

# *The Role of World War II and the European Theater of Operations in the Development of Anesthesiology as a Physician Specialty in the USA*

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WORLD War II is hailed as a juncture in the growth of anesthesiology as a medical specialty in the United States.<sup>1-6</sup> From the vantage of 60 years, the timing of World War II was propitious. In the years before World War II, the structural foundations of anesthesiology—training programs, research, professional organizations, and a certification process—were in place, but immature. After the war, budding anesthesiologists returned to circumstances ripe for continued expansion. This article investigates some of the factors of World War II and the European Theater of Operations that may have influenced the growth and development of anesthesia as a physician specialty.

## Pre-World War II

In 1846, a dentist performed what is designated as the first public demonstration of ether at the Massachusetts General Hospital.<sup>1,7</sup> Although this demonstration animated physicians worldwide, American physicians and surgeons were less enthusiastic about the practice of anesthesia. American dentists, on the other hand, embraced performing anesthesia, and became frequent and common practitioners. This behavior reinforced itself, such that the act of administering anesthesia became intimately associated with dentists and, subsequently, nonphysicians. Anesthesia, then, did not develop as part of the medical profession in the United States.

The use of ether further marginalized the medical practice of anesthesia. Because ether was simple, safe, and effective, physicians and scientists had little reason

to pursue the study of anesthesia.<sup>8</sup> Indeed, when the Henry Isaiah Dorr Chair for anesthesia was established 60 years after the demonstration of ether, the dean of Harvard Medical School wrote to the president of Harvard that the practice of anesthesia “. . . is so narrow a subject that a good man would not want to tie himself down to that and would hardly be willing to do so.”<sup>9</sup> The funds designated for the chair were used for pharmacology instead of anesthesiology until Henry K. Beecher, M.D., occupied the Dorr chair in 1941.<sup>9</sup>

In the late 1920s and 1930s, the medical practice of anesthesiology laid the groundwork both for the growth of anesthesiology during World War II and for the next half-century. Ralph M. Waters, M.D., forged the template for academic anesthesia at the University of Wisconsin, Madison.<sup>1</sup> Waters emphasized medical student and resident education in the science of anesthesia, performance of basic science and clinical research, outstanding clinical care, and participation in the medical leadership of the university. To achieve his goal of anesthesiology as a nationally accepted academic medical profession, Waters sought to replicate his model. Emery A. Rovenstine, M.D., perhaps first among Waters' many scions, brought the Wisconsin paradigm to Bellevue Hospital in New York City in 1935 and established a nonpareil academy that fulfilled Waters' vision of academic anesthesia and his goal of developing like-minded anesthesiologists. At the same time, other prominent centers of medical anesthesia were developing, including the Mayo Clinic, Hahnemann Medical College, and Hartford Hospital.

At the same time, the structural foundations of the specialty were emerging. *Current Researches in Anesthesia and Analgesia*, the forerunner of *Anesthesia and Analgesia*, was established in 1922, and ANESTHESIOLOGY began publication in 1940. The American Society of Anesthetists, the forerunner of the American Society of Anesthesiologists (ASA) and descendent of the Long Island Society of Anesthetists (1905) and the New York Society of Anesthetists (1911), was founded in 1935. In 1938, the American Medical Association established the American Board of Anesthesiology as a subboard of the American Board of Surgery. In 1939, the first written examination for board certification was given.<sup>10</sup>

Nonetheless, on the eve of World War II, physicians practicing anesthesia still sought legitimacy. For example, a primary goal of physicians-anesthetists making a

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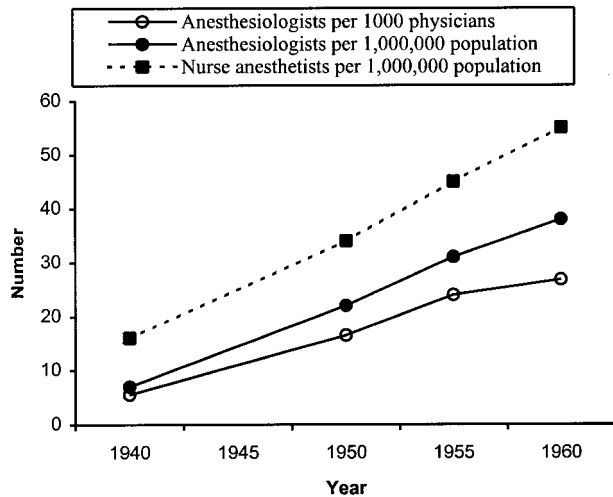


