Navy Medical newsletter

March 1970

United States Navy Medical Newsletter

Vol. 55 March 1970 No. 3

Vice Admiral G.M. Davis MC USN
Surgeon General
Rear Admiral J.W. Albrittain MC USN
Deputy Surgeon General
Captain M.T. Lynch MC USN, Editor
Mrs. Virginia M. Novinski, Assistant Editor
Mr. Ray Stevens, Art Director

Contributing Editors
Legal...Captain R. E. Blair JAGC USN
Nurse Corps...CDR A. M. Byrnes NC USN
Dental Corps...Captain A. K. Kaires DC USN
Preventive Medicine...Captain C. H. Miller MC USN
Aerospace Medicine...Captain H. S. Trostle MC USN
Radiation Medicine...Captain B. K. Hastings MC USNR
Medical Service Corps...CDR J. M. Beckwith MSC USN
Submarine Medicine...Captain B. K. Hastings MC USNR
Research Medicine...Captain B. F. Gundelfinger MC USN
Occupational Medicine...Captain N. E. Rosenwinkel MC USN
Amphibious & Field Medicine...Captain J. H. Stover, Jr. MC USN

POLICY

The U.S. Navy Medical Newsletter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry and allied sciences. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article, in its original form. The opinions and conclusions expressed in the articles or items included herein are those of the respective authors and do not necessarily represent the views of the Department of the Navy, the Bureau of Medicine and Surgery or any other governmental department or agency thereof.

DISTRIBUTION

The Navy Medical Newsletter is distributed to active duty Medical Department personnel via the Standard Navy Distribution List (SNDL) vice personal addresses. Any increase or decrease in the number of allotted copies should be requested via the local Commanding Officer through U.S. Naval Publications and Forms Center, Code 306, 5801 Tabor Avenue, Philadelphia, Pa. 19120. Other addressees may forward changes of address in the same manner, giving full name, rank, corps, old and new address, and zip code. The mailing label taken from the most recent issue should be forwarded if possible. See inside back cover for CORRESPONDENCE AND CONTRIBUTIONS.

The issuance of this publication approved in accordance with NAVEXOS P-35.

NAVMED P-5088

CONTENTS

Credits: Cover photograph reveals a patient arriving at the U.S. Naval Hospital in Danang, Republic of Vietnam.

All pictures are official Navy photographs unless otherwise indicated.

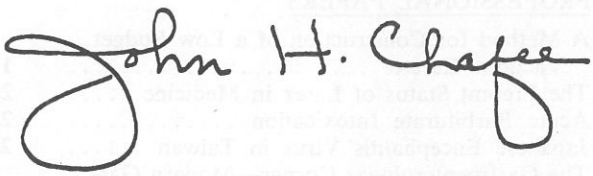
TO THE OFFICERS OF THE MEDICAL CORPS

It is with a great deal of pleasure that I extend greetings and congratulations to each of you on the occasion of the 99th Anniversary of your Corps.

Since the Medical Corps was established on March 3rd, 1871—in fact, since the first physician went to sea aboard the USS ALFRED with a young lieutenant by the name of John Paul Jones, almost 100 years before the formal founding of your Corps—Navy doctors have established a record for valor and devotion to duty that has earned for them a special place in the hearts of the sailors and marines with whom they serve.

I have the greatest confidence that you will continue your exemplary record of service to the men and women of the Navy and Marine Corps as we enter a decade that will bring new challenges and responsibilities to every member of the Naval Establishment.

Happy Birthday!



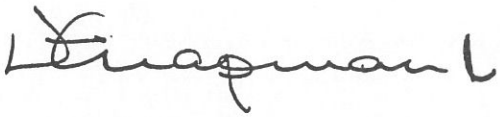
JOHN H. CHAFEE
Secretary of the Navy

I am most happy to extend greetings and best wishes to each of you on the occasion of your 99th Anniversary.

As you celebrate the formal founding of the Medical Corps on March 3, 1871, you can take great pride in your history of gallant service to the Marine Corps, from the Revolutionary War to Vietnam.

Every Marine is familiar with the devotion to duty that is the hallmark of the Navy Medical Corps. At home or abroad, on land or sea, wherever Marines have served—in peace or war—you have served with them, and every Marine is eternally grateful for your support.

Happy Birthday from the United States Marines!



L. F. CHAPMAN, JR.
General, U.S. Marine Corps
Commandant of the Marine Corps

I am pleased to extend my congratulations to each of you on the occasion of the 99th Anniversary of the Medical Corps.

Physicians have served on board ships of the United States Navy since 1775—long before the formal establishment of your Corps on 3 March 1871—and their record for gallantry in action and devotion to duty is a source of pride to every member of the Navy. In the last 99 years the Medical Corps has grown in stature as Navy doctors met new challenges and established new goals. Today your high standards of professionalism help to maintain a health care system that is known and respected throughout the world.

As Chief of Naval Operations, I know full well the importance of maintaining the health of every member of the Navy service. I am confident that each of you will continue to meet the challenge of providing the best medical care to the finest Navy in the world.

My sincere best wishes for a most Happy Birthday!

T H Moorer

T. H. MOORER
Admiral, U.S. Navy
Chief of Naval Operations

The first naval surgeon went to sea in 1775. He was soon followed by other physicians who chose to serve their country by joining the men who follow the sea—and the history of the Navy Medical Corps began. For almost two hundred years, in peace and war, wherever the Navy has carried our nation's flag, naval medical officers have served with valor and distinction.

On 3 March, as we celebrate the 99th Anniversary of our formal founding, I believe we can be justly proud of our history and our Corps.

A new decade of challenge and opportunity lies ahead. We serve today in as great a Navy as the world has ever known. Your skills and dedicated performance have added new luster to our distinguished record of service to the fleet. I know you share my pride in our Corps and I am confident that your performance will continue to reflect the fine tradition of devotion to duty that has always been the hallmark of the Navy Medical Officer—from 1775 to 1970.

It is with a great deal of pleasure and appreciation that I extend to each of you my very best wishes for a most Happy Birthday.

G. M. Davis

G. M. DAVIS
Vice Admiral, MC, USN
Surgeon General

from the Chief

Approximately a year ago, I assumed the duties of Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery. Since then I have had the opportunity to visit Medical Department personnel in facilities throughout the world, including major combat units in Vietnam. At this time, I would like to report to you on my impressions, accomplishments of the Navy Medical Department, and objectives.

It is well known to everyone that demands for medical services have increased enormously in recent years. Approximately 45,000 active duty personnel and nearly 10,000 civilian employees are involved in effectively administering a comprehensive health care program for roughly 1,000,000 active duty members and 2,000,000 retirees, dependents, and other eligibles. During 1969 an average of 16,400 patients occupied hospital beds daily and more than 17,000,000 were treated in outpatient departments of hospitals and other medical facilities. This represents an overall increase of 54% in both the average daily patient load and outpatient visits for FY 1965—1969 time frame. Much of this increase, of course, can be attributed to our involvement in Vietnam. Since January 1965 more than 133,000 casualties have been admitted to incountry and offshore facilities. The majority of these occurred in 1968 when the Navy and Marine Corps sustained in excess of 37,000 combat casualties, 60% of which required hospitalization. It is significant to note that of this number, 87% of those hospitalized were returned to duty, approximately 5% remain under treatment, and 7% have been separated from the naval service because of physical disability. Of greater significance is the fact that the mortality rate of those requiring hospitalization has been less than 1%. This is lower than ever before achieved in any military action, and without the sophisticated and meticulous care furnished in Navy medical facilities, there is every reason to believe that the ratio would be much higher.

The ability to meet our ever increasing patient load depends largely on availability of manpower and facility resources. While we have experienced a 22% increase in Medical Department strength, our growth has not kept pace with the total active duty strength of the Navy and Marine Corps or the increase in medical service requirements. Manpower studies are currently being conducted by a Department of Defense Hospital Management Evaluation Study Group, which is evaluating staffing requirements of comparable medical facilities in the Armed Forces. It is hoped that the findings of this study group will lead to an improvement of our personnel posture.

During the past 4 years, an aggressive construction program has been vigorously pursued in an effort to replace hospital facilities which are of temporary construction and no longer lend themselves to increasing medical service demands. New hospitals have been dedicated at Jacksonville, Florida, and Oakland, California, and plans have been approved for immediate replacement of hospitals in Memphis, Tennessee; Charleston, South Carolina; and Corpus Christi, Texas. Although plans for a new hospital to replace the existing structure at Camp Pendleton, California, during FY 1970 were recently denied, the excellent support which we are receiving from the Chief of Naval Operations, the Secretary of Defense, and the Congress is most encouraging. The projects programmed through FY 1971—1976 time frame include replacement of 10 existing structures and modernization or expansion of 12 other facilities. While it is recognized that a program of this magnitude represents a major challenge, success is considered essential if we are to fulfill our commitments to members of the Armed Forces and their dependents.

Efforts are continuing to improve and expand our training programs. At the moment, we have approximately 165 interns and 526 medical officers assigned to residency programs at naval hospitals, the Naval Medical School, and the Naval Aerospace Medical Institute. Additionally, 51 medical officers are assigned to full time training in specialties and subspecialties in more than 30 different civilian institutions. A proportionate number of training spaces are available for dentists, nurses, and officers of the Medical Service Corps. Though much has been accomplished in this area, there is still need for improvement, and additional training billets have been requested to permit further expansion of existing programs in Fiscal 1972.

Despite authorized career incentives, turnover of highly trained personnel of the Medical Corps, Dental Corps, Medical Service Corps, and Nurse Corps continues to be extremely high, and ways and means to reverse this trend must be found. Study groups in the Bureau are currently evaluating career incentives for each operational, occupational, and clinical specialty group, identification of "choice" billets with recommendations for improved use of such billets, additional methods of remuneration, and ways to improve the image of Navy medicine. While it is not possible to predict what recommendations will be made, every possible innovation which might contribute to making military medicine more attractive as a career will be explored.

I feel compelled at this time to pay tribute to a group of young men serving in Southeast Asia. These are our hospital corpsmen assigned to duty with the Marine forces. Though all of our personnel in Vietnam, both ashore and afloat, have performed superbly, these young men have exhibited great courage in rendering medical support to wounded Marines, oftentimes at a very great personal risk. Thus far more than 600 have received personal decorations for valor and earned in excess of 4,000 Purple Hearts. By their courageous performance in combat units, they have gained the respect and admiration of everyone throughout the naval service.

In summary, there is every reason to be optimistic about the future of the Navy Medical Department. While the reduction of resources, including troop strength and funds, has temporarily impaired the growth of some programs, we can look forward to improved academic opportunities, more modern medical facilities, and continued progress in the Navy Medical Department. These and other accomplishments would not have been possible without the help of many members of the Medical Department who have worked long hours without reward or personal acclaim to improve our medical services. To each and every medical officer, dentist, medical service officer, nurse, hospital corpsman, dental technician, and civilian employee, I would like to express my personal appreciation for the splendid job which you are doing and ask each of you to join me in dedication to carry Navy medicine to even greater heights, to insure that members of the Navy and Marine Corps families continue to receive the most comprehensive and dignified medical care possible.

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

NAVY MEDICAL CORPS—ITS GROWTH AND DEVELOPMENT

By Mr. W. Kenneth Patton, Medical Historian, Bureau of Medicine and Surgery

Despite the creation of a Bureau of Medicine and Surgery on 31 August 1842, internecine conflict continued unabated. In August 1869, the Army and Navy Journal reported that Navy Department General Order No. 120, directing the reduction of the rank of the Staff Corps, "evoked from the medical branch of the Navy a pamphlet of nearly 100 pages, issued without the name of printer or author". The pamphlet reviewed abuses and wrongs allegedly suffered by medical officers at the hands of line officers over the previous 50 years. It was further reported by the Army and Navy Journal that disparagement resulting from General Order No. 120 had "led to the formation of four different combinations, whose object it is to influence Congressional action next winter".

With the enactment of the Appropriations Act by the Forty-First Congress on 3 March 1871, the Medical Corps became established as a separate entity and as a Staff Corps of the Navy. The Act also provided that the Chief of the Bureau of Medicine and Surgery would have the title of Surgeon General and the relative rank of Commodore.

The "Register of the Commissioned, Warrant and Volunteer Officers of the Navy of the United States including officers of the Marine Corps and others, to July 1, 1871" listed the names of 153 medical officers in addition to that of Surgeon General William Maxwell Wood.

Medical Corps officers in 1876 wore cobalt blue cloth on the sleeves between the stripes of gold lace which indicated their rank. Other officers had anchors on the epaulets, but the Medical Corps did not. While it would appear that special corps devices may have been worn sporadically following the legislative act passed in 1871, perhaps with Medical Department authorization which did not conflict with Navy regulations, Uniform Regulations did not specify any official Medical Corps device until 1883. In the Uniform Regulations of 1883, the Medical Corps device was described as ". . . a spread oak leaf embroidered in dead gold, with an acorn embroidered in silver upon it". While some have considered the device symbolic of strength and virility associated with the sturdy oak tree, the most frequently accepted origin of the device is related to the Druids, a religious sect of magician-philosophers of pre-Roman Gaul and Britain. The Druids presumably gathered in forests and adopted the oak leaf as a symbol of identification. Essentially concerned with moral suasion and theology, their wisdom was presumed eminent and they were often called upon to resolve problems among the populace.

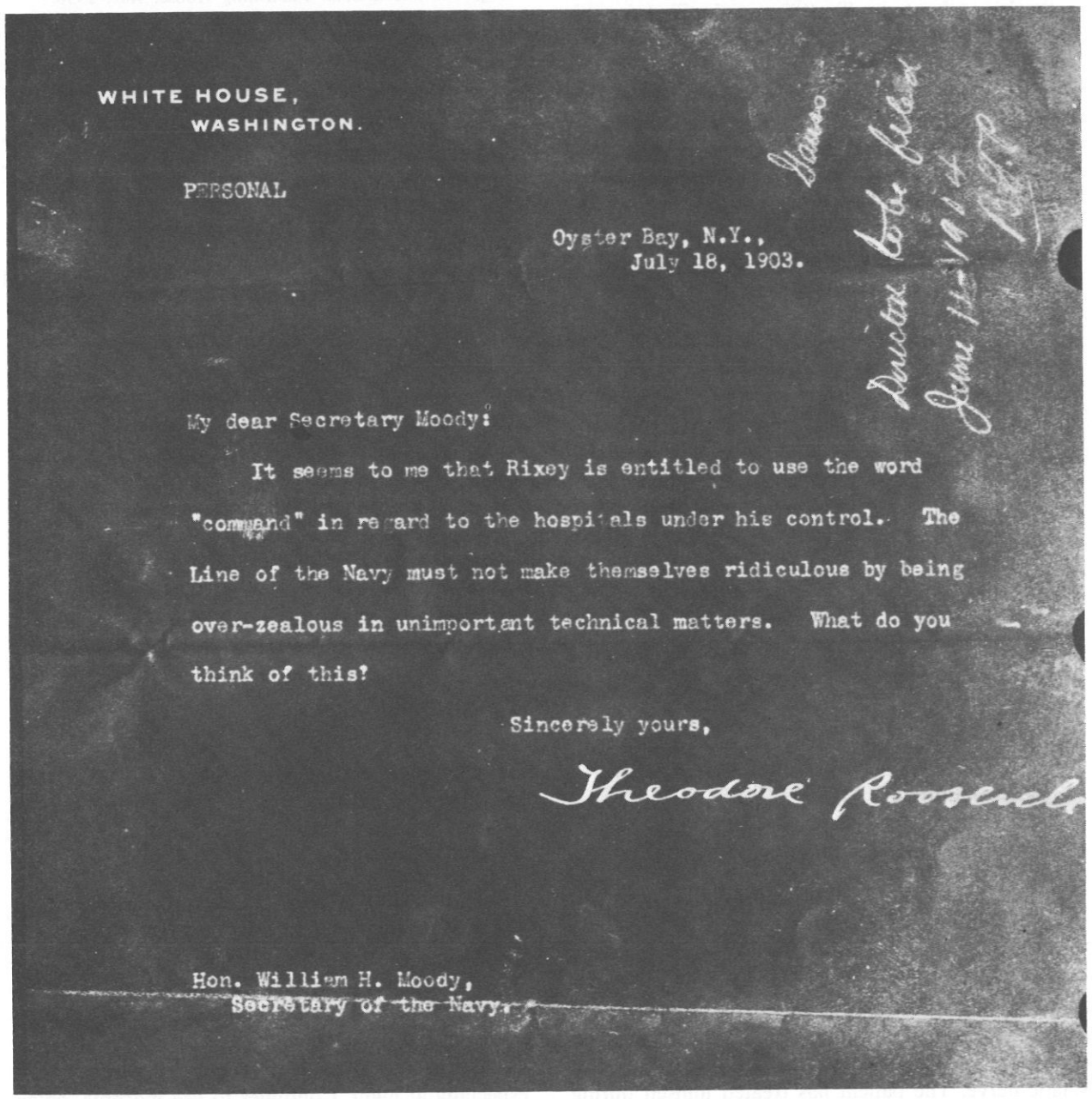
In 1883, a Museum of Naval Hygiene was founded in Washington, D.C., for the display of items of medical interest that had accumulated in the office of the Surgeon General. A building adjacent to the

PAY TABLE FOR MEDICAL CORPS IN 1871

	At Sea	On Shore Duty	On Lv Awaiting Orders
Fleet Surgeons Medical Directors (Relative Rank of Captains)	$4,400	.....	.....
Medical Inspectors (with relative rank of CDRS)	4,400	.....	.....
Surgeons (with relative rank of LCDRS)			
1st 5 years after date of commission	2,800	$2,400	$2,000
2nd 5 years " " " "	3,200	2,800	2,400
3rd 5 years " " " "	3,500	3,200	2,600
4th 5 years " " " "	3,700	3,600	2,800
After 20 yrs " " " "	4,200	4,000	3,000
Passed Assistant Surgeons (with relative rank of LT)			
1st 5 years after date of appt	2,000	1,800	1,500
After 5 years from date of appt	2,200	2,000	1,700
Assistant Surgeons (with the relative rank of Master)			
1st 5 years after date of appt	1,700	1,400	1,000
After 5 years from date of appt	1,900	1,600	1,200

Navy Department was rented to serve both as a Museum and a Navy Dispensary. Space became available for examination of pathology specimens and a system of Navy Medical Research evolved, with particular emphasis on chemistry and tropical medicine. The Museum of Naval Hygiene was subsequently moved, in 1894, to the building formerly occupied as the Naval Observatory. In 1902, the Museum was merged with, and retitled as the Naval Medical School, where a greatly expanded program of medical research and postgraduate instruction of newly-appointed medical officers resulted.

In 1902, a dynamic Surgeon General, RADM Presley M. Rixey, MC USN, served concomitantly as White House Physician. The President, Theodore Roosevelt, was an advocate of a strong Navy and a proponent of physical fitness. RADM Rixey believed that sound medical administration was proscribed by the "relative rank" concept and the denial of the right of command over purely Medical Department activities. In the summer of 1903, the senior medical officer at Norfolk Naval Hospital forwarded an official letter to the Bureau and signed it as "in Command". Proceeding through prescribed channels, the letter passed via the CO of the Receiving Ship *Franklin,* where it was ill received, and returned. The



WHITE HOUSE,
WASHINGTON.

