tank and thereby completed the machine . . . we can use it for emergencies.”⁸ On Heidbrink machines, “the N₂O pressure reducing gauges which attach to the large cylinders would register but not deliver gas” intermittently. Cleaning did not help, but protecting machines from extremes of temperature did.⁹ Protecting equipment from the elements was a common theme. For example, keeping the tubes, breathing bag, and mask free of condensed water vapor helped to minimize problems with ether vaporizing inefficiently.⁸

Given the capricious availability of equipment and supplies, physician-anesthetists needed to be flexible. For example, faced by a shortage of atropine and scopolamine, physician-anesthetists premedicated with morphine and barbiturates.¹⁰ A physician-anesthetist, sans machine and pentothal and disgusted with open

drop ether, experimented successfully with intravenous ether.¹¹

Many letters commented on the need to be able to perform regional blockade. Sometimes the need was medical, such as to treat immersion foot in a sailor.¹² Sometimes the need was due to inadequate equipment for general anesthesia. More commonly, it seems, regional blockade was used in conjunction with general anesthesia or as a way to simultaneously facilitate surgery for several patients. One letter discussed regional blockade for leg amputation in an appropriately staccato tone: “Amputations of leg are done under local. I divide the leg above sight of injury (several inches proximal) into 4 or 5 equal parts. Insert my needle through each part of the bone. Deposit 10 ml on the bone and 10 to 20 ml on the way out. Then through a subcut and intradermal circle around the leg.”¹³ Physician-anesthetists were advised to be able to perform, among others, brachial plexus blocks, sacral blocks, scalp blocks, and deep cervical blocks.

Field physician-anesthetists passed along mistakes, creating a virtual morbidity and mortality conference. Because doing laparotomies under spinal procaine and pontocaine resulted in a number of pulmonary complications, physician-anesthetists were forced to build a gas machine and provided explicit instructions: “A gas machine was improvised by missing nitrous oxide and oxygen from regulating valves on the tanks, through a glass Y tube and attaching the rubber connecting hose to a B-L-B oronasal oxygen mask. By means of this crude gas machine 50% oxygen and 50% nitrous oxide was administered and 2% solution of pentothal was given intravenously.”¹⁴ In general, oxygen and ether was the preferred way to manage common abdominal wounds. There were also suggestions about how to handle abdominal cases when ether could not be used. “The abdominal cases I did under pentothal were fine until it came to closing and then we had to put them pretty deep to close them. In fact, we had two who had apnea, one for ten minutes and the other for five we gave them picrotoxin and artificial respiration and they came around . . . You probably wonder why I used pentothal on bellies at all; the first one was my first case and was done by flashlights and gasoline lanterns during an air-raid with blankets’ to black us out; I couldn’t use ether . . .”¹⁵

Other factors brought out were the predominance of spinal anesthesia in the navy and the importance of tracheal intubation for chest cases. “In cases of open pneumothorax it is imperative to get control of the respiration immediately because of the untoward effects of mediastinal flutter and paradoxical respiration. This can be done by tracheal intubation and controlled respiration.”¹⁶ In fact, “We do not use our machines except for the chest cases demanding closed anesthesia with

positive pressure; and other selected cases. In this way we conserve what oxygen we have.”¹⁷

Even the concept of difficult airways was discussed. One letter noted that for a face “half blown away,” it was often better to use morphine for analgesia and sedation and local anesthesia for an awake tracheotomy.⁸

Sometimes physician-anesthetists passed along specific hints that were not otherwise available. Physician-anesthetists made endotracheal tubes out of stomach tubes.¹⁸ Figuring out how to mix pentothal ahead of time was a challenge. “I have a method of missing pentothal in a flask . . . to 1 gm. of pentothal 3 Abbott ampules of water are added. Since the ampules contain 52 to 53 ml this makes close to a 2.5% solution. We keep the solution on hand 3 or 4 days without any noticeable change in its effectiveness. I hold the solution in 30 ml syringes with plugs. The plugs are made from broken needles as you have described. However, we seal off the opening with collodion . . . they can be repeatedly autoclaved.”¹⁹

Another author suggested that it was impractical to use 2.5% solution. He suggested the following: “(1) We have only a few 30 ml syringes (no 20 ml.) and we have to use 10 ml syringes. Assistance is limited, and 2.5% solution in 10 ml syringes would involve too much changing. (2) We frequently have to rely upon trained enlisted men or nurses to mix our solutions. The ‘routine’ I have put into effect for the mixing of pentothal lessens the chance of error. This is the simple procedure of mixing 2 gms. of pentothal in one ampule of sterile water—one of those ‘50 ml.’ ampules which comes with the pentothal. . . . which makes only slightly less than a 4% solution. Besides being simple it has the added advantage of saving one ampule of sterile water out of every 2 boxes. This water we use for our solutions of procaine.”²⁰

Letters indicated that physician-anesthetists had responsibilities otherwise unconsidered. These included being responsible for oxygen therapy, transfusion therapy, data collection, administration, and teaching others to perform anesthesia safely. The *Anlet* directly and indirectly taught the importance of seeking out other military anesthetists for advice, knowledge, and help.