Fig. 1. From 1940 to 1960, the number of members of the American Society of Anesthesiologists increased, both as a percentage of physicians and as a percentage of total population. For comparison, the number of members of the American Association of Nurse Anesthetists as a percentage of total population is shown.<sup>1,14,66,67</sup>

presentation about anesthesia at the 1939 World's Fair in New York was to convince the general public that the practice of anesthesia was a medical specialty.<sup>11</sup> When E. M. Papper, M.D., decided to forego a career in internal medicine for a career in anesthesia, his friends and families asked "whether this change meant that I would not be a real doctor!"<sup>12</sup>

Consequently, as Lundy wrote about the pre-war years, "there was a tendency for only those physicians who were incompetent in general practice or in other branches to limit themselves to the practice of anesthesia."<sup>13</sup>

## Post-World War II

The years after World War II were prosperous for both the medical and the nursing practices of anesthesia. The memberships of the ASA and American Association of Nurse Anesthetists (AANA) increased from 1940 to 1960 by 600 and 400%, respectively. Although both organizations grew, evidence indicates that the increase in medical anesthesia was wider spread and more significant (figs. 1 and 2). For example, the number of anesthesia programs and residency positions increased from 37 and 108 in 1940, respectively, to 217 and 731 in 1950, and 237 and 1431 in 1960. In a study of university hospitals, the percent of cases performed by physicians and residents increased from 18% in 1940 to 75% in 1962.<sup>14</sup> The greater increase in physician anesthesia was considered to be more likely caused by increased physician interest in anesthesiology than by decreased interest in nurse anesthesia.<sup>14</sup> Numerous staff and residency positions were available, and remuneration was ample.<sup>15</sup> In addition, the American Board of Anesthesiology fostered interest by offering a credit of 1 year of residency train-

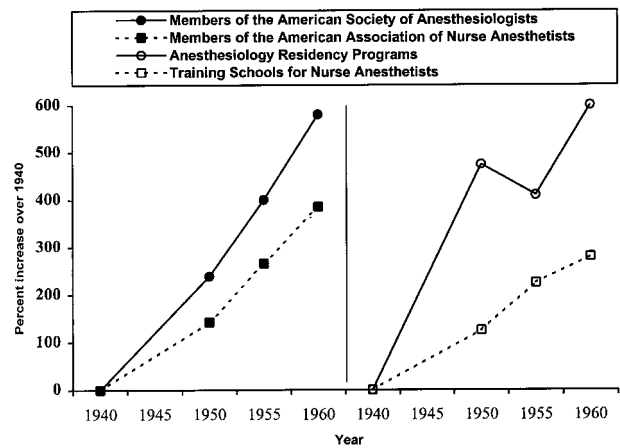


Fig. 2. From 1940 to 1960, the percent growth of the American Society of Anesthesiologists and anesthesiology training programs outpaced the growth of the American Association of Nurse Anesthetists and training schools for nurses.<sup>14,66,67</sup>

ing for anesthesia service in the military, halving the time necessary to be eligible to take the board examinations.

Medical and social changes also cultivated growth. Concurrent advances in medical knowledge, preoperative preparation, antisepsis, and surgical care enabled surgeons to perform routine and increasingly complex surgeries more safely.<sup>13</sup> Perhaps most importantly, health insurance became widespread. Although a complete presentation of the growth of health insurance is beyond the scope of this article, it should be recognized that, without changes in health insurance, it is unlikely that the medical profession of anesthesiology would have developed to its current state. Health insurance was rare before World War II.<sup>16</sup> In 1942, the government instituted wage and price controls to minimize inflation and war costs. To attract workers, industry resorted to expanding benefits, most prominently health insurance. This led to unions becoming major consumers of health insurance. At the same time, the medical establishment supported private health insurance to forestall a push for national health insurance, insurance reimbursement policies favored hospital-based care, and government resources were devoted to the financing of new hospitals. This confluence led to a well-insured population taking advantage of surgical advances, plentiful surgeons, and numerous hospital beds, which created an unprecedented need for anesthesiologists.