PERSONAL

Oyster Bay, N.Y.,
July 18, 1903.

My dear Secretary Moody:

It seems to me that Rixey is entitled to use the word "command" in regard to the hospitals under his control. The Line of the Navy must not make themselves ridiculous by being over-zealous in unimportant technical matters. What do you think of this?

Sincerely yours,

Theodore Roosevelt

Hon. William H. Moody,
Secretary of the Navy.

hospital was directed to delete the phrase "in Command", and substitute the words "in Charge". RADM Rixey's sympathy with the hospital concerned was greatly enhanced by the subsequent written approval of *Franklin's* action by the Secretary of the Navy, who had been approached by the Bureau of Navigation. Although the President was at his summer home in Oyster Bay, N.Y., RADM Rixey soon had opportunity to discuss the incident with Mr. Roosevelt. Shortly thereafter, the President had occasion to write to the Secretary of the Navy the letter reproduced on page 7.

On 23 August, 1904, a general order was published authorizing the term "in command of" (vice "in charge of") for medical officers commanding naval hospitals.

During RADM Rixey's terms as Surgeon General, the Naval Medical Bulletin was created. Published continuously from 1907 to 1950, the *Bulletin* served well in disseminating professional information to medical officers throughout the world.

With the advent of professional growth and administrative recognition, the expansion of the Medical Department to include other vital professions so necessary for the optimal delivery of health care, and the evolution of harmonious respect among the diverse professional groups contained within the Navy Department, the Navy Medical Corps has come of age. Dedicated to the concept of healing and restoring comfort, the test of armed conflict has ever been met without compromise, and the Medical Corps has not been found wanting.

REFERENCES

1. Armed Forces Journal/16 August 1969.
2. Braisted, W. C. and W. H. Bell: The Life Story of Presley Marion Rixey, Surgeon General, U.S. Navy. Strasburg, Va., Shenandoah Publishing House, Inc., 1930.
3. Annual Reports of the Surgeon General, U.S. Navy; 1871 to 1940.
4. Navy Medical BULLETIN: 1907 to 1949.
5. Hospital Corps QUARTERLY: 1918 to 1949.
6. Gihon, A. L.: Naval Hygiene, GPO, 18.
7. Pleadwell, F. L.: Various Biographies, notably, Edward Cutbush, William Longshaw and Jonathan Cowdery.
8. Kerr, W. M.: Elisha Kent Kane (1820-1857), Amer Med History 6:71-125, 1924.
9. Gatewood, J. D.: Various Biographies, notably, J. M. Ambler.
10. Holcomb, R. C.: A Century with Norfolk Naval Hospital, Portsmouth, Va., Printcraft Pub Co., 1930.

NAVY SURGEON Millard H. Crawford was born 29 May 1852 at "Bonnie Doon", Mt. Meridian, Va. After obtaining his medical education at Jefferson Medical School in Philadelphia, he was appointed an assistant surgeon in the Navy on 1 November 1876, passed assistant surgeon on 1 November 1880, and surgeon on 21 August 1893. He served aboard the USS Tuscarora, Pacific Station, during the years 1878-80. The following case report has been taken from the clinical notes compiled by Dr. Crawford. We are extremely grateful to his great nephew, RADM Robert O. Canada MC USN (Ret.), who has made this interesting material available to us.

REPORT OF A CASE, 1878

E. H. W., Surgeon U.S. Navy, Age 36 years.
Native of Portland, Maine.
Entered the Navy Apr. 27th 1866.
Sciatica and *Fatal Narcotic Poisoning.*

The sciatica originated in line of duty from climatic influences. The patient states that he has never had sciatica before and his health generally has always been good. He is a man of most excellent physique. His present attack of sciatica commenced on the 10th of June 1878, while cruising on the coast of Mexico. The disease affects the left sciatic nerve. The patient has treated himself during the past month with narcotics, alteratives, tonics and stimulants.

Acapulco, Mex. July 22nd, 1878.

The patient was admitted to the sick list today, although he remained on duty and signed all official papers as senior medical officer. He has lost considerable flesh during the past month and is somewhat debilitated from close confinement to his stateroom.

Pain in the left sciatic nerve quite severe and especially at night. Continues to use morphia, chlor-

al, potass. bromidi, and also tonics, stimulants and electricity.

26th July—There has been no marked change in his condition since the 22nd, with the exception of an increase in debility. Continue same treatment.

27th July—Had a very restless night with but little sleep. Administered sufficient morphia to relieve pain. Also used counterirritation over left sciatic nerve. Continue treatment of 26th.

30th July—No change in the patient's condition. Continue same treatment.

2nd August—The sciatica continues to grow worse, and the patient is confined to his stateroom all the time, which is poorly ventilated; with a high temperature it becomes quite oppressive, and has a tendency to increase the disease in severity. I advised the Doctor and also Capt. Philip urged him to occupy a room in the Cabin where it was cool and well ventilated, but he would persist in remaining in his own room. He alternates with chloral, potass. brom., morphia and stimulants.

6th August—No improvement.

9th August—Sciatica gradually getting more painful with loss of flesh and strength. The patient's appetite is good. He takes stimulants regularly with the constant use of narcotics to obtain sleep. The patient was surveyed today and found unfit for duty; it was recommended that he be transferred by first Steamer to the Naval Hospital at Mare Island, Calif., for medical treatment and change of climate.

10th August—Patient says that he had a severe pain in the hip during the night, and did not sleep much, notwithstanding the large doses of chloral and morphia used. He continues to use brandy freely.

11th August—The patient states that he had a very restless night, being unable to sleep much on account of intense pain produced by sciatica. Pulse full and quick. The patient was sitting up in the forenoon, and wrote a letter to Capt. I. W. Philip in regard to the unhealthy condition of the Mexican coast. I saw him soon after writing this letter and he said he was going to eat his breakfast and "turn in", to try and get some sleep as he had had none for several nights. I was very busy during the afternoon and evening, and did not see the patient again until 10:00 P.M. At that time he was very talkative but perfectly rational. He remarked that he had taken morphiae sulphus. gr ½, chloral, and several ounces of brandy during the afternoon and evening. I remarked to him that I thought he was taking rather large doses of chloral and morphia for a man in his condition. I advised him not to take any more narcotics or stimulants during the night. And I left him with the understanding that he would not.

12th August—I was called by the Officer of the Deck at 2:30 A.M. (on the Poop Deck where I was sleeping at the time), who said I had better go below and try and quiet Dr. W. as he was and had been keeping up a great noise. I went to his room as soon as possible, and found him as I thought suffering from an overdose of narcotics, judging from the following symptoms, viz.; marked contraction of pupils and he complained of not being able to see anything, pulse quick and weak. Respirations increased and deficient. Mind rambling and talking of trivial matters; very much excited at times. I administered zinci sulphas. gr. xv. at once, which made him vomit freely in a short time. I then gave him atrophiae sulphas. gr. 1/30- (hypodermically), and as soon as could be obtained, some strong coffee. The above treatment seemed to give him great relief, increasing the strength of the heart, producing dilation of pupils with an improvement of respiration, and calming of mental faculties. The officers of the Wardroom said he was up and down most of the night. And as he had not slept much of any consequence for the past two nights, I thought it essential for him to have some rest in order to strengthen him. I was under the impression too that all the narcotics he had taken during the night that were not absorbed, were thrown off from the stomach when he vomited so freely. I supposed too that the atropia would antagonize any toxic effects of the morphia remaining in the system. He dozed off to sleep at 5 A.M. His pulse at this time was 100 per minute, full and rather strong. Respiration quickened. Temperature 100° F. As near as I could learn from the apothecary, he sent his bottle for chloral hydrate and potass. brom. a little before 12 P.M. with the following directions:

"Rx Chloral Hydrate drams II
Potassii Bromidi drams IV
Aquae f oz IV
Mix. Sig. One fourth at a dose
(Signed), E.H.W."

I looked over his room and found the above bottle, which contained a little less than an ounce of the solution, or about drams VI; and an ounce bottle half-full of Magendie's solution of morphia with a hypodermic syringe on his bureau. I also found three papers of morphia, containing ¼ gr., each in a drawer over his "bunk" besides a small vial of morphia in his pocket case.

There was an empty brandy bottle and one about half-full on his bureau. I noticed the patient closely

until 8:30 A.M. when I was obliged to attend "sick call". During that time or in my absence I noticed him as often as circumstances would permit. His sleep during this time was almost normal with some sighing or slowness of respiratory movements. Temperature slightly elevated. Pulse quick with loss of strength. Also during my absence at "sick call" some of the officers noticed him. I returned to see him again at 9:30 A.M. when I found him in a comatose condition, pupils dilated, conjunctivae deeply injected, mouth and injected tongue deeply congested; the latter organ was very dark-colored. There was also a large clot of blood in his mouth. Respiration deficient. Pulse irregular, intermittent and weak. Skin hot and moist. He was immediately removed from his room to the deck of the Wardroom under the windsail and the following treatment was used, viz.: flagellation and pinching of the hands, feet, face and the whole body. Used cold douches to the face. Galvanization and artificial respiration were applied freely. Friction of the feet and legs, and as soon as he could swallow, strong coffee was administered. Gave hypodermically, atropiae sulph. gr. 1/40. Inhalation of ammonia. After two hours of persistent work, we succeeded in resuscitating or arousing him from his deep sleep and comatose condition. He vomited very soon and the matter vomited contained some blood. (I was unable to get any of the matter vomited as it was thrown out during the excitement). The application of electricity seemed to be more beneficial and aroused him more than anything else that was used. The hypodermic of atropia sulph. acted quickly, producing marked dilation of pupils with an increased action of the heart and respiratory movements. When consciousness returned, he recognized most of the officers. He was able to move around a little and to get up and down from his cot, although he showed marked symptoms of prostration and loss of coordination of the muscular system. I judged it would be better not to allow him to exert himself much, in his exhausted and debilitated condition. His mental faculties during the afternoon and evening were not sane as he labored under delusions of every description, being unable to collect his ideas on any subject. He begged and entreated for morphia and chloral during the afternoon and evening. In order to satisfy and quiet him I was obliged to administer placeboes. His pulse up to 12 P.M. was one hundred per minute and rather weak. Respiration slow and rather deficient. He had a very free evacuation from the bowels at 4 P.M. He urinated frequently and freely and there seemed to be some vesical irritation, judging from his frequent desire to micturate. Skin acting well. The following treatment was pursued, viz.: brandy with white of eggs, strong coffee and milk were administered every fifteen minutes during the evening and night. I thought it advisable not to give any more atropia with the above symptoms. He was not allowed to sleep any in the afternoon or evening, until 10 P.M. He would doze off after 10 P.M. and sleep at intervals of 5 or 10 minutes and then wake up in a very excited condition.

13th August—There was no marked change in the patient's symptoms up to 4 A.M. I administered his stimulants regularly every fifteen or twenty minutes during the night and early part of the morning. His bowels moved freely at 3:30 A.M. At 4 A.M. he had a relapse. His pulse became quick, weak, and continued to grow feeble until 6:30 A.M. when I was unable to detect any pulse at the wrist. Respiratory movements slow and very deficient. Temperature 97° F. in the axilla. Unconsciousness soon returned. Pupils dilated. Skin moist. Every means possible was used to revive him in the way of stimulants, galvanization, and artificial respiration with but only temporary effects. He expired at 7:30 A.M. His death was easy and free of pain. His body soon after death became very much congested, especially his face, back and mouth. A post-mortem examination was not made as it would interfere with the embalming process. I embalmed his body and sent it by Pacific Mail Steamer to San Francisco.

Remarks—His death was undoubtedly due to an overdose of morphia and chloral hydrate, administered by himself sometime during the night of the 11th of August 1878. The only way that I can account for his sad mistake is that he got up during the night to take some medicine, and through mistake took an overdose or perhaps got the wrong bottle, and in a state of excitement and suffering took the fatal dose. The only reason that I can assign for the failure of the atropia and other antidotes that were used, was on account of the great mixture of the narcotics in the system, and especially was the fatal result due to the continuous action of the chloral hydrate. Also his marked debilitated condition made him particularly susceptible to the depressing affects of the mixture of narcotics. I fear too that I am to blame for not administering a sufficient amount of atropia to correct or antagonize the action of the opium.

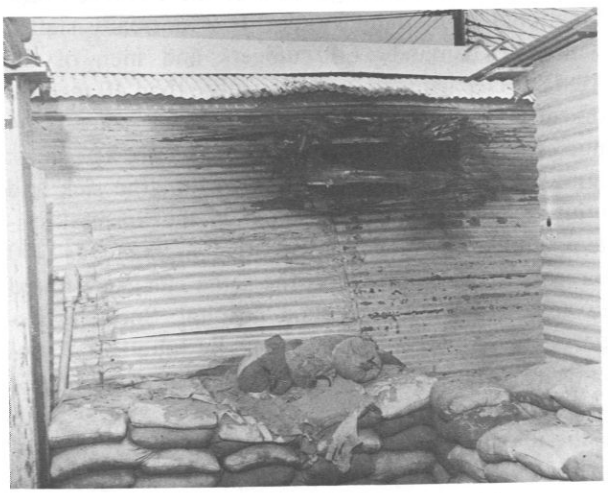
FROM THE ANNALS OF NAVAL SUPPORT ACTIVITY, DANANG, REPUBLIC OF VIETNAM

By CDR F. O. McClendon, Jr. MSC USN, Director, Management Information Center, Bureau of Medicine and Surgery.

On 31 July 1965 the prospective Senior Medical Officer and his Administrative Officer arrived at Danang, Republic of Vietnam, to supervise construction and development of what was eventually to become the largest combat casualty treatment facility in the world. Together with the Commander in Chief, U.S. Pacific Fleet, they officially dedicated a 60 bed facility on 17 January 1966. Since that time the hospital, which was born of war and death, has expanded to 600 beds and has admitted more than 63,000 patients for treatment of war wounds, non-combat injuries, and disease.

Sitting on a 50-acre site of sand dunes in Danang East, the hospital is located approximately 3 miles from Danang proper. Surrounded by a myriad of military components, it has frequently come under enemy attack either by design or otherwise. During initial construction stage, the hospital site was overrun in October 1965 by the Viet Cong who with satchel charges and mortars destroyed six of the buildings. Rebuilding began immediately and in January 1966 a 60-bed facility was opened. By June 1966 it had grown to 400 beds, expanding to 600 beds in 1968. Since dedication, the hospital has repeatedly sustained rocket and mortar hits. The urology clinic and orthopedic ward were struck by rockets 4 March 1968. The clinic was 74% destroyed, 5 patients were injured—none seriously, and 3 hospital corpsmen sustained wounds (one of them was seriously injured). Despite such attacks which have continued through late 1969, morale of personnel has remained remarkably high and performance has been superb.

Helo Pad at NSA Danang. Note Triage areas in quonset hut structures and hospital in background.



Enemy Mortar Damage to OR "F", 12 August 1969. —(Official Navy Photograph by HMC McGee, USN.)

The Danang hospital is charged with the responsibility for providing emergency and definitive hospital care, primarily to Navy and Marine Corps personnel in I Corps Tactical Zone; for treating those patients with diseases or injuries requiring specialized care not available in other medical elements; and for furnishing dispensary services for personnel in the Danang area. Organizationally, it is a Department of U.S. Naval Support Activity (NSA) Danang, and the Senior Medical Officer is designated a department head. Functionally, however, because of the professional nature of assigned duties and the extensive workload, his responsibilities more closely parallel those of a commanding officer. For example, he is

responsible for providing total patient care for an average daily patient load of approximately 400 patients, determining disposition of patients, administering staff personnel functions, controlling his medical supply system with a 4 month stock level and serving as Staff Medical Officer to the Commander, Naval Support Activity.

For the most part, the hospital complex consists of quonset hut buildings used in the advanced base functional component system. It is normally staffed with approximately 600 officers and men of the Medical Department, including more than 40 medical officers, 12 dentists, 20 medical service officers, 34 nurses, and nearly 500 hospital corpsmen. The latest innovations and equipment for care of the sick and injured have been incorporated in the hospital system, and it is capable of treating as many as 700 patients, if necessary, with the same efficiency found in any modern metropolitan hospital. Specialty departments consist of those normally found in a general hospital including general surgery, orthopedic surgery, neurosurgery, genitourinary surgery, anesthesiology, ophthalmology, otolaryngology, internal medicine, radiology, dermatology, laboratory, and a neuropsychiatric service which was recently established. Since it is an acute casualty treatment center, the surgical services occupy much of the available hospital space, including eleven OR's, an ICU (Intensive Care Unit), recovery room, and five surgical wards of 50 to 60 beds each. Because of the high incidence of malaria, parasitic diseases, and tropical fevers, the medical service is nearly equally as large consisting of 5 wards, each of which has a 30 to 60 bed capacity.

Other capabilities of the hospital that are somewhat unique include a Preventive Medicine Unit which is organized in six sections (epidemiology, laboratory, environmental health, entomology, vector control, and administration); a medical research unit, helo pad, and two triage areas designed for sorting mass casualties and instituting resuscitative procedures. The surgical research study group which has been evaluating management of shock in battle casualties has played an important role in establishing and maintaining the high level of patient care at Danang, and has published several papers on the work it has done. The efforts of this group will unquestionably be of invaluable assistance to both the military and civilian medical communities in studying ways and means of managing patients with fresh trauma.

Patients generally arrive at the hospital in a mass by helicopter. With an admission rate averaging approximately 2,000 admissions each month, a highly organized triage area is vital to quality patient care. Following arrival casualties are immediately taken from the helo to one of the triage areas where they are methodically categorized, lifesaving procedures undertaken, and diagnostic studies ordered. Subsequently, they are taken to pre-op, if appropriate, for debridement, prepping, etc., and scheduled by the triage officer for surgery in one of the eleven OR's. It is not unusual during this critical period for several

Helo Arriving at Danang.

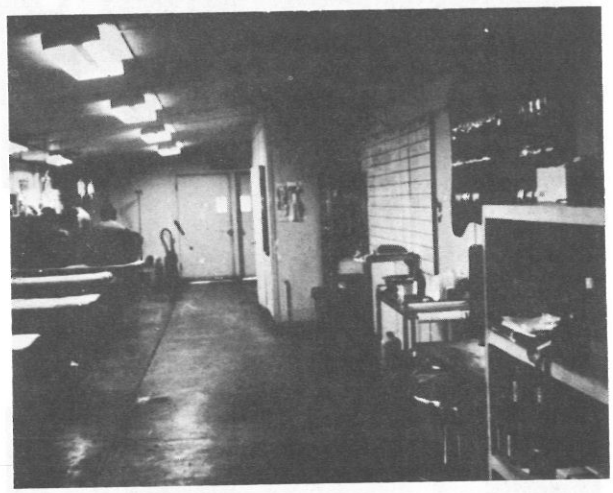
Casualty Arrives at Danang.

Triage Area, NSA, Danang.

teams of surgeons to work simultaneously on one case because of multiple wound involvement. The triage area is rapidly cleared and made ready to receive other casualties. After surgery the patients are usually taken to a highly sophisticated ICU and later they are transferred to the surgical or neurosurgical service for continued treatment and disposition. Those requiring hospitalization in excess of 30 days are scheduled for evacuation to offshore facilities, usually in Yokosuka, Japan, or Guam, M. I., or to CONUS as soon as there are no contraindications to travel.