Conclusion

The lessons of the *Anlet* resonate today. Anesthesiologists in war or disaster situations should presume austere conditions. Listen to how the 1991 Gulf War experiences of Army anesthesiologist Rod Calverley, M.D. (Professor of Anesthesiology, University of California at San Diego, San Diego, California, 1938–1995) echo the reports of the World War II physician-anesthetists: “Large EKGs were our only standard monitor. Few ventilators were available. Many drugs were not to be found. Curare was the only relaxant; diazepam, the sole tranquilizer.

Narcotics were often in distressingly short supply. No pediatric equipment was stocked except for what we brought in our baggage. One hospital lacked endotracheal tubes.”²¹ Calverley also noted that wearing protective gas masks made stethoscopes worthless, and given the noise in the isoshelter (the putative operating room), aural alarms were useless. True to form, Calverley passed along suggestions, such as the benefits of visual-display compact multifunctional monitors.

The *Anlet* newsletter provided a critical link for World War II physician-anesthetists. The “90-day wonders” were thrust into the most complex complicated medical environment of the time, giving their instructors the virtual experiential knowledge necessary to make the physician-anesthetist’s transition to wartime anesthesia easier. Lundy’s idea to publish excerpts of the letters in a newsletter format was brilliant, and it allowed the instructors to modify curriculum in response to needs demonstrated in the field. It also allowed the instructors to impress upon their students those elements of the course that were critical to their ability to care for the wounded soldier. Undoubtedly, the *Anlet* saved lives and contributed not only to the war effort, but also to the creation of the specialty of anesthesiology after the cessation of hostilities because it was the competence of these short-course graduates that impressed the surgeons. In turn, when these surgeons returned from the war, they demanded physician-based anesthesia.

References

1. Unknown: Course of Instruction in Anesthesiology. Philadelphia, Hahnemann Medical College and Hospital of Philadelphia, January–March 1943
2. Waisel DB: The role of World War II and the European theater of operations in the development of anesthesiology as a physician specialty in the USA. *ANESTHESIOLOGY* 2001; 94:907–14
3. Waisel DB: Norman’s war: Norman B. Kornfield M.D., World War II physician-anesthetist. The experiences of Dr. Kornfield are typical of the physician anesthetist in World War II. *ANESTHESIOLOGY* 2003; 98:995–1003
4. Lundy JS: *Anlet*, N.R.C. June 1, 1943; 1(1):1. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
5. Lundy JS: *Anlet*, A.A. October 1, 1943; 1(2):1. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
6. Griffith HR, Johnson GE: The use of curare in general anesthesia. *ANESTHESIOLOGY* 1942; 3:418–20
7. Unknown: Letter. *Anlet*, A.A. Edited by Lundy JS. October 1943; 1(2):7–8. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
8. Unknown: Letter. *Anlet*, A.A. Edited by Lundy JS. October 1943; 1(2):2. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
9. Unknown: Letter. *Anlet*, A.A. Edited by Lundy JS. April 2, 1945; 3(1):4. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
10. Unknown: Letter. *Anlet*, A.A. Edited by Lundy JS. October 1943; 1(2):8. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
11. Unknown: Letter. *Anlet*, N.R.C. Edited by Lundy JS. June 1, 1943; 1(1):2. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
12. Unknown: Letter. *Anlet*, N.R.C. Edited by Lundy JS. June 1, 1943; 1(1):8. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
13. Unknown: Letter. *Anlet*, A.A. Edited by Lundy JS. May 1, 1944; 2(2):5. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois

14. Unknown: Letter. Anlet, A.A. Edited by Lundy JS. January 15, 1944; 2(1):2. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
15. Unknown: Letter. Anlet, A.A. Edited by Lundy JS. May 1, 1944; 2(2):3. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
16. Unknown: Letter. Anlet, N.R.C. Edited by Lundy JS. June 1, 1943; 1(1):3. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
17. Unknown: Letter. Anlet, A.A. Edited by Lundy JS. August 1, 1943; 1(1):6. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
18. Unknown: Letter. Anlet, A.A. Edited by Lundy JS. April 2, 1945; 3(1):7. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
19. Unknown: Letter. Anlet, A.A. Edited by Lundy JS. May 1, 1944; 2(2):2. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
20. Unknown: Letter. Anlet, N.R.C. Edited by Lundy JS. June 1, 1943; 1(1):4. Located at: Wood Library-Museum of Anesthesiology Collection, Park Ridge, Illinois
21. Calverley RK: Anesthesia near the center of the "storm", The History of Anesthesia: Third International Symposium. Edited by Fink BR, Morris LE, Stephen CR. Atlanta, Wood Library-Museum of Anesthesiology, 1992, pp 82-6