Nascent growth before World War II and a receptive medium afterward permitted the events of World War II to bolster the profession of anesthesiology.<sup>1,2,4,5,14,17,18</sup> Although it is impossible to determine whether the physician practice of anesthesia would have grown as vigorously as it did if World War II had not occurred, it is reasonable to posit that the physicians exposed to anesthesia practice created an interested and able cadre. Factors that contributed to the postwar growth of physician anesthesia include the effect of wartime anesthe-

sia training, the nature of combat anesthesia, and the exposure of surgeons and other physicians to the medical practice of anesthesiology.

### Wartime Education and Training

Wartime education and training in anesthesia may have stimulated physician interest in pursuing a career in anesthesia. At the beginning of World War II, the military did not have, and the civilian sector could not provide, sufficient numbers of trained anesthetists to support wartime medical care. Although this dearth was caused in part by the increased demand, it was also caused by the nature of prewar anesthesia practice in the United States. Most anesthesia providers were nurse anesthetists, most nurse anesthetists were female, and women had limited value to the military in terms of drafting and posting.<sup>19</sup> To address this issue, the military organized varied training during the war, most of which was focused on physicians. There were at least four important cohorts of American anesthesia training during the war.

One cohort consisted of American physician-anesthetists† who received training in the European theater by rotating through British hospitals.<sup>20</sup> In contrast to the development of anesthesia in the United States, anesthesia developed as a physician specialty in Great Britain because of the complexity of administering chloroform and the historical precedent of physicians administering anesthesia in Great Britain.<sup>7</sup> World War II physician-anesthetists tapped into this legacy.

In 1942, Ralph Tovell, M.D., Chair, Anesthesia, Hartford Hospital, Connecticut, was summoned to be the consultant in anesthesia in the European Theater of Operations. Tovell was well-suited for the role. A colleague of John S. Lundy at the Mayo Clinic, Tovell was brought to Hartford Hospital in 1936 and organized a modern department of anesthesia. He helped found the American Board of Anesthesiology in 1938 and was president of the ASA in 1940.

Colonel Tovell surveyed British hospitals in 1942 and found that they were well-supplied with standardized equipment and personnel were “well-trained” and of the “highest-order.”<sup>21</sup> Endotracheal anesthesia was not an unusual technique. On the other hand, American military hospitals had a hodgepodge of inadequate equipment and negligible tools for endotracheal intubation, and the people administering anesthesia were “insufficiently trained and . . . inexperienced.”<sup>21</sup> This difference prompted Tovell to issue an October 1942 report declaring that most of the doctors performing anesthesia in

American military hospitals needed additional training. He further advised that medical officers not assigned to anesthesia should crosstrain to be able to provide services in times of high demand and that corpsmen be trained to function under an assigned physician-anesthetist.

Tovell's initial training plan was to have two US Army hospitals, the 30th General Hospital in Mansfield, England, and the 2nd General Hospital in Oxford, England, provide courses in anesthesia. However, these hospitals did not perform enough surgeries until late 1943 to support the practical training courses. Tovell therefore authorized medical officers to rotate through the Radcliffe Infirmary to observe the British practice of anesthesia. In 1942–1943, 99 officers rotated through British hospitals for at least 1 month and personally saw professional, respected British anesthetists practice anesthesia.<sup>22,23</sup>