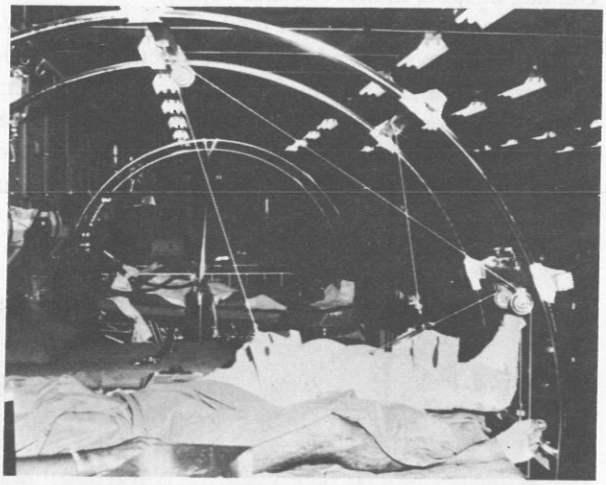
Since dedication in 1966, the workload of the hospital has been phenomenal. Nearly 24,000 patients were hospitalized in the calendar year 1968 accumulating in excess of 150,000 sick days; during 1969, approximately 20,000 patients were admitted to the hospital. Of the total admissions in 1968, approximately half were treated for combat wounds or injuries requiring more than 23,000 major surgical procedures. This included 120 craniectomies performed by two neurosurgeons during the summer offensive in May 1968. While 1969 brought a gradual decline in combat casualties, the number of patients requiring hospitalization continued extremely high because of a marked increase in malaria incidence. In May 1969, 22 additional personnel including 2 physicians, 2 nurses, and 18 corpsmen were temporarily assigned to the hospital to assist with the associated increased workload. By late July the malaria incidence peaked and assigned personnel were withdrawn. Such performance and responsiveness of superbly trained personnel are typical of the Danang hospital in meeting and coping with constantly changing requirements for medical service delivery.

Not to be overlooked are the tremendous contributions being made by the hospital staff in providing medical assistance to the Vietnamese. During 1968 and 1969, 1,445 Vietnamese civilians were admitted to the hospital on a humanitarian no-cost basis. Other



Debridement at NSA, Danang.

Surgery at NSA, Danang.



Circular Bed in ICU, NSA, Danang.

General Ward, Danang Naval Hospital.

accomplishments include hundreds of thousands of immunizations (mostly plague and cholera) and

LCDR Joyce C. Kearns, NC USN, changes leg dressing of a man injured in Vietnam. LCDR Kearns is a Staff nurse at the Naval Hospital in Danang, Vietnam. —(Photo by PM1 D. F. Grantham USN.)

more than 214,000 visits for outpatient care, an average of 8,920 visits monthly. In addition to substantially supporting the American—Vietnamese relationship, such efforts have provided treatment for many who might otherwise have been neglected.

Summary

The Danang hospital is providing far more sophisticated medical care than ever before furnished combat support troops. Since dedication in 1966 it rapidly expanded from 60 to 600 authorized beds, and its workload has been phenomenal. During 1968 and 1969, nearly 44,000 patients were admitted to the hospital for treatment of wounds, injuries, or disease, requiring approximately 38,000 major surgical procedures. More than 515,000 outpatient visits were made during the same time frame. Despite adversities, including frequent enemy rocket and mortar attacks, the hospital staff has continued to perform superbly, affording casualties better medical care than in any previous military action.

A METHOD FOR CONSTRUCTION OF A LOW BUDGET VACUUM CURETTE

*LCDR M. S. Baggish, MC, USN, Ob-Gyn Department, Naval Hospital, Portsmouth, Virginia.**

The method of suction curettage affords a rapid and safe technique for the evacuation of the products of conception. Suction apparatus have been used in Eastern Europe for several years as the chief method of performing therapeutic abortion. Similarly with the revision of abortion laws in the United States and other nations of the Western World, this suction method will find increased use. Cases of incomplete abortion can be treated by rapid suction evacuation. Essentially the advantage accrued by suctioning, over the hand-operated sharp curette, are the following: (1) Speed: the former can be completed in 1 to 2 minutes compared to 10 to 15 minutes by the older method; (2) Blood Loss: the suction method can be done with a total blood loss of 10 to 20 cc, whereas the usual blood loss from the standard methods of emptying the uterus are 50 to 100 cc; (3) Pain: since the necessity of dilatation is either minimized or completely obviated, the suction method is an almost painless procedure which can be performed under local anesthesia.

As a method for evacuating hydatidiform mole, the suction is not to be excelled. It has been shown that regardless of the size of the uterus, vaginal evacuation is superior to abdominal hysterotomy. Again, the suction method offers a maximum of speed and safety, and is especially advantageous in decreasing blood loss, which in these particular patients may be extreme. We have evacuated a mole which produced a uterus of twenty weeks gestational size. The uterus was completely emptied in 8 minutes with a blood loss of under 100 cc.

For the reasons cited, it is felt that any active obstetrical service, large or small, would benefit considerably by the addition of this tool to their surgical inventory. At the present time one of the greatest obstacles to procurement of a workable suction curette machine is the high cost of such an apparatus on the commercial market. Most available machines list anywhere from $600.00 to $900.00. Further, one must be very selective to obtain a machine which incorporates a high negative pressure and flow rate. The suction should range from 20 to 30 inches of mercury, negative pressure, and should be able to at least create a suction of 25 inches of mercury negative pressure. For efficient operation the flow rate should approach 100 liters per minute. Because of the high cost of commercially available machines, a model of a Do-It-Yourself Method is presented here. *The Component Suction Curettage Apparatus* was constructed at the Naval Hospital, Portsmouth, Virginia at a cost of $244.26 (Fig. 1 A&B).

The heart of The Component Suction Curette Machine is the vacuum pump. The stringent requirements mentioned above were fulfilled by a Vacuum pump constructed by the Gast Manufacturing Company—Model 0522-V3-G-18DY (Fig. 2). The latter pump is explosion proof, supplies a negative pressure of 30 inches of mercury, and has a flow rate of 100 liters per minute. Incidentally, it might be mentioned that this machine was designed by Gast as a milking pump.

To complete the safety requirements, an explosion proof switch (see electrical wiring diagram) (Fig. 3, not shown) and an explosion proof plug should be adapted to the pump's electrical system. The latter is quite simply accomplished by the hospital electrician. The explosion proof plugs and switches can be ordered from the Crouse-Hinds Company. As a matter of convenience we have hooked a vacuum relief valve onto our vacuum pump in order to selectively adjust the negative pressure to any designated setting. The latter is one of three safety regulatory factors in so far as negative pressure regulation is concerned. A vacuum indicator gauge reveals the actual negative pressure obtained in the unit for any given period of time (Fig. 4, not shown). For convenience we have fitted our apparatus with a foot switch, master power switch, and power indicator light. These features were all incorporated from the point of view of patient safety as well as operating convenience. When the master power switch is pulled upward (*on* position), the indicator light flashes red allowing the operator to know that the motor is ready for activation. The foot pedal obviously allows the

*The opinions or assertions in this paper are those of the author and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

References to commercial supplies and sources are included for convenience of readers and may not be construed to imply product endorsement by the Navy Department or the naval service at large.

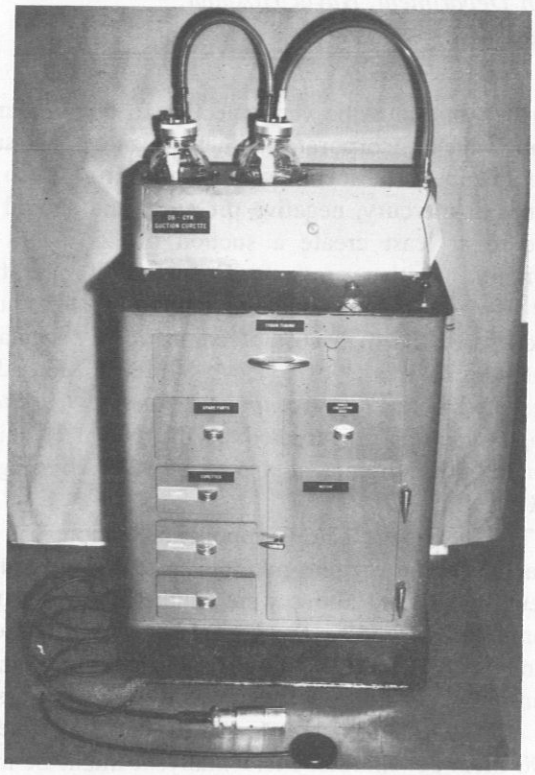


Fig. 1—(A) An overall view of the completed suction curette machine enclosed in a steel cabinet. Note the foot pedal switch and explosion proof plug.

surgeon to maintain full control of the vacuum while nevertheless remaining sterile. Suction cannot be produced without depressing the foot switch. The last safety control over the high negative pressure lies in the curette handle itself. The electrical circuits for the main power switch, foot switch, and indicator light are illustrated in Fig. 5. Again these circuits can be easily adapted to the system by the hospital electrician. It might be mentioned that none of the commercially available models incorporates all of these features into their machines.

Standard vacuum jars hooked up in series are used to collect the specimens. The second jar serves as a safety factor to allow for overflow and to prevent liquid or solid material from getting into the pump motor. The tight-fitting jar covers are of great importance from the standpoint of preventing loss of suction. Sturdy construction will obviate the possibility of the top being sucked into the jar itself. The stainless steel vacuum jar lids designed and manufactured by the Berkeley Tonometer Company are suitable. The input stem is constructed so that a tight rubber ring slips into a groove etched in the steel. By attaching a piece of gauze tubing (closed at one end) to the input piping, (Fig. 6) the solid specimen contents are conveniently collected in the bag while the liquid material runs through the gauze mesh and is collected at the bottom of the suction jar. At the terminus of the procedure, the gauze specimen bag is simply removed and dropped into a jar of fixative (Fig. 7). The vacuum jar is rinsed out, made ready and clean for the next case.

Incidentally, the gauze tubing can be purchased in rolls very cheaply and the collection bags should average one cent each.

The sterile equipment consists of the lucite curettes and suction hose. This equipment should be of high quality since it must withstand repeatedly the high negative pressures required to evacuate the uterus. We have found that thick walled, large bore Tygon tubing is most adaptable for our crucial needs and does not collapse even after repeated usage (Fig. 8, not shown). The latter can be obtained from the SUCT-URET company. High quality lucite curettes with fingertip suction control can be obtained in three sizes through the SUCT-URET company. The inner diameter of the curettes is 5mm, 10mm, and 15mm. The rather large 15mm curette

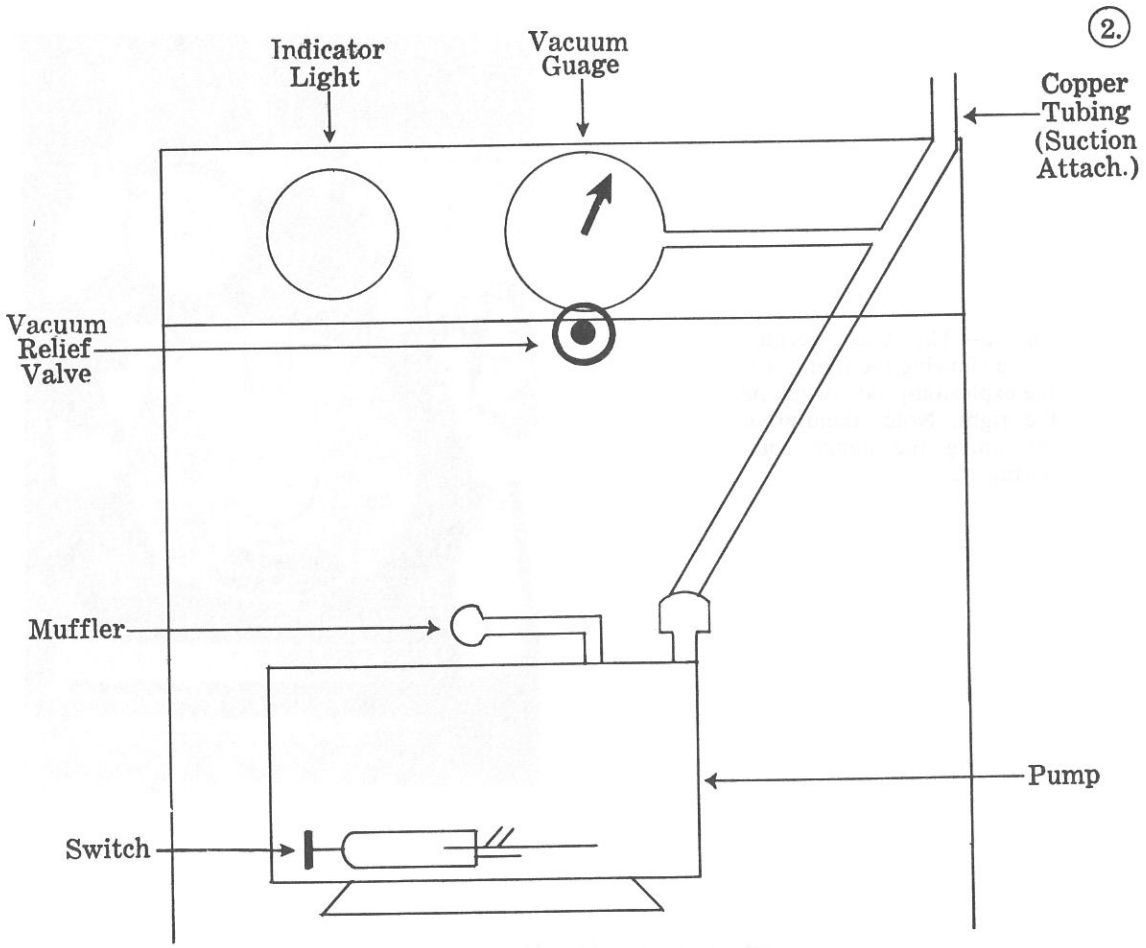


Fig. 1—(B) A schematic drawing of the inner part of the machine illustrated in (A).

would be useful in removing retained products from a large uterus, e.g. in the immediate postpartum period when retained placenta is present, and the large, open venous sinuses enhance the danger of air embolus through the standard in-and-out method of curettage with the subsequent piston-like effect. The suction by contrast would always be sucking air out. The curettes can be used over and over again, or disposed of after each case. (Fig. 9, not shown).

In summary, necessity is the father of invention. Monetary considerations prompted us to improvise in creating a piece of apparatus which we were unable to afford. This resulted in the *component suction curette machine* which is now being used daily at this large teaching hospital. For the convenience of the reader, the component parts and their sources of procurement are listed at the end of this article.

(Due to space limitations, some of the photographs and diagrams submitted by LCDR M. S. Baggish, MC, USN have been omitted. Interested readers should contact the author for further information.)

Component Parts
Ob-Gyn Suction Curette
Portsmouth Naval Hospital

1) *Vacuum Motor*—High output and flow (100 liters/minute) with 30 inches Hq. Maximum negative pressure. Explosion proof.

   Gast Pump 0522-V3-G-18DY $92.50
   (C. Arthur Weaver, Richmond, Va.)

2) Filter V-500D $4.00
   (C. Arthur Weaver)

3) Vacuum Gauge AA-640 $3.00
   (C. Arthur Weaver)

4) Vacuum Relief Valve A-840-A $3.00
   (C. Arthur Weaver)

5) Fittings
   a) 3/8" T Brass No. 2 @ $.68
   b) 3/8" Close Brass Nipple No. 3 @ $.26
   c) 3/8" x 1/4" Bushing No. 1 @ $.31
   d) 3/8" Elbow compositein No. 1 @ $.48

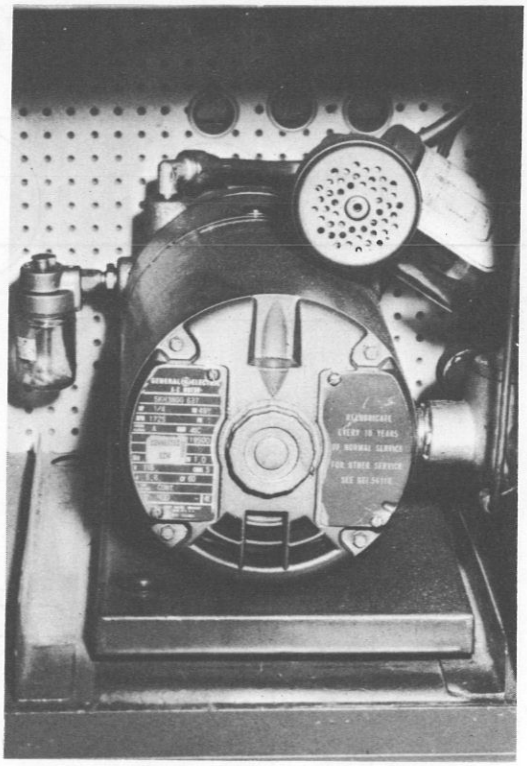


Fig. 2—The Gast vacuum pump showing the motor and the explosion-proof switch on the right. Note sound-proof tile lining the motor compartment.

Electrical Circuits

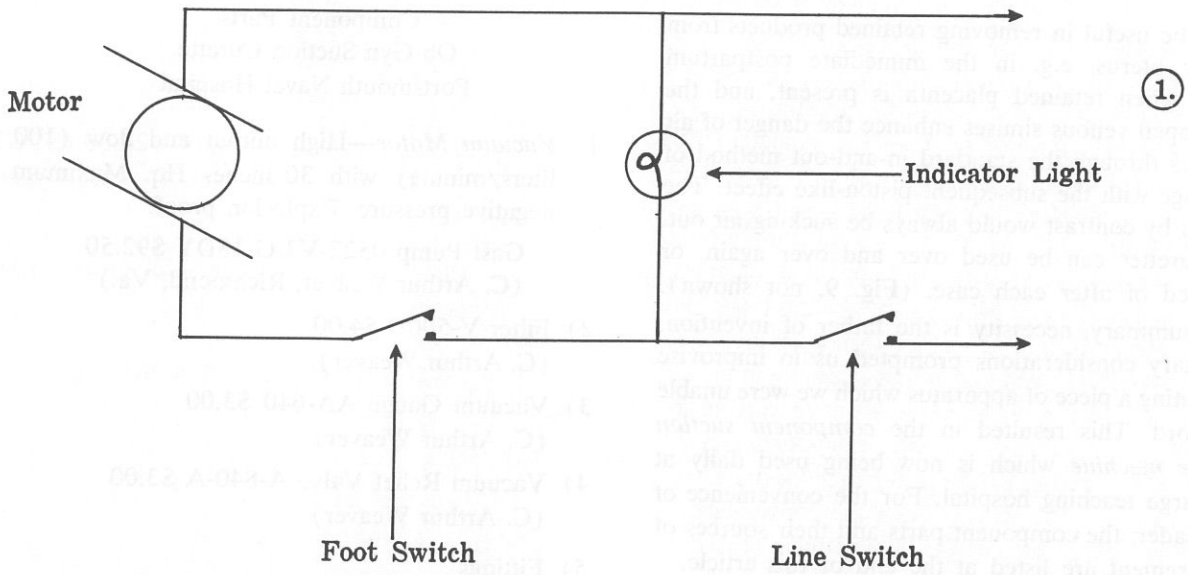


Fig. 5—An overall drawing of the electrical circuits to illustrate powerline foot switch and indicator light connections.

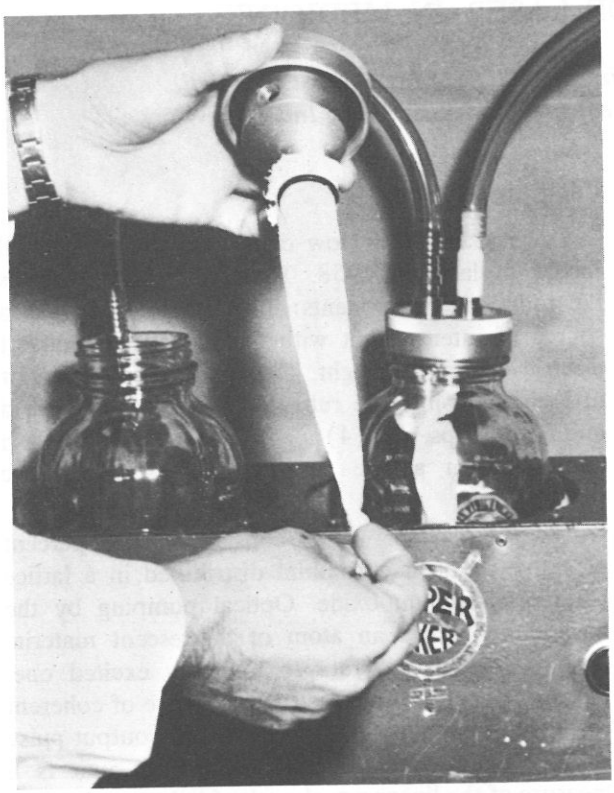


Fig. 6—The stainless steel vacuum lid is held in the operator's hand showing the rubber ring and specimen collection bag.

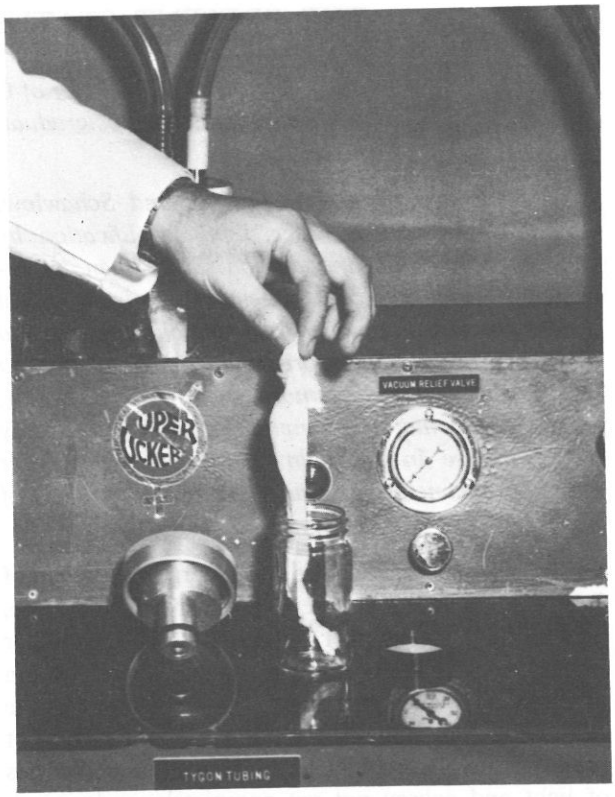


Fig. 7—At the terminus of the procedure, the collection bag is removed from the input stem of the vacuum jar lid and dropped into a bottle of fixative.

e) 3/8" St. Elbow No. 1 @ $.49
f) 3/8" x 1½" nipple No. 1 @ $.30

6) Explosion Proof Plug $12.00
Crouse-Hinds

7) Lucite Curettes No. 4 @ $3.00-$12.00 (SUCTURET, Box 751, Virginia Beach, Virginia 23451)

8) Vacuum Jar, Glass No. 1400 cc No. 2 @ $2.50-$5.00
(McKesson Appliance Company, Toledo, Ohio)

9) Stainless Steel Lid, complete W/O Rings No. 23033, No. 2 @ $38.75-$77.50
(Berkeley Tonometer Company)

10) Fittings, Male No. 1 @ $1.40
(Berkeley Tonometer Company)

11) Fittings Female No. 1 @ $1.40
(Berkeley Tonometer Company)

12) Tygon Tubing No. 3 @ $9.60-$28.80 (SUCTURET, Box 751, Virginia Beach, Virginia 23451)

13) Salvaged Steel Cabinet—no cost (was marked for disposal)

TOTAL COST—$244.26

THE PRESENT STATUS OF LASER IN MEDICINE

Vinton E. Siler, MD, University of Cincinnati College of Medicine, Cincinnati.
Reprinted from Postgraduate Medicine © McGraw-Hill, Inc.

In 1958 two physicists, Townes and Schawlow, conceived the idea of laser, light amplification by stimulated emission of radiation. Since then, physicians have used it to control hemorrhage from retinal lesions in diabetics, to correct detached retinas, to obliterate tattoos and port-wine angiomas, and to treat a few selected tumors such as melanomas, Kaposi's sarcoma, and lymphomas. Although it may have promise in ophthalmologic conditions, laser has had inconclusive results in the treatment of tumors.

The laser is a new device for generating a beam of light that is more coherent, more monochromatic, and capable of greater intensity than any other known source of light. The word "laser" is an acronym derived from light amplification by the stimulated emission of radiation. This concept of radiation involves the field of physics and theories of light and energy not yet completely understood, particularly as applied to biomedical equations.

At present there are two theories to explain the phenomenon of light. One, the corpuscular theory, defines light as a form of matter. The second, now generally accepted as correct, is based on James Clark Maxwell's finding in 1873 that the speed of light is the same as that of electromagnetic waves. We now believe that light consists of electromagnetic waves of a length within the range sensitive to the eye.

Amplification may be characterized as a controlled release of stored energy. Bohr first suggested that light or other forms of electromagnetic radiation are emitted when an atom falls from an upper level of energy to a lower level, thus emitting a quantum of electromagnetic energy. In 1917 Einstein pointed out two ways in which an atom may emit a quantum of radiation. First, radiation may result when an atom falls from a higher to a lower energy level, such as light from the sun or an electric light bulb. Second, if an electromagnetic wave of a given frequency is present, it may stimulate an atom in an upper energy state to fall to a lower state, giving up its energy to the stimulating wave.

Presented before the fifty-third annual Assembly of the Interstate Postgraduate Medical Association at Pittsburgh.

Laser Instrumentation

Townes and Schawlow delineated the conceptual theory of laser in 1958. Their ruby laser features the following components: (1) a ruby rod, (2) a source of intense light with flash lamps to convert electric energy into light, (3) a reflective capacitor to focus light into the ruby rod and contain the rod and flash lamps, and (4) a power supply for the flash lamps known as the capacitor banks or electric storage units.

The ruby rod or crystal consists of 0.05 percent of active trivalent chromium distributed in a lattice of inert aluminum oxide. Optical pumping by the flash lamps raises an atom of fluorescent material from a low-energy state to a highly excited one. When the energy is released a brief pulse of coherent red light is emitted. In ruby lasers this output pulse is 6,943 angstrom units. The angstrom unit is a measure of the linear wavelength of light equal to one hundred-millionth (10^{-8}) of a centimeter.

Production of highly excited energy states generates high temperatures that necessitate a cooling system. Liquid nitrogen is used to diminish this heat. Ruby lasers are about 1 percent efficient and output varies from 500 to 1,160 joules.

Gas lasers, developed more recently, have advantages over pulse lasers. Gas laser excitation is effected by gaseous electric discharge, producing a continuous wave emission of light. Argon was among the first gases tried, but carbon dioxide is now used more extensively. Development of the gas laser has prompted investigation of the possibility of a laser "surgical knife." The surgical goal of laser instrumentation is a precise, flexible light knife endowed with laser properties. We now have a carbon dioxide laser which has been used experimentally to incise and divide major organs such as the liver, spleen and kidneys. The head of this laser is cumbersome, it cannot be sterilized, and the light beam is too wide, but it is anticipated that these defects can and will be corrected.

Laser Reaction in Tissues

A significant thermal factor characterizes laser reaction in tissue, spreading from the target area by conduction, convection and radiation. The brief dur-

ation of the laser impact plus the low thermal conductivity of tissues gives a sharply demarcated reaction, especially in pigmented tissues. The reaction is thus limited to focal coagulation necrosis and does not affect adjacent vital structures, such as major blood vessels, nerves and bones. This phenomenon explains the rationale for laser treatment of foreign body pigment (tattoos) and superficial cutaneous port-wine nevi. With pulsed laser impaction, charring and vaporization are evident grossly. Microscopically, there is intense coagulation necrosis of the tissue. Cellular membranes are ruptured and cellular structure distorted, similar to changes following thermal cautery.

In the second phase of this laser reaction, the high energy impact on tissue produces elastic stress and recoil waves. Laser heating causes cellular expansion, bursting the cell membranes. At the same time, sudden vaporization of surface tissues develops recoil pressure changes that hinder cellular necrosis.

In the third phase, interaction of the enormous electromagnetic fields of the light beam produces free electrons and ionized atoms and molecules.

The fourth consideration of laser at a cellular level concerns optical properties of the target area. Pigmented cells absorb selectively at the laser wavelength. Studies suggest that the location of blood vessels, blood flow, and concentrations of oxygen and hemoglobin also may have an influence on the absorption of laser.

Hazards of Laser Radiation

The development of high-energy laser systems (those with outputs of 50 joules or more) increases the problem of protecting personnel involved in their operation. The protection program focuses on control of both personnel and the area. The chief concern in safeguarding personnel is protecting the eyes of individuals working with the laser beam, but protection of the skin and control of air contamination must also be considered. Area control factors include spectral reflectance, proper ventilation, and avoidance of electric shock.

The biologic effects of laser radiation are not completely known at present, and only critical evaluation of assembled data on personnel and areas used will determine the true and perhaps protracted hazards which laser might invoke.

Biologic and Basic Medical Research

Since laser is in its infancy as a biologic or medical tool, more basic research is needed to prove it a worthwhile adjuvant in the control and treatment of disease processes in experimental animals and in man.

Cancer research chemists are studying dyes, especially the cytotoxic dyes, that may form new compounds after laser impaction. El'piner and associates discussed effects of laser radiation on carcinogens and the field of "hot atoms" in 1965.

Research in cytology and cytogenetics has demonstrated the value of the laser-equipped microscope in studying cancer cells. Tissue culture has shown the impact of laser on cancer cells and their enzyme systems. Another feature of laser microscopy is the laser microprobe. A Q-switched laser can impact selected target areas. The resultant plume permits spectroscopic analysis of living tissue in these areas. Continued research will determine whether such observations will yield information valuable to the control or cure of cancer.

There has been extensive research in laser treatment of malignancies in experimental animals with inoculated or spontaneous cancer. Because of the marked absorption of laser by deeply pigmented tumors, melanomas, including such types as Pitt 41 and Cloudman S-91, have been studied. McGuff and associates have used the cheek pouch in hamsters as an experimental model for studying laser radiation. One pouch serves as a control site and the other as a site to observe the laser's effect on cancer growth. When the tumors were deep or "hard" and when laser radiation was impacted through skin and subcutaneous tissue, the results of this impaction were not consistently good, possibly because of inadequate laser dosage.

Other studies of the effect of laser on animal tissue are being made. Using the carbon dioxide laser, Fidler, in our laboratory, has studied the effects of laser impaction on red blood cells, noting at what energy densities they are destroyed. Investigators are also studying the effects of laser on animal skin, fat and incisions into and through vital organs such as the liver, spleen and kidneys.

Laser in Medical Practice

Many physicians hope that laser radiation will provide a new modality of therapy with results not heretofore observed.

In ophthalmology, experimental and clinical trials substantiate the possibility of using laser to control hemorrhage resulting from diabetic retinopathy. There are reasons to believe that laser may be safely used in correcting a detached retina without injury to

the conjunctiva, the cornea or the lens of the eye globe.

In dermatology, laser has been used in clinical investigations of skin lesions, specifically in ablation of tattoos and similar disfiguring pigmented marks. Because of the specificity of laser to the pigment, good results have been obtained in erasing tattoo pigment without injuring normal skin. Port-wine lesions of the skin and superficial angiomas have been impacted with laser. Most of these clinical studies have been done on patients without using local or general anesthesia. Overall results in smaller lesions have suggested that this form of therapy has more to offer than others.

Superficial melanomas have been logical targets of laser irradiation. In one case, a superficial melanoma responded to laser therapy and has not recurred in more than four years. On the other hand, deep melanotic masses have been subjected to laser therapy without great benefit. Since 1964 nine patients with deep inoperable or deep metastatic malignant melanoma have received laser therapy. Although these clinical experiments had as their goal the development of laser technology and technics, evaluation of the total effect on the patient was of secondary concern. Most, if not all, of these patients had terminal disease. Although the local effects of laser were encouraging, certainly we must learn more about density dosage and other facets to justify continued clinical study.

The method of applying laser to subcutaneous or deep melanotic tumor masses is complex and involves a variety of personnel—physicists, engineers, physicians, nurses and technicians. In our experience, standard surgical technics with local or general anesthesia were used to expose the melanotic tumor mass. Frequently, the surgeon or laser technicians could not see the entire tumor. The pulsed ruby laser delivered impaction with energy densities of approximately 2,000 joules per square centimeter. Special sterilized quartz rods were used to transmit the laser beam. No infected wounds have resulted from this technic. The laser's power supply was in a room adjacent to the operating room, and a foot switch delivered and controlled pulsed laser impacts. Screens protected the patient and anesthesiologist, and all personnel wore protective glasses.

Lesions in man that have been exposed to laser therapy for clinical experimental evaluation include subcutaneous venous angioma (Maffucci's syndrome), Kaposi's hemorrhagic sarcoma and malignant lymphoma.

Summary

Laser is a new form of radiation which *may* prove a useful biomedical tool. Since it is in its infancy, more basic research by physicists, engineers, biochemists, physiologists and physicians will be required to assess its application as a safe modality in the field of clinical medicine.

Results of gross and cellular tissue studies have been inconclusive because the unit dosage of laser radiation has not been standardized as yet.

As a laboratory tool, laser has inherent dangerous properties warranting fully controlled experimentation and protection of all personnel. As an experimental tool, laser should be studied further in laboratory centers by competent investigators.

At present, the use of laser in clinical medicine is limited and should continue to be restricted until basic animal research proves beyond doubt its real value in altering pathologic processes in man. Laser may show promise in certain ophthalmologic conditions such as control of hemorrhage in diabetic retinopathy and correction of detached retina. Laser has eradicated superficial pigmented skin lesions such as tattoos and port-wine lesions. Since it has not yet proved of real value in oncology, conventional methods of surgery and radiation should be used to treat and control malignant tumors.

Experimental studies with continuous-wave laser may lead to development of a new surgical instrument capable of performing bloodless operative procedures heretofore considered impossible.

ACUTE BARBITURATE INTOXICATION

CONCEPTS OF MANAGEMENT

John Hadden, MD; Keith Johnson, MD; Sheldon Smith, MD; Lawrence Price, MD; and Elsa Giardina, MD, JAMA 209 (6): 893–900, August 11, 1969.

Deep coma resulting from barbiturate overdose was studied in 50 patients. The length of coma correlated with depth of coma and serum barbiturate level except in those patients with drug addiction and

hepatic or renal disease. The complications of pneumonia, bleeding of the gastrointestinal tract, urinary tract infections, and thrombophlebitis were common; however, all patients survived. Treatment was instituted on a rotation basis with supportive care alone, mannitol diuresis, or peritoneal dialysis. Using length of coma, the slope of disappearance of serum barbiturate value, and clearance data as indicators of the effectiveness of treatment, we found that the three treatment forms did not differ. Supportive care alone was associated with less local and systemic morbidity and appears to be the best method of reducing morbidity and mortality in patients with barbiturate overdose.

In 1952 Reed et al reported 300 cases of acute barbiturate poisoning which were treated at the Roosevelt Hospital between 1940 and 1951. In an era of widespread use of analeptics and death rates upwards of 40%, these authors offered a rational staging for depth of coma. They advocated intense supportive care for all and analeptics only for the most severe cases. By reducing the dose of analeptics and restricting their use, mortality was reduced from 13.4% (28 out of 209) to 5.5% (5 out of 91). In 1961 Dubos et al reported the Roosevelt Hospital experience from 1952 to 1959. In a study of 141 patients these authors found that avoidance of analeptics reduced mortality from 5.2% to 3.0%. This progression of experience from analeptics to supportive care at the Roosevelt Hospital parallels that of the literature. In the 1950's many investigators showed that mortality figures without analeptics were less than 5%. With the demise of analeptic treatment, more sophisticated supportive techniques received considerable attention. These methods will be outlined; in essence they involve basic anesthesia care.

As mortality was reduced, attention turned to treatments designed to remove barbiturates and thereby to reduce length of coma, and hence, morbidity. In addition to supportive care, diuretic and dialytic treatment are available. To the best of our knowledge, this represents the first prospective program designed to compare three forms of treatment: supportive, mannitol diuresis, and peritoneal dialysis.

From the Department of Medicine, Roosevelt Hospital, New York.

Drs. Johnson and Smith are now with the US Army Medical Corps, Department of Medicine, Fort Gordon, Ga. Dr. Price is with the US Navy, San Diego, Calif.

Reprint requests to 428 W 59th St, New York 10019 (Nicholas Christy, MD).

Materials and Methods

Patients.—All patients with barbiturate intoxication admitted to the Roosevelt Hospital Medical Service from May 1965 to November 1967 were considered for inclusion in the group. Only patients unresponsive to painful stimuli (Reed's stage II or deeper) were included. Reed's staging for depth of coma is as follows: Stage 0—asleep but can be roused to speak. Stage I—withdraws from painful stimuli, all reflexes intact. Stage II—unresponsive to pain, most or all reflexes intact. Stage III—unresponsive to pain, loss of reflexes, but no depression of respiration or circulation. Stage IV—depression of respiration or circulation, with shock or cyanosis.

During the study period of 30 months, 102 patients were admitted to the Roosevelt Hospital with the diagnosis of barbiturate overdose. Of these, 50 fulfilled the criteria for inclusion in the study. Of the remaining 52, forty were classified as stage 0 (3) or stage I (37). Twelve patients were stage II or deeper and were excluded from the study: four of these were patients with primarily alcohol intoxication ("Mickey Finns," ie, stage IV patients with a mean coma length of six hours); five patients were private patients and their physicians refused admission into the study; three patients qualified for the study but for miscellaneous reasons were not admitted.