A second cohort was the “90-day wonders” who trained in 12-week courses at institutions in the United States. Until the war, there had been only one military course in anesthesia. Stevens J. Martin, M.D., who trained in Wisconsin under Ralph M. Waters, M.D., organized the first Army course in anesthesia in July 1941 at Tilton General Hospital, Fort Dix, New Jersey.<sup>24,25</sup> This course became the model used for the anesthesia courses developed by The Subcommittee on Anesthesia of the National Research Council. The subcommittee consisted of Ralph M. Waters, M.D., Chairman, and Emery A. Rovenstine, M.D., Secretary, John S. Lundy, M.D., Henry K. Beecher, M.D., Paul M. Wood, M.D., and Lewis S. Booth, M.D.<sup>24</sup> Courses began in the summer of 1942 and were given at leading anesthesia departments (and homes of the members of the subcommittee) such as those at Bellevue Hospital, Mayo Clinic, Hahnemann Medical College, and the University of Wisconsin General Hospital.

The 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.”‡ A typical course included 11 weeks in the operating room and focused on the practice and theory of inhalation, regional, and intravenous anesthesia. Students were evaluated from both a military and a professional point of view, and a thesis presentation was required for successful completion of the course. Suggested theses included anesthesia for patients with burns, anesthesia for patients exposed to poisonous gas, anesthesia for thoracic surgery, ether anesthesia, and airway management. Recommended textbooks included Beecher's *Physiology of Anesthesia* (1938), Lundy's *Clinical Anesthesia* (1942), Gillespie's *Endotracheal Anesthesia* (1941), and Guedel's *Inhalation Anesthesia* (1937).<sup>26–29</sup> In 1942, the Subcommittee published the *Fundamentals of Anesthesia*, which not only became the primary book for wartime anesthesia course, but also became the “Bible for physician-anes-

† As was the custom during World War II, physicians who provided anesthesia were called physician-anesthetists. The widespread use of the term anesthesiologist came later.

‡ *Course of Instruction in Anesthesiology*, Hahnemann Medical College and Hospital of Philadelphia, Inc., January–March 1943



Fig. 3. Photograph of the members of the second course of anesthesia at the 120th Station Hospital, Tortworth Court, England, 21–26 February 1944.<sup>21</sup>

thetists during World War II.”<sup>25,30</sup> Students were also encouraged to read ANESTHESIOLOGY, *Current Researches in Anesthesia and Analgesia*, and *Journal of the American Medical Association*.

A third cohort of training occurred in 1944, when the Army gave four intensive courses in anesthesia taught by “the outstanding physician-anesthetists in the theater.”<sup>20</sup> The first three of the 6-day courses were given at the 120th Station Hospital in Tortworth Court in January, February, and March 1944 (fig. 3). The fourth course was given during the first week in May at the 10th Station Hospital in Manchester, Lancashire.<sup>21</sup> Each course had about 70 trainees, the majority of whom were medical officers. After completion of the course, graduates were to attend a 30-day orientation in hospitals. The first three courses underwent this further training, whereas the fourth did not because of movement restrictions as a result of the upcoming D-Day invasion.<sup>20</sup>

A fourth cohort was an amalgam of on-the-job training and informal and formal apprenticeships by medical officers in the theater. In American units with adequately experienced medical officers, training and apprenticeship programs for local and rotating officers were established. The newly trained physician-anesthetists then returned to their own hospitals to train more medical officers and corpsmen in anesthesia.<sup>21</sup> To help provide continuing education and a forum for discussion of wartime anesthesia problems, monthly meetings of American physician-anesthetists were held in conjunction with the meetings of the Section on Anesthesia of the Royal Society of Medicine.<sup>20,21,31</sup> These meetings started in December 1943 and often consisted of discussions about scientific papers that were relevant to problems of giving combat anesthesia. As the war continued, required apprenticeships were implemented to address the increasingly inadequate number of physician-anesthetists.<sup>20,21</sup> In fact, because of the shortage, in Novem-

ber 1944, it was determined that a trained replacement was required before an anesthetist could move out.