Drug Data.—The average overdose occurred 7½ hours before admission (range, 1 to 24 or more hours); in four patients this was unknown. The drugs ingested are shown in Table 1. In two thirds of the patients the drug was known at the time of admission, but the approximate amount was known in only 40%. This information did not prove useful in predicting the length of coma. The average overdose of a short-acting barbiturate was 2.5 gm, and the average overdose with a secobarbital sodium and amobarbital sodium mixture (Tuinal) was 5.8 gm.

Patients who had taken other drugs besides barbiturates were accepted into the study if we felt that the barbiturate was responsible for the coma.

The patients were distributed in the study as shown in Table 2.

Alcohol was ingested concurrently in 19 patients; in terms of length of coma these patients were not different from the others. Twelve patients concurrently ingested other sedatives or hypnotic drugs, as follows: a carbromal and pentobarbital sodium mixture (Carbrital), three patients; meprobamate, two patients; glutethimide (Doriden), two patients; chlordiazepoxide hydrochloride (Librium), two pa-

tients; an amobarbital and secobarbital sodium mixture (Hypnodram), one patient; papaveretum (Pantopon), one patient; and heroin, one patient. This group was indistinguishable from the remainder of the study group in distribution of coma depths, admission barbiturate levels, and coma lengths; and we, therefore, considered them homologous with the group that had taken barbiturates alone.

Age, Sex, Social Factors.—Thirty-four of the 50 patients admitted to the study were female. The sex ratio was, therefore, two females to one male. With respect to age (range, 18 to 85; mean, 40.5 years) and to various social factors, the study group appeared to be a cross section of a well, adult, primarily unemployed, urban-dwelling population.

Height and Weight.—Using a crude obesity index based on the Society of Actuaries Desirable Weight Table, 16% of the study population were overweight, 66% were normal, and 18% were underweight. The obesity index had no detectable effect on the character of the coma.

Psychiatric History and Diagnosis.—Twenty-six of 50 patients had a history of psychiatric care; 19 of 50 had previous suicide attempts (17 of the 19 were women). Three women had more than three prior suicide attempts. Five patients suffered from alcoholism and eight from drug addiction (predominantly barbiturates). All patients were seen by a psychiatrist before discharge. Forty-six of 50 patients received psychiatric diagnoses with the following breakdown: depressions, including mixed neurotic and psychotic, reactive depression, depressive reaction, and psychotic depression (27); personality disorder, psychoneurotic (1); schizophrenia (6); and character disorders, including sociopaths (3), passive aggressive (1), schizoid (2), and mixed or unclassified (6).

Methods.—The evaluation of depth of coma was made in the Emergency Room after an airway was established. Once the patient was accepted into the study, gastric lavage was performed, usually with a No. 18 nasogastric tube and a 50-ml syringe. An initial aspiration specimen of 10 ml was tested qualitatively for the presence of barbiturate, glutethimide, and salicylates. Further lavage with at least 500 ml of saline was carried out and analyzed quantitatively by the colorimetric method of Baer. After gastric lavage and confirmation of barbiturate overdose the patient was transferred to the Intensive Care Unit where he was assigned in rotation to one of the three treatment groups: supportive care, mannitol diuresis, or peritoneal dialysis. The details of the therapeutic regimens are these:

Supportive Care.—Daily maintenance fluids were given, while the staff monitored input, output, daily weight, and serum electrolyte levels. Indwelling urethral catheters were used routinely. Methylcellulose drops were used for eye care and lids were taped to prevent corneal injury. Patients were turned every two hours to prevent pressure necrosis and to mobilize pulmonary secretions. Frequent tracheal suction was done. Pulmonary infection was treated early and aggressively, and gram stains were used to aid in the selection of antibiotics. Antibiotics were not given prophylactically. Respiratory care was aided by frequent analysis of blood gases and by the assistance of the respiratory therapy group.

Mannitol Diuresis.—In addition to those measures listed under supportive care, this group received infusions of 20% mannitol to keep the urine output above 250 ml/hr. Fluid and electrolyte balance was monitored by daily electrolyte values, daily weight determinations, and hourly urine output.

Peritoneal Dialysis.—In addition to the supportive regimen, dialysis was carried out with a mixture of sodium, calcium, magnesium, chloride, lactate, and dextrose (1.5% Impersol). The dialysis catheter (No. 18 French or No. 11 trocath) was inserted aseptically and 2-liter exchanges were performed every two hours. Potassium chloride, 8mEq, was added to each 2-liter exchange. Heparin sodium (50 mg) was added in the first exchange, and subsequently as needed to prevent clogging. Intake and output were recorded. Specimens of dialysate were also tested daily for protein, white blood cell count (WBC), and bacterial culture.

At the time of admission, values for the following were obtained routinely: hemoglobin, hematocrit, WBC and differential, blood urea nitrogen, creatinine, liver function tests (bilirubin, serum glutamic oxaloacetic transaminase, alkaline phosphatase, and prothrombin time), electrolytes (sodium, potassium, chloride, and carbon dioxide), and pregnancy tests for females of child-bearing age. In addition, the patient was examined clinically by a member of the barbiturate study group at the time of admission and every eight hours through the coma period. The following information was charted at every visit: vital signs, depth of coma (ie, response to pain, pupil size and reaction, corneal reflex, bowel sounds, deep-tendon reflexes), status of fluid and electrolyte balance, and signs of infection. Specimens of serum and aliquots of urine and dialysate were obtained at eight-hour intervals and refrigerated. Later, analysis for barbiturate was done by the colorimetric method of Baer. When the type of barbiturate be-

came known, serum levels were calculated in mg/100 ml.

Stage 4 patients had one or more of the following modes of therapy in addition to those described:

1. Central venous catheters were placed. When arterial hypotension was present, hydration with lactated Ringer's solution was often enough to raise the blood pressure to acceptable levels. Fluids were infused rapidly until the central venous pressure (CVP) reached 4 cm H_2O, and CVP was then maintained between 2 and 10 cm H_2O.

2. If additional support of blood pressure was required, metaraminol bitartrate (Aramine), 100 to 300 mg, was diluted in 500 ml of 5% glucose and water and given at a rate to maintain systolic blood pressure above 90 mm Hg.

3. Endotracheal tubes were used in the patients who required ventilatory assistance. If coma persisted for longer than 36 hours, a tracheostomy was usually done. Ventilation was achieved with a respirator. This aspect of the patient's care was under the close supervision of the Anesthesiology Department.

4. Cardiac monitors were used in patients with known heart disease or patients receiving metaraminol.

The overdose protocol was discontinued when patients reached stage 0. When the patient was fully conscious he was interviewed by a physician from the study group and by a psychiatrist. The physician interview included vital statistics such as age, race, religion, marital status, and residence, as well as a complete medical and social history. The psychiatric evaluation included previous psychiatric treatment and institutionalization, previous overdoses and hospitalizations, and mental status examination.

Results

Mortality.—No stage-0 or stage-I patient suffered significant complications or died. No patient ad-

Table 1.—Drug Ingested

Drug	No. of Patients	Drug Action
Secobarbital sodium	14	Short
Pentobarbital sodium	12	Short
Secobarbital sodium-amobarbital sodium mixture	13	Short-intermediate
Amobarbital sodium	1	Intermediate
Phenobarbital sodium	3	Long
Mixed	4	
Unknown	3	
Total	50	

Table 2.—Distribution of Patients by Method of Treatment and Coma Depth

	Coma Depth			
Therapy	**II**	**III**	**IV**	**No. of Patients**
Supportive	4	3	10	17
Mannitol diuresis	6	3	8	17
Peritoneal dialysis	2	3	11	16
Total	12	9	29	50

Table 3.—Effect of Gastric Lavage as Related to Time of Ingestion Before Admission

Time of Ingestion, hr	Mean Extraction, mg	No. of Patients
<4	348	14
4 to 12	107	11
>12	34	6
Unknown	94	4

Table 4.—Analysis of Variance for Coma Length by Treatment and Drug Action

Source	df	ms	F	P*
Treatment	2	1,144.87	2.232	ns
Short vs short-intermediate	1	364.64	...	
Interaction	2	797.65	1.548	ns
Error	33	515.33		
Total	**38**			

*P values were not significant (ns).

Table 5.—Relationship of Predisposing Medical Condition to a Derivative of Admission Serum Level of Barbiturate (ASL/MBT)

Predisposing Medical Conditions	No. of Patients	Mean Coma Length (hr)	Mean Ratio ASL/MBT
Drug addiction (barbiturate)	6	15.5	0.86
Alcoholism	3	26	0.66
No predisposing medical condition	15	33	0.95
Other medical conditions	10	49	1.19
Liver and kidney disease	5	55	1.01

Table 6.—Mean Slopes of Serum Barbiturate Levels (mg/hr)

Drug	Support	Dialysis	Mannitol
Secobarbital sodium	0.07	0.07	0.13
Pentobarbital sodium	0.07	0.09	0.06
Mixture of amobarbital sodium and secobarbital sodium	0.13	0.12	0.16

Table 7.—Mean Clearance (ml/min)

	Secobarbital Sodium (14)*	Pentobarbital Sodium (12)	Amobarbital Sodium, Secobarbital Sodium Mixture (13)	Group (49)
Mannitol	12.4	9.8	14.9	9.9
Dialysis	11.9	15.7	9.2	13.0
Support	11.6	18.2	10.0	11.7

*Numbers in parentheses indicate total number of patients in group.

mitted to the study group died. Of the group of 12 patients, stage 2 or deeper, excluded from the study, three of the private patients died.

The overall mortality was 2.9%, and the study group mortality was 0%.

Gastric Lavage.—Gastric lavage was performed without complication in all patients; but barbiturate concentrations were obtained in only 35. The effectiveness of gastric lavage depended on how recently the drug was taken (Table 3).

Coma Depth.—The depth of coma as it relates to the length of coma is shown in Fig 1 (not shown here) and constitutes a poor predictor of the length of coma (Chi square test, $X^2 < 10; > 0.05$). The maximum coma length increased with depth of coma (stage II, 44 hours; stage III, 80 hours; and stage IV, 98 hours) so that although individual coma lengths cannot be predicted, group limits can be set.

Coma Length.—The mean length of coma for the whole study group was 36 hours. The mean coma lengths of the different treatment groups (supportive, mannitol diuresis, and peritoneal dialysis) were statistically identical. Because coma lengths depend on type of action of the ingested drug (short, short-intermediate, intermediate, and long), we felt that a difference in coma length among treatment groups might have been masked by differences in drug action. Sufficient numbers for analysis existed only for short-acting drugs (25) and short-intermediate-acting drugs, such as an amobarbital sodium and secobarbital sodium mixture, (14). An analysis of variance was performed which allows the simultaneous evaluation of both variables (drug type and treatment) and their interaction (Table 4). No significance emerged from this analysis, thus allowing the conclusion that neither treatment nor drug type has a significant effect on coma length.

Length of Coma as Related to Serum Barbiturate Level at the Time of Admission.—In order to determine if serum barbiturate level at the time of admission determined the length of coma, we carried out a regression analysis. This showed that types of the barbiturates behaved differently depending on length of action, and that for the mixture of amobarbital sodium and secobarbital sodium no relationship existed for predicting coma length from the serum level at the time of admission. The relationship of short-acting barbiturates (secobarbital sodium and pentobarbital sodium) to coma length was analyzed by regression analysis. They were found to exhibit the same relationship: For a serum barbiturate level of X mg/100 ml, a patient remained in coma for 17 hours + 5.1 hours for each mg/100 ml of admission serum barbiturate level ($r = +0.44, P < 0.025$).

The Effect of Predisposing Medical Problems on Coma Length.—Five categories of predisposing medical problems were obtained by examination of each patient's history; these were related to length of coma in those patients who had ingested short-acting barbiturates or an amobarbital sodium and secobarbital sodium mixture. One patient with hypothyroidism was excluded from all analyses involving coma length.

Differing coma lengths could result from either the type of predisposing medical condition or different amounts of barbiturate ingested. Since different types of barbiturates produce different serum levels, the patients were made comparable by calculating a ratio of serum barbiturate level at the time of admission (ASL) to the mean ASL for all patients who had ingested that particular type of barbiturate (MBT). The ratios were then averaged for each type of predisposing medical condition; a mean ratio (ASL/MBT) near one and a coma length of 33 hours, as seen in the group with "no predisposing medical condition," were average. The data shown in Table 5 were analyzed by analysis of variance, analysis of covariance, and the Duncan Range Test. The following hypotheses can be made: (1) Predisposing medical conditions affect coma length ($P < 0.025$). (2) Alcoholics had shorter comas, and patients with other medical conditions had longer comas as a result of differing amounts of ingested barbiturate as indicated by serum barbiturate level. (3) Drug addicts have shorter comas, and those with liver and kidney disease have longer comas than can be accounted for by barbiturate level alone.

Effect of Treatment on Barbiturate Removal.—Serum barbiturate levels were calculated at the time of admission, at 8 hours, and at 16 hours. Those patients with coma lengths of less than 16 hours were excluded from this analysis. Results of analysis of

variance for 39 patients who took short-acting barbiturates and the amobarbital sodium and secobarbital sodium mixture show that time and action of the drug are significant in determining the behavior of the serum level ($P<0.005$). However, treatment operating during this period had no effect in altering the slope of the line.

The slopes of serum barbiturate levels were calculated during the entire coma in those patients who had ingested secobarbital sodium (13), pentobarbital sodium (12), and a mixture of amobarbital sodium and secobarbital sodium (12) and were related to treatment (Table 6). No significance was found in the effect of treatment. In addition, serum level on awakening was not related significantly to serum level at the time of admission or length of coma.

For each patient clearance values were obtained which represented, for the supportive and mannitol treatment, the sum of mean values of eight-hour urine clearances, and for the dialysis group, the sum of mean values for both dialysis and urine clearance. Table 7 represents the clearance means. Analysis of variance for clearance indicates that treatment has no significant effect on the clearance of either short-acting barbiturates, a mixture of amobarbital sodium and secobarbital sodium, or the group taken as a whole. An attempt was made to correlate urine flow-rates in milliliters per minute with clearance in milliliters per minute; while results in a single patient might indicate a positive relationship, the patients grouped by drug type showed no significant correlation.

Complications of the Overdose.—Respiratory tract infection is the most common complication of overdose, and is due to poor handling of secretions and hypoventilation. Many patients have fever, leukocytosis, and produce purulent sputum. These symptoms usually subside spontaneously if the coma lightens and the cough reflex returns soon after onset. We feel this is an early step in the pathogenesis of pneumonia which we have termed atelectasis. Pneumonia demonstrable by physical examination and X-ray film occurs if coma persists and treatment is not undertaken. Figure 5 (not shown) depicts the close relationship between the length of coma and respiratory tract infection.

Other complications of overdose found in our series of patients included gastrointestinal bleeding, five; cardiovascular (congestive heart failure, myocardial infarction, and arrhythmia), three; and acute brain syndrome, one. Complications of treatment are shown in Table 8. Urinary tract infection related to the use of an indwelling catheter was found in three patients in the dialysis group, in two of the support group, and in none of the mannitol group. It is of interest that the corresponding urine flow-rates were 53 ml/min, 83 ml/min, and 228 ml/min, respectively, suggesting that diuresis is effective in inhibiting bladder infection.

Table 8.—Complications of Treatment

	Complication	Number
General	Urinary tract infections:	5/50
	Thrombophlebitis with pulmonary embolization;	3/50
	Gastrointestinal bleeding related to anticoagulation	1/50
Specific		
Mannitol therapy	Dilutional hyponatremia;	4/17
	Congestive heart failure	1/17
Dialysis therapy	Bleeding at trocar site;	1/17
	Leaking;	1/16
	Protein loss, electrolyte imbalance, and localized peritonitis;	2/16
	Generalized peritonitis	1/16

The complications of mannitol diuresis were mild, uncomplicated hyponatremia in four patients and congestive heart failure in one patient with myxedema.

Complications of peritoneal dialysis were more common and serious. Of 17 attempted dialyses, one failed as a result of initial bleeding at the trocar site while 16 proceeded at a mean flow-rate of 89 ml/min. Two cases of localized peritonitis and one case of generalized peritonitis were successfully treated with antibiotics.

Thirty-two of 50 patients had significant enough infection to require antibiotic therapy; no complications of this treatment were observed. Overall, there were no mortalities due to overdose itself and no late mortalities from complications of either the overdose or its treatment.

Comment

Barbiturates are metabolized primarily by deactivation of side chains in the liver, but are excreted to a minor extent intact by the kidneys. The short-acting barbiturates are metabolized at a rate of approximately 2.5% per hour while long-acting barbiturates are metabolized at a rate of 0.7% per hour. For this reason the long-acting barbiturates produce longer comas with higher serum levels. As a result of their slow hepatic metabolism, a larger portion of these compounds is excreted by the kidneys.

The lethal serum levels in unsupported patients are 3.5 mg/100 ml for short-acting barbiturates and 8 mg/100 ml for long-acting ones. The serum level of barbiturates represents an indirect measure of the total barbiturate pool which in turn is a function of absorption, tissue deposition, rate of degradation, and rate of excretion. It has been assumed in the literature that in patients with overdose, the behavior of the serum barbiturate level (ie, its slope of decline) and urinary clearance are meaningful measures which will reflect the results of treatment.

Many studies seek to show the benefit of diuretic and dialytic therapy by demonstrating significant effects on these two measurements. The forms of forced diuresis have included mannitol, urea, and diuretics, such as furosemide and mercurial and chlorothiazide preparations. Alkalinization with lactate, bicarbonate, and tromethamine has been advocated to increase clearance for the long-acting barbiturates with pK values near 7.2. This treatment has no effect on short-acting barbiturates with pK values near 7.9. The forms of dialytic treatment have included hemodialysis and peritoneal dialysis.

Many workers in the field have overestimated minor changes in clearance figures. Figures from uncontrolled studies with forced alkaline diuresis are maximally 14 ml/min for short-acting barbiturates and 17 ml/min for long-acting barbiturates. With peritoneal dialysis, clearances of 12 ml/min for both short-acting and long-acting barbiturates can be obtained while the use of tromethamine or albumin increases the extraction by a factor of two.

Little data on unmanipulated renal clearance exist to compare with the treatment results. What figures do exist range from 1 ml/min to our figure in the supportive group of approximately 10 ml/min. Several studies quote figures which represent intermittently treated subjects as their own controls, and it is difficult to determine the validity of these values. In addition, it is not known whether the clearance rates of barbiturates differ depending on their length of action.

In an overdose patient with a baseline clearance of 10 ml/min and a urine output of 6 cc/hr, a change of 1 ml/min clearance represents an increase in extraction of 3 mg/hr for short-acting barbiturates (serum level of 5 mg/100 ml), and an increase of 6 mg/hr for a long-acting barbiturate (serum level of 10 mg/100 ml). In the typical patient, whose barbiturate pool is in excess of 5,000 mg, this change in clearance produced by treatment (although statistically significant) is inadequate to affect length of coma.

Only two controlled clinical studies show that in addition to increased clearance rates, length of coma is shorter as a result of treatment. In both studies the barbiturates ingested were long-acting and the treatment was forced alkaline diuresis with urine flow-rates in excess of 500 ml/hr. In neither study was mortality significantly decreased, and of 71 patients so treated one patient died of pulmonary edema thought to result from therapy.