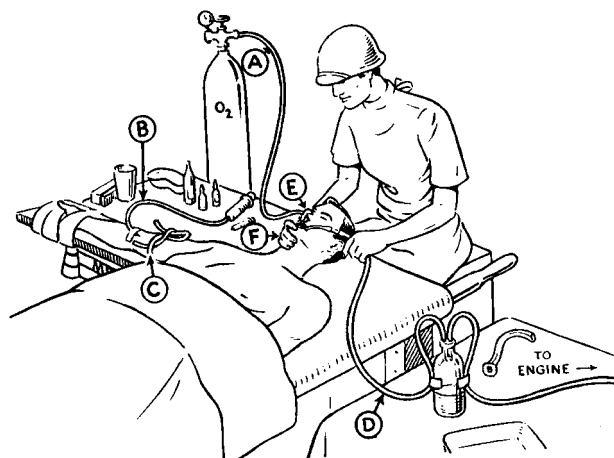
Wartime education in anesthesia may have brought about interest in the profession of anesthesia. In a variety of circumstances, physicians learned the science and art of anesthesia, saw anesthesia as an academic medical profession, and met professional anesthesiologists who were active in military and medical leadership. In particular, the personal influence of role models such as Waters, Rovenstine, Beecher, Lundy, Ruth, and Tovell cannot be overstated.<sup>32,33</sup> Their ability to represent the future of physician anesthesia and to make the study of anesthesia exciting induced many physician-anesthetists to pursue a career in anesthesia<sup>17,25,34–36</sup> (personal communication, interview with Dr. James Eckenhoff, La Pointe, IN, July 1994).

### The Nature of Anesthesia Practice

Wartime practice may have interested physicians in pursuing a career in anesthesia (figs. 4–7). Physician-anesthetists routinely had to solve unexpected problems, make-do with uncertain equipment and irregular supplies, and develop new skills.<sup>20,21,37–42</sup> Physician-anesthetists developed pride in their distinctive abilities to provide anesthesia for difficult cases, such as trauma, and to advance the science of anesthesia through academic pursuits and publications.

Creativity solved basic problems. Physician-anesthetists turned Planter’s Peanuts cans into serviceable masks for open-drop ether and created syringe holders out of ping pong brackets.<sup>21</sup> Perhaps the most common problem was not having enough hands.

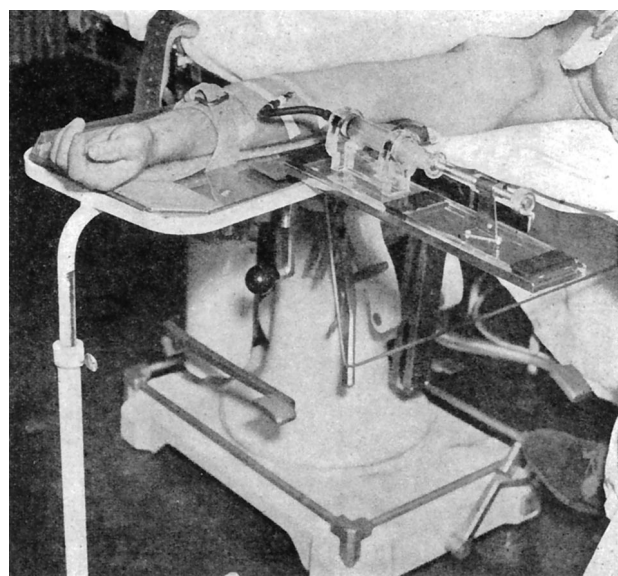
It was necessary for [one anesthetist] to hold the airway, check blood pressure, and maintain the needle in the vein that was connected to the pentothal syringe: By using a piece of tubing about 4–6 inches long between the tip of the 30 cc syringe containing the pentothal and the adapter attached to the needle in



**Fig. 4.** The resourceful wartime anesthetist. The caption from the article read: "Forward anesthetist. He has been quick to utilize parts of salvaged plasma sets to make his task easier under trying field conditions. A) Intranasal oxygen being administered through plasma tubing. B) A piece of plasma tubing connecting intravenous needle and syringe. C) Plasma tubing used as an arm tourniquet. D) Parts of plasma set used to improvise a field suction apparatus plus a rubber catheter as the adapter and a field ambulance motor as the source of vacuum. E) Respiration indicator F) Hand for constant control of chain and extension of neck when indicated."<sup>48</sup>

the vein, greater flexibility of the syringe could be made without displacing the needle in the vein. By taping the syringe on the volar surface of the outstretched forearm, the syringe was slightly higher than the vein and blood was less likely to back up into it. We also found that since the syringe is not in contact with the patient, we do not have to sterilize it. A new syringe of pentothal can be put in place of the empty one during anesthesia without disturbing the needle if the surgeon runs too long, which seems quite common.<sup>41</sup>