Although a rational case can be made for alkaline diuretic treatment in long-acting barbiturate overdose, the percentage of this type of overdose has been declining. In the 1940's and 1950's the percentage incidence of phenobarbital sodium ingestion ranged from 20% to 25% both in Denmark and the United States. In recent years this incidence has been reduced to between 12% and 17%. The incidence in our study was 6%. In order to avoid subjecting patients to needless morbidity one should not institute diuretic or dialytic treatment without the knowledge that a long-acting barbiturate has been ingested.

No study with forced diuresis or peritoneal dialysis has shown a significant effect on length of coma as a result of treatment in short-acting barbiturate overdose.

Hemodialysis has shown encouraging results with respect to clearance figures and length of coma in both short-acting and long-acting barbiturate overdose. Clearance can be increased by a factor of four during the treatment period, usually eight hours. The risk involved in transferring a patient to a hemodialysis unit and the cost of this procedure are significant. More important, an unexplained mortality from cardiac arrest of 12.5% to 35% prohibits meaningful consideration of hemodialysis as a form of treatment at this time.

As outlined, treatment increases morbidity, and in evaluating treatment one must consider this and weigh it in relation to the therapeutic effect. Treatment with forced alkaline diuresis should be reserved for those who have ingested long-acting barbiturates, while treatment with dialysis should be reserved for those with significant liver and kidney disease.

The one treatment form that proved effective in reducing mortality and involved minimal morbidity was supportive management. We do not believe that well-supported patients die from excessive barbiturate ingestion. When so little can be expected from other forms of treatment, we feel that our regimen of "aggressive supportive care" should become the

sole method of treatment with the exceptions mentioned.

The methods involved include the following: (1) frequent and painstaking observation with careful attention to subtle changes in vital signs, depth of coma, and fluid and electrolyte balance; (2) maintenance of airway with the use of endotracheal and tracheostomy tubes and mechanical assistance in order to maintain adequate ventilation as measured by blood gases; (3) prevention of respiratory infection with frequent turning and suctioning to remove secretions; and early treatment of respiratory tract infection, with gram stains of tracheal aspirates at the earliest signs to aid in the selection of antibiotics; (4) management of hypotension with central venous pressure catheters, electrolyte solution replacement, and metaraminol, if necessary, to maintain the systolic blood pressure above 90 mm Hg; (5) attention to the details of eye care, the prevention of pressure necrosis, and the maintenance of sterile indwelling catheter technique; and (6) strict avoidance of analeptics.

Excellent results in the treatment of even the most severe barbiturate overdose can be expected with the use of these simple techniques.

This investigation was supported by the House Staff Research Fund, the Roosevelt Hospital.

Nicholas Christy, MD; Gabriel Covo, MD; Herman Ziffer, MD; and Pasqual Amato, MD, assisted in this study.

Generic and Trade Names of Drugs

Glutethimide—*Doriden.*

Chlordiazepoxide hydrochloride—*Librium.*

Meprobamate—*Equanil, Miltown.*

Mannitol—*Osmitrol.*

Metaraminol bitartrate—*Aramine, Pressonex Bitartrate, Pressorol.*

Furosmide—*Lasix.*

Tromethamine—*Tris Amino, Trizma.*

Secobarbital sodium—*Barbosec, Evronal Sodium, Seco-8, Seconal Sodium, Sedutain, Talesco.*

Phenobarbital sodium—*Luminal Sodium, Phenalixir, Talpheno.*

Phenobarbital sodium—*Isobarb, Napental, Nembutal Sodium, Pembule, Pental, Sodital, Talpento.*

Amobarbital sodium—*Amytal Sodium, Talamo.*

(The figures and references may be seen in the original article.)

JAPANESE ENCEPHALITIS VIRUS IN TAIWAN: PRELIMINARY EVIDENCE FOR *CULEX ANNULUS* THEOB. as a VECTOR[1]

By Merrill D. Cates[2, 3] and R. Detels[2, 4], J Med Ent 6(3):327–328, August 1969.

Abstract: During a study of Japanese encephalitis ecology in Kuanshi, Taiwan, *Culex annulus* Theob. was the only Japanese encephalitis virus-positive mosquito. Its populations outnumbered 10 to 1 those of the only known vector, *Culex tritaeniorhynchus summorosus* Dyar. It appears that *Culex annulus* may be a more important vector of Japanese encephalitis in Taiwan.

Japanese encephalitis virus (JEV) is a mosquito-borne group B virus to which summer encephalitis epidemics in most of East Asia have been attributed. Hu & Grayston (1962) implicated *Culex tritaeniorhynchus summorosus* Dyar as an important vector of this virus on Taiwan. Hurlbut (1964) further established the importance of *C. tritaeniorhynchus* as an encephalitis vector by demonstrating its role as a vector among amplifying hosts, i.e., pigs. To date no other species has been reported as a vector of JEV on Taiwan. However, unpulished data of Bravi (1966) suggested that *Culex annulus* Theob. could also harbor JEV. Therefore, during an ecologic study of JEV in a heronry in Kuanshi, Hsinchu County, *C. annulus* was collected for isolation attempts in addition to *C. tritaeniorhynchus*. We now report on mosquito collections from a JEV endemic site and on JEV isolation attempts from *C. tritaeniorhynchus* and *C. annulus*.

[1]This study was supported in part through funds provided by the Bureau of Medicine and Surgery, Navy Department, for Work Unit MR005.09-0083. The opinions and assertions contained herein are those of the authors and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

[2]U.S. Naval Medical Research Unit No. 2, Box 14, APO San Francisco 96263, U.S.A.

[3]LT, MSC, USNR

[4]LCDR, MC, USNR

Materials and Methods

Mosquitoes were collected 3 days per week from 29 March to 5 August 1967 from 1 Magoon trap, 2 pig pens, and a New Jersey light trap. All hand collections from pigs in pens and from Magoon traps were made about dusk using a hand aspirator. The light trap, employed from 1 July to 5 August 1967, was equipped with a wire-framed cloth collecting bag which was covered with a moist, cotton-filled tube for insulation. The light trap was operated from 1700 to 0800 on nights hand collections were made. Mosquitoes were placed in quart jars, supplied with 10% dextrose, and transported to Taipei the day following collection. Female mosquitoes were held in these jars at 26° C and 24-hr continuous photoperiod for 4 days before pooling to allow for digestion of any blood in the gut. All males were discarded after identification.

Female *C. tritaeniorhynchus* and *C. annulus* mosquitoes were pooled according to species and collection site (pen or trap) and triturated according to the method of Hurlbut & Nibley (1964). The resultant solution was inoculated intracerebrally (i.c.) into 1 to 2-day-old mice and the mice observed for 21 days post-inoculation. A pool was considered positive when at least 3 of the 6 suckling mice became sick. At that point the brains were harvested, triturated according to Hurlbut & Nibley (1964), and inoculated into a second 1 to 2-day-old litter. Cross-neutralization tests were performed on harvested brains from the 2nd litter to confirm the presence of JEV.

Results and Discussion

Eleven species of mosquitoes were collected from pigs during the trapping period, 29 March to 29 June 1967. Approximately equal numbers of mosquitoes were detected by each collecting method. The species and the number of each caught are listed in Table 1. *C. annulus* dominated all collections but comparatively large numbers of *Anopheles tesselatus* and *A. sinensis* were also collected. In addition, *Armigeres subalbatus, Culex fatigans,* and *C. tritaeniorhynchus* were fairly numerous. Enumeration of all other species terminated on 29 June 1967 since only *C. annulus* and *C. tritaeniorhynchus* were used for virus isolation pools. As of 29 June, *C. annulus* clearly outnumbered *C. tritaeniorhynchus* by 10 to 1. In fact, *C. annulus* was the dominant mosquito. This same ratio persisted throughout the entire season so that by 8 August 1968, 2377 *C. annulus* had been captured as opposed to 174 *C. tritaeniorhynchus*. No previous investigation has reported such a population ratio. It appears likely that both Hu & Grayston (1962) and Hurlbut (1964) included *C. annulus* in pools of *C. tritaeniorhynchus.* These 2 mosquitoes are very difficult to separate and mixed pools could readily result from rapid screening.

TABLE 1. Total number of indicated mosquito species collected by aspiration from penned pigs and a pig-baited Magoon trap from 29 March 1967 through 29 June 1967.

Species	Number of Specimens		
	Male	Female	Total
Aedes albopictus	1	20	21
Anopheles maculatus	0	2	2
An. sinensis	4	1026	1030
An. tesselatus	0	1265	1265
Armigeres subalbatus	4	361	365
Culex annulus	1	1337	1338
C. bitaeniorhynchus	0	9	9
C. fatigans	342	225	567
C. fuscanus	1	2	3
C. fuscocephalus	0	2	2
C. tritaeniorhynchus summorosus	0	133	133

From 174 pools of *C. annulus* and 121 pools of *C. tritaeniorhynchus,* JEV was isolated from only *C. annulus* on 3 occasions: The 1st from the collections of 2-8 July, the 2nd from 9-15 July, and the 3rd from 23-29 July 1967. One positive isolation was obtained from mosquitoes captured by each of 3 collecting methods. All 3 isolations were confirmed to be JEV by cross-neutralization tests. These data substantiate Bravi's unpublished evidence that *C. annulus* is a vector for JEV on Taiwan. It is probable that *C. annulus* has always been present and has had a role in JEV epidemics in Taiwan. However, it is impossible to evaluate its role in previous epidemics since Bravi in 1966 was the first to call proper attention to it as both a pestiferous mosquito and a disease vector. This significant information was too late to be useful to Hu & Grayston (1962) and Hurlbut (1964) who discussed in detail the role of *C. tritaeniorhynchus* as a JEV vector.

It is obvious that more information is necessary on the ethology of *C. tritaeniorhynchus* and *C. annulus.* We have encountered *C. tritaeniorhynchus* and *C. annulus,* both adult and larval stages, in the same respective habitat. Seasonal population peaks occur simultaneously for both species; however, knowledge of *C. tritaeniorhynchus* and *C. annulus* feeding habits is insufficient. Pennington & Phelps' (1968) report and unpublished data of Lien (1968) reveal that *C. annulus* rather than *C. tritaeniorhynchus* is more

likely to bite man. Pennington & Phelps' (1968) data indicate that only 0.02% of a sample population of *C. tritaeniorhynchus* had fed on man. The facts that (1) *C. annulus* appears to be able to harbor and transmit JEV, (2) *C. annulus* is 10 times more abundant than *C. tritaeniorhynchus* in the Kuanshi area, and (3) *C. annulus* may feed more readily on man than *C. tritaeniorhynchus* indicates a need for a revision of the present concept of JEV ecology on Taiwan.

We propose here that *C. annulus* is an important vector of JEV on Taiwan. Its role in the local epidemics should be elucidated by further study on feeding habits, ecology, transmission efficiency, and seasonal history. In addition, the role of *C. annulus* in JEV epidemics might be further understood by carefully sorting mosquito collections and pools in areas were JEV is extant and where *C. annulus* might be encountered.

Acknowledgments: We thank W. C. Huang, S. C. Lien, S. F. Chiu, P. L. H. Chen, and H. C. Liu of the U.S. Naval Medical Research Unit No. 2, and Y. T. Huang and S. L. Severinghouse of Tung Hai University for their aid in collecting and processing specimens.

(The references may be seen in the original article.)

ABSTRACT PAPERS

ACTINOMYCOSIS: IS IT REALLY RARE?

CAPT R. P. Hylton, DC USN, CAPT H. S. Samuels, DC USN, and LCDR G. W. Oatis, DC USN, Oral Surg, January 1970.

There are probably many more cases of cervicofacial actinomycosis seen than are recognized. Consider the patient who presents with nontoxic, nonindurated, nonerythematous facial cellulitis which responds to short term penicillin therapy initially but who returns in a few weeks with an exacerbation of signs and symptoms. After the second episode the patient is likely to seek help by another clinician, leaving the initial clinician with the impression that he has successfully managed a bacterial problem. If the initial clinician is fortunate enough to have the second and third opportunity at management, he should develop the necessary high index of suspicion of actinomycosis.

During a three year period, seven cases of actinomycosis were managed by the Oral Surgery Department of the Dental Service of the Naval Hospital, Philadelphia, Pa. The writer was impressed with the consistent observation that the signs and symptoms in the patients in this series presented a syndrome that, when compared to cellulitis of bacterial origin, was relatively nontoxic, nonerythematous, nonindurated, nonfluctuant and either low grade or no temperature elevation. Incision with drainage of the areas was done even when the usual clinical indication for such was not classic. The drainage from these procedures was negligible and it was necessary to obtain a specimen for Gram stain and culture studies with a curette rather than a cotton applicator.

Successful management depends upon: (1) A high index of suspicion and knowledge of signs and symptoms. The classic textbook "lumpy jaw" is infrequently seen with the prevalent use of antibiotics. (2) An extremely close liaison with a knowledgeable, interested, persistent microbiologist. The specimen for identification must be taken by curette rather than a cotton swab, and *immediately* subjected to Gram stain studies as well as culture procedures. A glass cover slip should be placed over the specimen on the glass slide and then removed in order to spread and thin the specimen. The identification of "sulphur granules" or clubbed hyphae is not necessary for diagnosis. The delicate filaments of the hyphae may be fragmented in preparation. They may be decolorized by the acetone/alcohol and appear as Gram negative rods or diphtheroids to the untrained or unsuspecting eye, rather than the Gram positive organisms of actinomycosis. (3) Long term penicillin therapy. The following course of penicillin therapy was used in this series.

Aqueous Penicillin G—30,000,000 units I.V. daily for three days.

Benzathine Penicillin G—1,200,000 units I.M. every two weeks for three months.

Phenoxymethyl Penicillin—500 mg orally; daily for three months.

(Appreciation is expressed to LTJG Melchor N. Flondarina, MSC USNR, Staff Microbiologist, whose astute observations were primarily responsible for the diagnosis in this series.)

(Abstract by CAPT H. S. Samuels, DC USN, Chief of Dental Service and Head, Department of Oral Surgery, Naval Hospital, Philadelphia, Pa.)

AUTOGENOUS BONE MARROW IN THE RECONSTRUCTION OF DEFICIENT ALVEOLAR RIDGES IN DOGS

LCDR J. E. Yacabucci, DC USN, and LCDR S. J. Poidmore, DC USN.

Recent studies have shown that autogenous hematopoietic bone marrow transplants serve well to effect rapid osseous repair and to stimulate osteogenesis supracortically, but this technique has not been applied to the deficient alveolar ridge. The purpose of this study was to investigate the use of autogenous hematopoietic bone marrow in the restoration of a deficient alveolar ridge in dogs. Six adult mongrel dogs 1 to 2 years old were rendered edentulous in the maxillary and mandibular posterior regions. Alveolectomies were performed to create artificially deficient alveolar ridges. Following a 4-week healing period, autogenous bone marrow obtained from the diaphysis of the femur was placed over the deficient alveolar ridges. Cast chrome-cobalt cage implants, shaped to conform to the desired increase in ridge height and contour and lined with Millipore filter material, were used to retain the marrow grafts at the surgical sites. To serve as a comparison, transpositional autogenous bone grafts taken from the inferior border of the mandible were placed on the opposite side. The graft sites were evaluated at 4, 8, and 12 weeks by gross appearance, histologic examination, and tetracycline fluorescence. At 4 and 8 weeks the bone marrow grafts showed increasing bone formation whereas the bone grafts showed progressive resorption. At 12 weeks, the marrow graft site consisted of an elevated, hard alveolar ridge composed of dense bone and a calcifying alveolar crest, whereas the bone grafts had completely resorbed, leaving only minimal improvement in alveolar ridge height or contour. It was concluded that autogenous hematopoietic bone marrow is an ideal graft material for the restoration of deficient alveolar ridges in dogs and is more predictable than bone.

(Abstract by Research Work Unit: MR005.19-6052 by LCDR J. E. Yacabucci, DC USN and LCDR S. J. Poidmore, DC USN.)

The opinions and assertions contained herein are those of the authors and are not to be construed as reflecting the views of the Navy Department or the naval service at large.

THE GASTROENTEROLOGIST CORNER

MODERN GASTRIC ANALYSIS

*By CDR Erwin L. Burke, MC, USN.**

History of Gastric Analysis

Early recorded history reveals that man, unencumbered by factual knowledge, speculated freely upon the processes of digestion. It was not until the 18th and early 19th century however, that advances in chemistry began to shed some cold scientific light upon these speculations. It could be said that the first gastric analysis was reported by Réaumur, the inventor of the Réaumur temperature scale, in 1752 in a presentation before the Académie Royale de Science of Paris.[1] After training a buzzard to swallow and regurgitate a perforated metal capsule containing small sponges, he found that the gastric juice contained in the sponges would digest meat and bone. With laudable dedication he found that the paste resulting from the digestion of bone tasted acid and gave an acid reaction to litmus paper.

In 1803, John R. Young submitted a thesis to the University of Pennsylvania for the degree of Doctor of Medicine, in which he demonstrated that the stomach of man was capable of secreting acid. Unfortunately the state of chemistry in his day was such that he erroneously identified the acid as phosphoric.[2]

It remained for William Prout, in a presentation before the Royal Society in 1823, to demonstrate that the stomach of animals could secrete uncombined hydrochloric acid.[2] He demonstrated that the acid in the gastric contents of animals was hydrochloric

---

*Director of Gastroenterology Branch, Medical Service, Naval Hospital, Philadelphia.

The opinions expressed herein are those of the author and cannot be construed as reflecting the views of the Navy Department or of the Naval service at large.

and his subsequent deliberations upon the process of gastric acid formation have proved remarkably accurate. Today his work in gastric acidity is recognized to be of fundamental importance and secures for him a significant place in medical history.

The clinical study of gastric juices could not begin until development of a tube suitable for intubation of the stomach. A perusal of the literature creates some confusion as to when and by whom the first stomach tube was introduced. It seems reasonably clear that the first scientific report of the development and therapeutic use of a gastric tube in man was by the great English Surgeon, John Hunter in 1790.[3,4] The design and use of the modern soft rubber tube for gastric intubation was reported by Ewald in 1874.[3] Twelve years later the use of a stimulatory test meal was described and gastric analysis was launched as a laboratory test. Other substances such as alcohol, caffeine, small doses of histamine or Histalog etc. were subsequently used. The author's first and last use of alcohol stimulation of gastric secretion took place years ago when its administration to a sedate, elderly female in a busy outpatient clinic resulted in her tearful inebriation.

Strictly speaking the term gastric analysis has many facets, i.e. pepsin, acid, food residues, mucous, etc. The close correlation of acid secretion with clinical states has resulted in the common use of the term to refer to gastric acid. In its various forms gastric analysis enjoys wide popularity in clinical and research work. One could say that rivers of gastric juice have resulted in acres of paper.

Terminology

With regard to terminology the trend to discard certain old terms has proceeded slowly, some terms such as free and total acid having achieved somewhat the status of folklore. "Free acid" was derived from the titration of gastric juice with 0.1N NaOH to the end point of Toepfer's reagent, a pH of 3.5, while "total acid" was obtained from titration to an end point with phenolphthalein, a pH of 8.2 to 9.0. The common practice was to express the number of milliliters of 0.1N NaOH required to reach the above end points in the titration of 100 ml of gastric juice as the degrees or clinical units of free and total acid respectively. Quite fortuitously the above determinations are identical with milliequivalents per liter. From the chemical point of view the terms free and total acid are meaningless as they depend upon the volume and buffering power of gastric fluids other than hydrochloric acid. The older techniques made no measurement of the amount of acid secreted per unit of time, but merely measured the concentration. As the practice generally was not to place the tube fluoroscopically, the volume collection would have been inaccurate in any event.

In modern gastric analysis the procedure is to record the volume and pH of the fluid and to titrate electrometrically to neutrality (pH7.0) or to body pH (7.4). Specimens are collected for 15 minute periods and the acid expressed as total mEq for that period of time obtained by multiplying the concentration in mEq/liter by the volume in liters (ml/1000). Under basal conditions the sum of four consecutive fifteen-minute specimens is referred to as the basal acid output (BAO). Some authors work in terms of activity coefficients and derive the concentration of hydrogen ion directly from the pH of each specimen. While physiologically more meaningful, this procedure is not widely used.

The most widely accepted use of gastric analysis is to establish the presence or absence of "absolute" or "histamine fast" achlorhydria. Card and Sircus recommend that this definition be taken to mean that state of gastric secretion in which the pH of the secretion fails to fall below 6.0 following maximal histamine stimulation.[5] The American Gastroenterological Association at its Chicago meeting in 1966 concurred with this view. We feel that this definition can be applied to any of the other maximal stimulatory tests, i.e., gastrin or Histalog.

Maximal Effective Gastric Stimulation and Parietal Cell Count: The Basis of Quantitative Gastric Analysis

In 1953 Kay studied the effect of large doses of histamine on gastric acid secretion, using a previously discovered fact that many of the side effects of histamine could be blocked by the prior parenteral administration of an antihistaminic.[6] By increasing the usual parenteral dose of histamine diphosphate, 0.01mg/kg of body weight, by increments of 0.01mg/kg, he found the maximal effective dose to be 0.04 mg/kg. Most importantly he found this response to be reproducible within a 5% error in the same individual. He further noted that secretion rose to a peak and began to decline within 1 hour. The highest rate at which the stomach could secrete was obtained from the sum of the 2 consecutive 15-minute periods in which the output was highest. Kay referred to this determination as the peak half-hour. Others have multiplied this figure by 2 and expressed it as the maximal histamine response, i.e., the amount of

acid a maximally stimulated stomach could secrete in 1 hour.[7] Histalog has largely supplanted the use of histamine in the United States, due primarily to the significantly less side effects of Histalog as compared to histamine. We feel that the appropriate intramuscular dose of Histalog for an augmented test is 1.5mg/kg of body weight and routinely precede Histalog injection by the injection of 1cc (10mg) of a parenteral form of chlorpheniramine.[8] The duration of action of Histalog is considerably longer than histamine and the resultant secretory curve is more nearly flat. We follow the common practice of adding the results of the four consecutive 15-minute specimens giving the greatest response, and express the result as the maximal acid output (MAO). The maximal effective subcutaneous dose of gastrin II has been established as 2μg/kg[9] and the corresponding dose for intramuscular pentagastrin has been found to be 6μg/kg[10] of body weight.

The basis for the reproducible nature of the augmented gastric analysis has been clearly shown to lie in the total parietal cell count of the stomach.[11,12] A highly significant correlation between the results of maximal acid output and the direct parietal cell count has been shown to exist. Forty million parietal cells are required to produce 1mEq of acid per hour. Similarly the calculated MAO of 1 billion parietal cells would be 26mEq/hr which is about the range of a young male without ulcer disease.

The Technique of Collection and Analysis

Scientific understanding of the principles of gastric secretory analysis notwithstanding, careful attention to details and technique is essential if a gastric analysis is to be truly quantitative. All procedures other than the 12-hour overnight test should be carried out in the early morning on a subject who has had a light meal the night preceding the test and who has been fasting since midnight. The subject must not smoke on the morning of the test and neither can his attendant imbibe food or beverages in the presence of the patient. Anticholinergics must be discontinued at least 48 hours prior to the test and in a new patient, it is most preferable to perform the test on the patient before he is started on anticholinergic therapy.

The gastric tube is positioned fluoroscopically in the stomach, with the distal tip generally just distal to the junction of the antrum and body of the stomach. The preferred approach is through the nares with a rounded-tip rubber tube of 16 to 18 French diameter. The fluoroscopic placement of the tube cannot be overemphasized in that otherwise one has very little idea where the tube lies; often it will be curled up in the gastric fundus and on occasion will be found in the duodenum, esophagus, or trachea.[13]

It is our practice to collect the secretions in the left lateral position, however the sitting position may be used. Where a partial gastrectomy has been performed, the tip of the tube is placed near the stoma and the collections are made in the erect position. Suction is best supplied by machine with devices to limit the vacuum to 30-35 cm of water and to assure intermittent breaking of the suction. We further inject air down the tube at 5-minute intervals, and turn the patient briefly into the supine position every 15 minutes. Titration is best done electrometrically with a commercial pH meter and glass electrode, with a view toward increased accuracy and economy of technician time. Periodic calibration of the pH meter with buffer solutions of known pH should be employed.

We have on occasion experienced some bleeding during the Histalog gastric analysis. While this has never been serious in degree, we hesitate to use this test on a patient with upper gastrointestinal bleeding until several days have elapsed. In the case of a diagnostic trial of therapy in a gastric ulcer believed to be benign, we do not interrupt the period of treatment or perform an augmented gastric analysis. In either situation we do not hesitate to perform a basal gastric analysis. Many authors hesitate to perform an augmented gastric acid test on individuals over 65 years of age or with significant heart disease. Employing our technique, we observe no age limitation and do not hesitate to perform the test on individuals with stable heart disease providing sufficient indication for the test is present. Any laboratory determination should be logged and reported in a manner which promotes clarity, accuracy, and understanding. A reproduction of the form used at this institution is presented in Figure 1.

Basal Gastric Analysis

The development of the different forms of basal gastric analysis was based on the initial work of Henning and Norjsoth in Germany in 1932 and of Dragstedt in the United States in 1935. These authors demonstrated elevated levels of basal secretion of acid in the fasting state in patients with duodenal ul-

cer.[14] Dragstedt popularized the 12-hour overnight basal gastric analysis and this type of basal test is still favored by many surgeons. Its rationale and theory are on firm grounds, but in actual practice problems in collection arise. The 12-hour period of collection is uncomfortable for the patient and as one would expect, adequate supervison of the test for that period of time is difficult. Dragstedt has published the following values for the 12-hour basal gastric analysis:[14]

Normal residents and interns	(81 subjects)	18mEq/12 hours
Duodenal ulcer patients	(394)	57mEq/12 hours
Gastric ulcer patients	(35)	12mEq/24 hours
Duodenal ulcer patients post vagotomy	(394)	5mEq/12 hours

A well known computer analysis of 260 cases of Zollinger-Ellison syndrome, published in 1964, revealed that of 55 patients in whom appropriate acid studies were available, 85% produced more than 1 liter/12 hours and 74% exceeded 100mEq/12 hours.[15]

The 1-hour basal gastric analysis is more popular with the gastroenterologist and quite often precedes the augmented test or the insulin hypoglycemia test. The mean value in normals is 1.5mEq/hr. and the upper limit of normal has been proposed by Grossman to be 2.5mEq/hr.[16] This test tends to be quite variable in the same subject from time to time and a basal acid output of 0 or above 2.5 mEq/hr. is not a rare finding in normal individuals. Both the 12-hour and the 1-hour basal test values are often particularly high in instances of antrum retained after gastrectomy, in the Zollinger-Ellison syndrome, and in certain other, ill-defined hypersecretion states.[17,18] When the BAO reaches 10mEq/hr. or 100mEq/12 hrs. the possibility of Zollinger-Ellison syndrome should be considered. Only 3% of duodenal ulcers will attain a BAO of 15mEq/hr. but 2/3 of Z-E syndromes will reach this level.[19]

The Hypoglycemia Test of Vagal Continuity (*"Hollander Test"*). Vagotomy combined with some type of drainage procedure or with partial gastric secretion has become a widespread surgical approach to the treatment of peptic ulcer disease, especially duodenal ulcer. The success or failure of such an approach depends largely upon the degree of success achieved in interrupting the vagal innervation of the stomach. The need for a test of interruption of vagal continuity is obvious. Hollander first reported on the clinical use of an insulin hypoglycemia test to detect completeness of vagal innervation in 1946.[20] He discovered that hypoglycemia would activate the vagus to stimulate secretion of gastric acid. Following a basal acid secretion test, he administered insulin intravenously in a dose sufficient to depress the blood sugar to 50mg% and collected gastric juice in 15-minute increments for 2 hours. His criteria are now considered to be: a rise in concentration in any one specimen of 10mEq/liter if all basal specimens were anacidic, or a rise of 20mEq/liter if the basal test demonstrated acid. Other criteria have been developed, the most notable of which was the so called early positive response, i.e. the criteria of Hollander occurring in the first hour.[21] Other criteria include: a basal secretion greater than 2mEq/hr., a rise in volume after insulin, and a rise in acid output greater than 1.5-2.0mEq/hr. for any 1-hour period after insulin. Bank and Marks suggested the use of "multiple criteria", including all of those listed above.[22] Their work has shown that the incidence of recurrent dyspepsia and ulceration was distinctly higher in those individuals who fulfilled more than one criterion, and increased with the number of positive criteria. Only 2 of 8 patients with all criteria positive remained asymptomatic after 4 years.

As shown in Figure 2, it is our custom to draw fasting, 30 and 45-minute blood sugars and to insist on a low 45mg% true blood sugar. We do utilize multiple criteria, however, another criterion which we acknowledge is a significant reduction in the MAO postoperatively. The MAO should decrease about 70% after a successful vagotomy. We usually wait about three weeks postoperatively before performing gastric analysis.

Clinical Applications of Gastric Analysis

1. To affirm or deny the diagnosis of pernicious anemia. The adult form of pernicious anemia does not exist in the presence of gastric acid.

2. To confirm the diagnosis of carcinomatous ulcer of the stomach. The diagnosis of benign peptic ulcer is not tenable in the presence of histamine-fast achlorhydria, and is less likely with a grossly lowered acid secretory rate.

3. As an aid in the diagnosis of the Zollinger-Ellison syndrome. As previously stated under discussion of basal gastric analysis, a basal acid output of 15mEq/hr. is strongly suggestive of the Zollinger-Ellison Syndrome. A ratio of BAO/MAO of 60% is virtually diagnostic of the syndrome, but this criterion has only been found in about one-half of the proven cases.[19] It would seem most likely that the radio-immuno-assay of gastrin will prove to be the ultimate confirmatory test.

Figure 1—Standard form for recording and reporting results of the 1-hour basal and augmented Histalog gastric analysis. Interpretation by the reporting medical officer is added in the lower right corner, when appropriate.

GASTRIC ANALYSIS LABORATORY DEPARTMENT OF MEDICINE
U.S.N.H. PHILADELPHIA, PA. 19145

ONE HOUR BASAL GASTRIC ANALYSIS

Technician:_____ Body Weight:_____lbs. Date:_____ X-Ray No._____

Gastric Residuum: Volume_____cc. Character:_____ Hosp. No._____

Spec.	Bile	Time	Amt.	pH	(mEq/liter) Titr. Acid	mEq/15min.
1						
2						
3						
4						

Basal acid output_____mEq/hour

Remarks:

Specimens are collected with constant intermittent suction on a patient who has fasted overnight and has been on no drugs affecting gastric acidity for 24 hours. (Unless so stated). Reported acid is in terms of "titratable acid", which represents titration in the usual manner with 0.1N NaOH; but to the body pH of 7.4. An automatic titrimeter is used, and periodic backchecks with a manual titration are made.

The mean basal acid output by this technique is 1.4 mEq/hr and the upper limit of normal is 2.8 mEq/hr. (Grossman, M., Am. J. Med. 29:748, 1960).

AUGMENTED HISTALOG GASTRIC ANALYSIS

Dose:_____mgm/kg. Total Dose:_____cc(50mgm/cc).

Spec.	Blood Bile	Time	Amt.	pH	(mEq/liter) Titr. Acid	mEq/15min.
1						
2						
3						
4						
5						
6						
7						
8						

Maximal acid output_____mEq/hour

Remarks:

This technique is modified from the original Kay technique with maximal histamine dose, and conforms to guidelines set forth by the AGA at its Chicago Meeting in 1965. The dose of Histalog is 1.5mgm/kg body weight (unless otherwise stated) and is preceded by the injection of 10mgm Chlor-Trimeton IM (1cc). The maximal acid output is calculated from four consecutive 15 min. values giving the highest value. The mean is considered to be 11.3 mEq/hr in normals with upper limit of 21 mEq/hr. (Grossman, M., Am. J. Med. 29:748, 1960). Many authorities consider these values to be low however. (Kay, W., BMJ July 1953).

4ND NH 6310/10 Use Imprinter Reported by:

4. As an aid in the diagnosis of peptic ulcer disease. The diagnostic benefit of gastric analysis in this situation is quite limited in any specific situation due to the marked overlap of the ranges of normals, duodenal ulcers, and gastric ulcers. Baron has shown, however, that in the absence of complicating factors, i.e. the development of gastric cancer, that a peptic ulcer does not exist with a MAO below 15mEq/hr.[23] Others cite figures of 14mEq/hr. for men and 13mEq/hr. for women.[24] The implications in diagnosis are obvious. Further, the overlap between normals and patients with duodenal ulcers is less marked with advancing age, as apparently the natural tendency to diminished secretion in older individuals does not occur in those with duodenal ulcer.[23]

5. The use of the MAO as a factor in deciding the type and extent of planned surgery. The author is convinced that many gastroenterologic internists and surgeons employ the level of acid production as an additional determinant in considering the extent or type of surgery to be performed. For example, in a case of peptic ulcer disease being prepared for surgery, a marked degree of hypersecretion might lead to partial gastrectomy and vagotomy rather than vagotomy and a drainage procedure. It is generally accepted that success of gastric surgery is linked to reduction of acid, but that drastic resection, while controlling acid production, promotes greater incidence and severity of side effects. Some of our Scandinavian colleagues have perfected the technique of grading the extent of resection on the basis of the MAO values and have been able to predict the postoperative acid values. Others have convincingly advocated this use of gastric secretory capacity for determining the extent and type of surgery,[27,28,29] while others have demonstrated a quantitative relation between the extent of resection and the secretion of acid in experimental animals.[30]

6. In the diagnosis of hypersecretory gastroduodenopathy. We have encountered occasional dyspeptic individuals who are gross hypersecretors without past or present evidence of peptic ulcer, hyperparathyroidism, or Z-E syndrome. Often these individuals have been labeled with some psychophysiologic condition or lumped into a loose "diagnostic grab-bag" under the heading of duodenitis. These cases not infrequently have a characteristic gastroscopic and radiologic picture. The most striking and consistent finding has been the X-ray appearance of coarse duodenal and/or jejunal folds, very similar to that often seen in instances of the Zollinger-Ellison syndrome. A word of caution is in order however, since the same small bowel changes can result from parasitic infestation. While the term is our own, the concept has been well described previously by other investigators.[17,18]

7. As a prognostic indicator in peptic duodenal and prepyloric gastric ulcers. High acid production, other factors being equal, apparently denotes a worse prognosis with increased chance of intractability and/or perforation, and a lessened chance of response to medical therapy.[31,32]

8. Postoperative assessment. The insulin hypoglycemia test as previously discussed should be a routine part of the postoperative evaluation of any case where a vagotomy has been performed. It can yield significant prognostic information; in particular, it can be a valuable guide in a surgical training program as to the adequacy of the gastric surgery technique of surgical residents. The maximal secretory test also has value; many consider that an MAO of 15mEq/hr. in an individual with a postgastrectomy dyspepsia is strongly suggestive of jejunal ulceration.[33,34]

9. In carcinoma screening and case finding. Other factors being equal, the risk of carcinoma development in the stomach is greater in individuals with hypochlorhydria or achlorhydria. The University of Minnesota Medical School Cancer Screening Clinic has reported some interesting data on this subject. In a series of 7,074 routine screening tests for gastric acid in presumably well people, with about equal numbers of male and female patients, 25% had achlorhydria or hypochlorhydria. (A submaximal dose of histamine was used.) With yearly evaluations including stool guaiac tests, X-rays, and gastric analysis, 19 carcinomas of the stomach were detected.[35] This is 5.2 times the expected national rate. The cost of such a program and the problems of patient acceptance diminish the impact of testing for this purpose. Regardless of the course the clinician may decide to follow, he must regard the risk of development of gastric carcinoma, in a person with known achlorhydria, as significantly increased.

Summary and Conclusions

Modern gastric analysis has become quantitative and reproducible. In its various applications, it can and should be developed for use in hospitals where significant numbers of dyspeptic individuals are treated. It is the author's contention that the uses

Figure 2—Standard form for recording and reporting Insulin Hypoglycemia Gastric analysis, following completion of One-Hour Basal Gastric Analysis. Reporting medical officer evaluates indicated criteria, grading responses as positive or negative.

GASTRIC ANALYSIS LABORATORY DEPARTMENT OF MEDICINE
U.S.N.H. PHILADELPHIA, PA. 19145

INSULIN HYPOGLYCEMIA GASTRIC ANALYSIS

Technician:_____ Date:_____ Dose (0.2 ukg IV):_____ Inj. Time_____

Blood sugar determinations: Fasting_____mgm% 30 Minutes_____mgm% 45 Min._____mgm%

Spec.	Time	Amt.	pH	Titratable Acid mEq/1
1	____	____	____	_____
2	____	____	____	_____
3	____	____	____	_____
4	____	____	____	_____
5	____	____	____	_____
6	____	____	____	_____
7	____	____	____	_____
8	____	____	____	_____

Acid Output mEq/hr.

_____ 1st hour only

_____ entire 2 hours

Report of Multiple Criteria: (See under remarks)

1) Rise in Concentration within 2 hours_____mEq/1. . . . . Pos_____ Neg_____.
2) 1 hr Volume after insulin_____cc Basal hr. vol._____cc. . . . . Pos_____ Neg_____.
3) Basal secretion (BAO)_____mEq/hr . . . . . Pos_____ Neg_____.
4) Rise in Concentration in first 60 minutes_____mEq/1. . . . . Pos_____ Neg_____.
5) Rise of hourly output after insulin_____mEq/1. . . . . Pos_____ Neg_____.

Remarks:

1) As originally described by Hollander a positive response consisted of a rise in concentration of greater than 20mEq/1 within 2 hours after the injection of insulin (or 10mEq/1 if basal specimens were achlorhydric). Ref: Hollander, F., Gastroenterology 7:607, 1946. Additional or modified criteria are employed at various centers. The most accepted of these criteria are here reported in terms of absolute values and in terms of whether the values indicate a positive or negative response. Ref: Bank, S., et al Gut 8:36, 1967. An additional criterion not here reported is a significant (60–70%) reduction of the maximal response.

2) After a successful vagotomy the hourly volume after insulin should be less than the basal volume. Ref: Waddell, Surgery 42:652, 1957.