Wartime physician-anesthetists played a role more consistent with being a physician than a technician during what is now referred to as the perioperative period. The importance of having the respect, authority, and



**Fig. 5.** A syringe holder.<sup>68</sup>



**Fig. 6.** Underground surgery. The floor is 4 feet below the ground level, the sides are built up with sandbags, and the space is roofed with heavy logs.<sup>21</sup>

independence of a physician is underscored by the fact that correspondents went out of their way to emphasize this point. "Under the heading of anesthetist, it is my duty to see that all patients are properly prepared for surgery, including an adequate physical exam and work-up. When, of course, the choice and administration of the proper anesthetic agent is entirely my responsibility."<sup>43</sup>

Anesthesia for trauma patients in shock was relatively new and uniformly exhilarating.

The boy was admitted several weeks ago due to injuries of a land



**Fig. 7.** Operating in a clearing station, December 17, 1943. Note the mask anesthesia for an abdominal operation.<sup>21</sup>

mine. . . . He was in severe shock; he had lost a great quantity of blood and was still bleeding. . . . His pulse was weak, rapid, and thready; and his pre-operative blood pressure was 68/46. . . . I thought him to be in the irreversible stage of shock; but as it turned out, he wasn't. I departed from my usual 4% solution and used a 2.5% solution. Two cc. of this was enough to put the patient to sleep. To insure [sic] an open airway, and in order to give oxygen, I did a blind intubation with a Magill intratracheal tube through the nostril (the face was being repaired at the same time as the legs were being worked on). Oxygen was given via the machine with my 'adhesive tape' connectors. . . . He was treated for shock in the operating room all through the night and was in fair condition the next morning, at which time **I allowed him** to be transported to the ward. He was in good condition for evacuation [emphasis added].<sup>45</sup>

Physician-anesthetists published articles in academic journals that focused on the practices of anesthesia and improvements in methods, techniques, and anesthetic equipment.<sup>31</sup>

Publications included reports on the anesthetic management of blast injury, mechanisms and science of blood banking, management of anesthesia in the patients harmed by poisonous gas, and more commonplace topics, such as new regional anesthesia techniques and shock and its effect on anesthetic management.<sup>38,44-47</sup> Academic summaries of wartime anesthesia helped document the growth and advances of the specialty.<sup>38,48-51</sup>

### Greater Respect for the Profession of Anesthesia

Surgeons and other physicians began to have greater respect for the job of anesthetizing patients.<sup>4,12,20,21,23</sup> Perhaps the most important factor in the increased respect was the exposure of surgeons to true physician-anesthetists. Henry Ruth said it best,

It is not unlikely that experiences encountered during the present war will greatly increase the opportunity for anesthesiology. Before the war, large numbers of surgeons had never had the experience of operating under conditions provided by the physician anesthetist. Many of them had never attempted to acquire the services of a physician for anesthesia. They could, therefore, have no basis for a comparison of the operating conditions provided by the two types. Many of these surgeons have made or will make their first contacts with competent anesthesiologists in the armed forces and work under such improved conditions provided by them. After such an experience, it is to be seriously doubted whether many of them will be content on their return to civilian practice to retrogress to the inferior type of unsupervised technician anesthesia, where, as the law requires, they (the surgeons) must assume full responsibility for the anesthesia, even though fully occupied with the technical requirements of the surgery, and at the same time must dictate treatment and supportive measures during the operative period. On the other hand, there will be numerous surgeons who have long been accustomed to the advantages provided by anesthesiologists who will be exposed to the nonprofessional type of service. It may be assumed that a large

portion of this latter group will become even more active in furthering the advance of anesthesiology after the war.<sup>52</sup>

Surgeons and other physicians also learned about the complexities of anesthesia through didactic lectures. § Tovell frequently presented the 2-hour anesthesia lecture given to all medical officers at the Medical Field Service School in the European Theater. This course used the *Fundamentals of Anesthesia* textbook<sup>30</sup> and covered an ambitious agenda including oxygen therapy, inhalation anesthesia, intravenous anesthesia and pentothal, and regional anesthesia.

Physician-anesthetists brought regional anesthesia to wartime medicine and quickly established its value.<sup>33,40,51,53</sup> For example, in the first 6 months of 1943 in the European Theater of Operations, 58% of anesthetics were regional blockade.<sup>20</sup> It was well-recognized that regional anesthesia, except for spinal anesthesia, caused the least alteration of normal physiology and permitted a more awake patient to be returned to the ward, allowing for fewer ward caregivers. Furthermore, placing the regional blockade allowed the patient to be safely watched by a nonphysician, freeing the anesthetist to care for more complicated patients.<sup>40</sup> Regional techniques included cervical blocks, brachial plexus blocks, field blocks, digital blocks, and head blocks, such as mental, mandibular, and zygomatic blocks.<sup>38,54</sup> Regional blockade was also used for pain management, such as lumbar sympathetic block on patients with immersion foot.<sup>55,56</sup>

Other refinements of anesthesia, such as the increasingly important ability to use endotracheal intubation to manage severely wounded patients, may have impressed upon surgeons the benefits of physician-anesthetists.<sup>21,37,57</sup> At the end of World War I, Dr. Ivan Magill (who would become Sir Ivan Magill) was posted at the Queen's Mary Hospital of Facial and Jaw Injuries, where surgical advances were permitting an increasing number of facial injuries from World War I to be repaired. Magill developed a technique of blind endobronchial intubation in response to the need to share the airway and the space at the head of the bed.<sup>58,59</sup> This permitted Magill to maintain the airway while improving operating conditions for the surgeons. Although the technique of tracheal intubation became familiar in Great Britain, the United States lagged. Indeed, Tovell had to recommend in his 1942 report, "endotracheal tubes should be approved in principle as essential and that appropriate equipment . . . be provided as standard for standard to operating rooms in general, evacuation and surgical hospitals."<sup>21</sup> The wartime benefits of endotracheal anesthesia were prominently listed in a 1945 report "Endotracheal Anesthesia in the Combat Zone."<sup>57</sup> Endotracheal intubation permitted the anesthetist to (1) establish or maintain a clear airway, (2) provide positive pressure for thoracic operations, (3) provide abdominal relaxation, and (4) provide an unobstructed operative field.<sup>57</sup>

Expanded supervisory and managerial activities may

§ Wartime Graduate Education Meetings: Outline for 2-hour course in anesthesia.

have elevated the standing of the anesthetist in the medical and military hierarchy.<sup>37,38,40,60</sup> To be able to care for the number of wounded who needed surgery, physician-anesthetists supervised nonphysicians administering anesthesia by inducing patients and then by “using nurses and enlisted men as ‘robots’ to do as I told them.”<sup>42</sup> Nurses and corpsmen remained by the patient to monitor vital signs, with instructions to call the anesthetist “if a falling systolic pressure crosses a rising pulse rate (at about 100).”<sup>40</sup> Physician-anesthetists commonly managed the operative schedules, supervise sterilization and autoclaving of equipment, performed preoperative and postoperative rounds, and managed the inhalation and fluid therapy throughout the hospital, including oxygen and helium therapy, and the administration of intravenous solutions, plasma, and whole blood.<sup>61</sup> They also supervised and trained medical officers and enlisted men, served as property officers, participated on hospital boards and, participating in the hallmark of military legitimacy, filed status and efficiency reports.<sup>43,61</sup>

### The Role of Pentothal

Pentothal provides an excellent example of how specialized knowledge of physiology and pharmacology elevated the importance of having a physician provide anesthesia. The misuse of pentothal was blamed for deaths at Pearl Harbor and the opponents of pentothal, while accepting within qualifications the appropriateness of its use in civilian practice, denigrated its use in military practice.<sup>62,63</sup> Reasons centered on safety issues, such as the potency of the agent for respiratory depression, the inability to reverse its depressant effects, the variability of individual tolerance, and the effect of pentothal in shock or near shock states.<sup>64</sup> However, intravenous anesthesia with pentothal had the wartime advantages of “simplicity of equipment, absence of complicated apparatus, the facility of transport, the ease of preparing the agent and of its administration, [and] the freedom from hazard of fire and explosive.”<sup>64</sup>

Beecher<sup>53</sup> discussed pentothal’s rehabilitation. Although pentothal was introduced into clinical practice in 1934, many wartime pentothal deaths occurred because of its “use by completely inexperienced individuals . . . (and) in cases where actually contraindicated.”<sup>53</sup>

Increased respiration caused by hypoxia, for example, was misinterpreted as inadequate anesthesia, which led to further administration of pentothal and sometimes death.<sup>53</sup> Limited understanding of both the physiologic effects of pentothal and the need to consider the patient’s weight and hemodynamic status in administering pentothal contributed to the inappropriate use of pentothal.<sup>65</sup> Because of its unquestionable advantages, however, such as smooth induction and prompt awakening, pentothal use continued. Experience led to greater

knowledge and understanding of the drug, which led to refined use, such as inducing anesthesia with pentothal but maintaining anesthesia with nitrous oxide and oxygen.<sup>38</sup> This refined use, along with other improvements in surgical and anesthetic management, led to a decrease in pentothal-related mortality. As more of a reflection of the magnitude of change rather than the actual numbers, the estimated death rate in the Mediterranean Theater of Operations decreased 12-fold, from 1:450 to 1:5,500, in the months of September 1943 and 1944, respectively.<sup>53</sup> By 1945, pentothal was called “one of the three most important anesthetic agents for use in military medicine.”<sup>53</sup> Because of pentothal’s history of misuse, physician-anesthetists were credited with not only resurrecting the drug, but also being solely capable of dosing it correctly. Physician-anesthetists became “the keepers” of pentothal.

### Nurse Anesthesia During World War II

During World War II, the US military would not give nurse anesthetists the respect of a specific designation within the nursing specialty.<sup>19</sup> Despite interventions by the American Association of Nurse Anesthetists, experienced nurse anesthetists who volunteered were required to accept general nurse status, and thus could be assigned to any nursing role. It was “as though the armed forces were to group all physicians into a single category, with no recognition of their various specialties”<sup>19</sup> The American Association of Nurse Anesthetists was in a difficult position. Many nurse anesthetists wanted to serve, but they were concerned that they would be unable to practice their specialty; however, the military noted that they would make every effort to accommodate the nurse anesthetists. As a result, some encouraged nurse anesthetists to consider the value of serving the “civilian army,” which made the war effort possible. Despite these hurdles, nurse anesthetists volunteered in great numbers and served with valor.<sup>19</sup> During the war—approximately 600 army nurses underwent training in anesthesia in hospitals in the United States and overseas—nurses were trained in the same manner and setting as physicians.

### Summary

World War II was a time of growth and development of anesthesia as a physician specialty. Wartime training exposed neophyte physician-anesthetists to role models who showed the potential of anesthesiology and to the richness of practicing anesthesia. Wartime anesthesia required dexterity, imagination, and pluck, and surgeons and other physicians were suitably impressed.

Drawing historical conclusions about cause and effect is hazardous. Recognized and unrecognized biases, pre-

conceived notions, and the quality and type of resources available affect writers. With this in mind, consider how the effects of World War II on the growth of physician anesthesia loosely parallel the growth of anesthesia in Great Britain during the 19th century. Anesthesia became a medical profession in Great Britain because of the interest and support of physicians and the complexity of administering chloroform anesthesia.

Similarly, World War II physician-anesthetists showed they could provide complex anesthesia care, such as pentothal administration, regional anesthesia, and tracheal intubation, with aplomb and gained the support of surgical colleagues who facilitated their growth within a medical profession. They returned to a medium ready to support their growth and helped to establish the medical profession of anesthesiology in the United States.

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