3) A basal secretion greater than 2mEq/hr is incompatible with complete vagotomy. Ref: Bachrach, Am. Jr. Dig. Dis. 7:1071, 1962.

4) An "early positive Hollander" is the criterion given to No. 1 occurring in the first 60 minutes. Many consider this to be the most important criterion for intactness of vagal innervation. Ref: Bell, Lancet 2:978, 1965 and Grossman, Personal Communication of August 1967.

5) A rise in output over the BAO of 1.5 or 2mEq/hr in any one hour after insulin. Ref: Bank and Marks, Unpublished data, 1966.

enumerated are well supported and will become increasingly widely accepted. In its present form of technique and terminology, communication and exchange of information between laboratories has become greatly simplified.

REFERENCES

1. Fulton, J. F.: Selected Readings in the History of Physiology, Springfield, Charles C. Thomas, 1930, pp. 152–154.

2. Kasich, A. M.: William Prout and the Discovery of Hydrochloric Acid in the Gastric Juice, Bull Hist Med *20*:340–358, 1946.

3. Friedenwald, J. and Morrison, S.: The History and the Development of the Stomach Tube With Some Notes on the Duodenal Tube, Bull Hist Med *4*:425–454, 1936.

4. Garrison, F. H.: A Brief History of Gastric Intubation, Boston Med and Surg J, *174*:267–270, 1916.

5. Card, W. I.: Anacidity in Jones, F. A. (ed) Modern Trends in Gastroenterology, 2nd series, New York, Paul B. Hoeber, Inc., pp 177–192.

6. Kay, A. W.: Effect of Large Doses of Histamine on Gastric Secretion of HCl; An Augmented Histamine Test, Brit Med J, *2*:77–80, 1953.

7. Marks, I. N. and Shay, H.: The Augmented Histamine Test, Gastroenterology *41*:599–603, 1961.

8. Burke, E. L. and Whetsell, J. E.: Further Consideration of the Minimum Dose of Histalog Necessary to Provoke a Maximal Secretory Response, Amer J Diag Dis *14*:637–642, 1969.

9. Makhlouf, G. M., McManus, J. P. A. and Card, W. I.: The Action of Gastrin II on Gastric-Acid Secretion in Man, Lancet pp 484–489, 5 Sept. 1964.

10. Johnston, E. and Jepson, K.: Use of Pentagastrin in a Test of Gastric Acid Secretion, Lancet *2*:585–588, 1967.

11. Cox, A. J., Jr.: Stomach Size and Its Relation to Chronic Peptic Ulcer, Arch Path *54*:407–422, 1952.

12. Card, W. I. and Marks, I. N.: The Relationship Between the Acid Output of the Stomach Following "Maximal" Histamine Stimulation and the Parietal Cell Mass, Clin Sci *19*:147–163, 1960.

13. Castell, D. O., Sparks, H. A. and Johnson, R. B.: The Importance of Fluoroscopic Tube Placement During Gastric Analysis, Amer J Dig Dis *12*:26–29, 1967.

14. Dragstedt, L. R.: Role of the Vagus Nerves in the Physiology of Gastric Secretion, Am J Surg *117*:813–821, 1969.

15. Ellison, E. H. and Wilson, S. D.: The Zollinger-Ellison Syndrome: Re-Appraisal and Evaluation of 260 Registered Cases, Ann Surg *160*:512–530, 1964.

16. Grossman, M. I.: The Pathologic Physiology of Peptic Ulcer, Am J Med *29*:748–753, 1960.

17. Rhodes, J., et al: Coarse Mucosal Folds in the Duodenum, Quart J Med *37*:151–169, 1968.

18. Stempien, S. J., et al: Hypertrophic Hypersecretory Gastropathy, Am J Dig Dis *9*:471–493, 1964.

19. Aoyagi, T. and Summerskill, W. H. J.: Gastric Secretion With Ulcerogenic Islet Cell Tumor, Arch Int Med *117*:667–672, 1966.

20. Hollander, F.: The Insulin Test for the Presence of Intact Nerve Fibers After Vagal Operations for Peptic Ulcer, Gastroenterology *7*:604–614, 1946.

21. Bell, P. R. F., et al: Augmented Histamine Response After Incomplete Vagotomy, Lancet *2*;978–979, 1965.

22. Bank, S., Marks, I. N. and Louw, J. H.: Histamine and Insulin Stimulated Gastric Acid Secretion After Selective and Truncal Vagotomy, Gut *8*:36–41, 1967.

23. Baron, J. H.: An Assessment of the Augmented Histamine Test in the Patient Diagnosis of Peptic Ulcer, Gut *4*:243–253, 1963.

24. Breuer, R. I. and Kirsner, J. B.: Present Status of Histalog Gastric Analysis in Man, Ann N Y Acad Sci *140*:882–895, 1961.

25. Myren, J., Gjeruldsen, S. and Fretheim, B.: Gastric Secretion Before and After Graded Partial Gastrectomy for Duodenal Ulcer, Scand J Gastroent *1*:132–137, 1966.

26. Fretheim, B., Myren, J. and Gjeruldsen, S. T.: Clinical Findings Before and After a Graded Gastrectomy for Duodenal Ulcer, Scand J Gastroent *1*:188–198, 1966.

27. Bruce, J., Card, W. I., Marks, I. N. and Sircus, W.: The Rationale of Selective Surgery in the Treatment of Duodenal Ulcer, J Roy Coll Surg, Edinburgh *4*:85–104, 1959.

28. Roth, J. L. A., et al: Results of Subtotal Gastric Resection (Billroth 2 Type) for Duodenal Ulcer, JAMA *161*:794–800, 1956.

29. Gelb, A. M. and Baron, J. H.: Clinical Tests of Gastric Acidity, N Y J Med *62*:2976–2982, 1962.

30. Ragins, H., et al: Quantitative Studies on the Effect of Gastric Secretion of Gastric Juices, Arch Surg *74*:266–272, 1957.

31. Pops, M. A., Moderator, The UCLA Interdepartmental Conference: Duodenal Ulcer Today, Ann Int Med *67*:164–182, 1967.

32. Wormsley, K. G. and Grossman, M. I.: Maximal Histalog Test in Control Subjects and Patients With Peptic Ulcer, Gut *6*:427–435, 1965.

33. Krag, Einar: Gastric Acid Secretion Related to Prognosis in Peptic Ulcer, A Long Term Followup Study, Acta Med Scand *180*:461–467, 1966.

34. Marks, I. N., et al: The Augmented Histamine Test, An Analysis of 672 Consecutive Tests, South African Med J *36*:807–812, 1962.

35. Goldenberg, J., Cummings, A. J. and Gompertz, M. L.: A Clinical Evaluation of the Maximal Histalog Test, Am J Dig Dis *12*:468–474, 1967.

MAJOR REVIEWS OF MARINE CORPS MEDICAL SUPPORT UNDERWAY

As hostilities in Vietnam wind down, major reviews of the "lessons learned" have been instituted. The Surgeon General's Ad Hoc Committee on Marine Corps Medical Support—an advisory group—has submitted two formal reports to the Surgeon General, which have been favorably endorsed and transmitted to the Commandant of the Marine Corps. A new Division of the Bureau, headed by Captain J. H. Stover, Jr., MC, USN, has been established to monitor and coordinate Bureau aspects of Marine Corps Medical Support. BuMed representation has been established on the USMC formal mid-range and long range planning staffs. A formal study group for medical communications was convened at USMC Development Center, Quantico, and has reported out. Its recommendations are now under consideration at Hqtrs, USMC. Naval Field Medical Research Laboratory has commenced a review of the field experience with the MUST (Medical Unit Self-Contained, Transportable) modular hospital units which have been deployed with 1st and 3rd Divisions and will make recommendations for modifications and the appropriate "mix" of units required to outfit Marine medical organizations. The Surgeon General has recommended that the Marine Corps adopt such a system of modular field medical structures to support USMC medical units. The feasibility of acclimatizing troops and maintaining this acclimatization while enroute to a tropical operations area is under intense study. Experimental studies are underway at both Field Medical Research Laboratory, Camp Lejeune, and Naval Medical Research Institute, Bethesda.

Special training and designation of hospital corpsmen for helicopter medical evacuation duty has been approved and is planned for implementation at both Camp Lejeune and Camp Pendleton. Advanced instruction in resuscitative and support techniques will be offered by the Naval Hospitals at these sites, while military instruction and flight operations orientation will be conducted by the Medical Field Service Schools and Marine Air Wing detachments.

A research study contract is under negotiation to independently look into the whole problem of field and amphibious medical support. Another contract study is underway regarding advanced Base medical facilities.

The problem of tropical immersion foot in Vietnam has not been satisfactorily resolved. A two-man team is in Vietnam at present to evaluate the field effectiveness of a new formulation of silicone ointment in the prevention of this condition.

A new field medical pouch for Corpsmen has been developed by the 1st Marine Division and extensively tested in the field. On the basis of this field experience, Field Medical Research Laboratory has fabricated modified versions of the original pouch and forwarded them to Vietnam for field evaluation.

The possibility of a "surgical support unit" which could be split off from the Marine Medical Battalion or a hospital ship has been proposed and initial discussions of staff and equipment for such a unit are under study.

It has been proposed that certain Navy ships could be rapidly converted to auxiliary hospital ships by employing modular units such as the "MUST" components and that these could also be deployed ashore if needed from such ships. Technical studies regarding power interfaces, etc., are in progress.

The organizational aspects of providing preventive medicine and epidemiological service to deployed USMC units has been considered by a working group of preventive medicine personnel. Radical changes in the present organization were not recommended.

A far ranging review of the equipment allowances for USMC medical units is considered imperative by many returning officers. The review will commence with laboratory equipment. Various field-experienced surgeons have been requested to provide BuMed with lists of laboratory procedures they consider essential to the practice of modern surgery. Two lists are in preparation (a) when patients are to be held for only four days (b) when patients may be held for 15 days. When a list of procedures has been agreed upon, selection of specific equipment and field packaging will be developed. The advent of transistorized equipment and various foam type packing materials have greatly expanded the range of instruments which can tolerate the rough handling and poorly regulated power sources encountered in field applications.

Helicopter support for medical units has been the subject of several studies, and others are proposed. The necessity for "transport" helicopters to move substantial numbers of casualties from hospital to hospital, to airheads and to and from hospital ships,

has become apparent. Whether or not these should be "dedicated" medical department assets has generated much interest.

New developments in field structures, new ship construction now being received by the amphibious forces, new airlift capabilities, new communications systems and land warfare tactics all lead to the necessity to re-evaluate our traditional patterns of Marine Corps medical support. Interested personnel are invited to correspond with Code 75; suggestions for improvement of the system will be most welcome.

DENTAL CHARTING INACCURACIES

LCDR Roger E. Alexander, DC, USN

The purpose of the Standard Dental Form 603 is to aid in diagnosis, treatment planning, and patient handling; to aid in patient identification in disasters; to provide a record of missing teeth, existing restorations, diseases, and abnormalities existing prior to entry into the military service; to provide a record of subsequent diseases and abnormalities; to record treatments rendered while in the service; to provide a basis for statistical information; and to protect the Government against fraudulent claims and protect the patient's veteran benefits.[1]

As cognizant dental officers, we must appreciate the need for this form to be meticulously accurate in all respects. Military personnel are exposed to a great number of potential catastrophies, including combat casualties, airplane and automobile crashes, and shipboard fires. Following such tragedies, the SF 603 may provide the sole means of identification. The fire aboard the USS FORRESTAL brought the value of the SF 603 in forensic identification into sharp focus once again.

Another reason for accuracy is for the protection of ourselves and the government. If initial and subsequent entries are careless, haphazard, and/or inaccurate, future claims against a dental officer or the government, regardless of the validity might be difficult, if not impossible, to justify or defend. This applies not only to the realm of professional liability, but also to veterans' benefits after discharge.

Clinical Study

A clinical study was initiated within the Atlantic Fleet to ascertain the accuracy level of SF 603's in current use. One hundred forty-six patients from 36 different ships were examined by the author at random. The only criterion for reviewing a record was that the initial examination* in Section 4 had been performed on or after 1 July 1964, to make the study current. Patients were identified by name during the study to prevent duplication. Patients with no restorations or missing teeth were excluded. Any third molars initially marked as missing but now erupted were given the benefit of the doubt and were assumed to have subsequently erupted, rather than to have been incorrectly charted originally. Other teeth originally marked present but now missing, or vice versa, inaccuracies in restoration charting, and other inaccuracies in the initial or subsequent (Section 15) chartings, were counted as errors. Any other gross errors which were felt to be detrimental to the form's mission were likewise considered as errors.

Results. In 146 patients' charts, a total of 435 errors were noted, an average of 2.98 per chart (or to put it another way, 3000 errors per 1000 men on active duty). There were 364 initial errors, 46 subsequent errors, and 25 errors of miscellaneous nature. The number of errors per chart varied from zero to fifteen. An additional 30 third molar charting errors were not included in the statistics for the reasons stated previously. Only 30 patients (20.54%) had error-free records in initial and subsequent treatment sections, and an additional 7 cases had no initial errors, but had subsequent errors in Section 15.

It was noteworthy that only 7 of the SF 603 records contained 87 of the errors. One chart had 15 errors, two had 14 errors each, two had 12 errors each, and two had 10 errors each.

Recommendations

The following suggestions are submitted to Naval dental officers for their consideration: 1) That all dental officers and technicians periodically review the Manual of the Medical Department, Chapter 6, to obtain a clearer understanding of the purpose of, and correct procedures for, accurately recording in the SF 603; 2) That individual dentists periodically review the SF 603 entries in the course of treatment, to assure continued accuracy; 3) That initial examination centers strive to attain a high degree of accuracy by assuring that technicians are recording the entries properly; 4) That printing computers utilized in some facilities be modified to print com-

[1] Manual of the Medical Department, U.S. Navy (NAVMED P-117).

The opinions or assertions contained herein are the private ones of the author and are not to be construed as official or reflecting the views of the Department of the Navy or the Naval Service at large.

*NOTE: For the purposes of this study, the term "initial exam" will refer to *all* exams charted in Section 4, including replacement records.

plete first and middle names, thus avoiding record mixups; 5) That periodically all activities remind dental technicians of the importance of accuracy, insuring that the disto-occlusal filling, for example, is not instead supposed to be a mesio-occlusal, or that tooth #3 is not really supposed to be #14; 6) That facilities not overload the chart with redundant SF 603 forms. Some Reserve centers are apparently confusing the annual physical (on SF 88) with the SF 603.

Summary

The Standard Dental Form 603 is frequently being maintained in a less-than-accurate state. A clinical study of 146 random dental records from 36 ships in the Atlantic Fleet revealed that only 21% (30 records) were error-free. The remaining 116 records contained from one to fifteen errors each, for a total of 435 errors, or an average of 2.98 per record. Seven charts contained ten errors or more each, and would have severely hampered body identification attempts in a disaster situation. Constructive recommendations are made for the purpose of improving the overall quality of future dental record keeping.

Editor's Note: *The Bureau of Medicine and Surgery concurs with the importance of this subject and the recommendations set forth. It is MANDATORY that all dental records be maintained in an accurate manner.*

LT Elizabeth J. Murrow, NC USN completed the course in orthopedic nursing at the Naval Hospital, Philadelphia in the fall of 1968 and reported aboard the USS Sanctuary in January 1969 to put into action what she had been taught. LT Murrow's knowledge of orthopedic nursing was challenged by the variety of orthopedic conditions complicated by additional battle injuries. The following account of shipboard nursing of the orthopedic patient is based upon a paper presented by LT Murrow at the Association of Military Surgeons, Far East Chapter at Tachikawa, Japan, in November 1969.

SPECIALIZED ORTHOPEDIC NURSING CARE OF THE PATIENT WITH WAR WOUNDS

LT Elizabeth J. Murrow, NC USN.

For the past 10 months it has been my privilege to serve aboard the USS SANCTUARY (AH-17). This ship is efficiently equipped and sufficiently staffed to meet the most demanding and varied needs of war casualties. It carries a highly skilled professional staff of approximately 30 physicians, 29 nurses and 250 corpsmen. It provides modern medical, radiology and laboratory facilities, a decompression chamber and an artificial kidney machine, which is frequently used. The ship is equipped with a modern laundry and dry cleaning plant, utilizing valuable water obtained by desalting and purification of sea water, which is processed aboard ship. It is centrally air-conditioned, an important asset in this hot, humid climate. The ship is maintained operational by the men assigned in Ship's Company. The ship has 2 commanding officers, one who is responsible for the ship and the other, a physician, who is in charge of the hospital spaces. Authority and responsibility are delegated throughout the hospital from this level to the various department heads, including the nursing service.

Seven hundred and fifty patients can be accommodated in time of emergency, however, the operating bed capacity is 686. American military personnel are brought to the ship from station hospitals strategically located on the mainland of Vietnam or directly from the battlefield. An important aspect of the ship's mission is the provision of medical-nursing care for the South Vietnamese military and civilian population.

The usual mode of transportation to the ship is via medevac helicopter. When a helicopter sets down on the ship's deck an alerted staff, specifically trained to provide emergency medical care receives and assigns each patient to the appropriate hospital department. All areas aboard ship are limited in space and the Orthopedic Unit is no exception. The 40-bed

ward has bunk type racks with the exception of two traction beds, which frequently are insufficient to accommodate the large number of patients in skeletal traction. Consequently, the traction equipment is adapted to the racks with inspired ingenuity by specially trained orthopedic technicians.

One problem which is definitely unique to shipboard nursing is working while underway either with favorable weather conditions or otherwise. The movement of an unmanned cart or stretcher is somewhat alarming, consequently, all movable objects are securely anchored in place, including intravenous bottles which can be "hazardous to your health" when in motion.

In addition, adequate supplies, medications and emergency equipment must be maintained in readiness at all times. These must be checked by each nurse assuming charge of a unit, including a safety check of potential fire or other hazards. In contrast to the architectural inconveniences and space limitations, the staff's spirit of service and the patients' level of morale are exceptionally high.

The word "orthopedics" is derived from the Greek word "ortho", meaning straight or free from deformity, and "pais", meaning child. This basic idea has been expanded to include the art and science of prevention, correction and restoration of function of the musculo-skeletal system. Under the direction of the Orthopedic Surgeon and his assistants, who interpret policies and set standards, the nurse functions as a practitioner, director and coordinator of nursing care. Of great importance to the nurse is the education and development of the other nursing team members. It is impossible for the nurse to personally accomplish all that must be done for each patient, consequently a nursing analysis will identify those functions which require her professional skill and time and those that can be delegated. It is imperative that the nurse comprehend the capabilities of those assigned to her unit. The Navy Nurse Corps Officer is assisted by Corpsmen who are assigned following the completion of approximately 14 weeks' intensive medical-nursing training. This training is supplemented by a varying amount of clinical experience within the framework of a naval hospital. The service provided by Corpsmen is outstanding; it has been rigorously tested on the battlefields of Vietnam and in other naval hospitals caring for war casualties. Navy Corpsmen deserve and are receiving the highest praise of our patients, people and Government.

One definition of orthopedic nursing care is the application of basic nursing skills with specific knowledge of and the ability to clinically practice effective nursing care of patients with orthopedic problems. This involves knowledge of anatomy and physiology, normal growth and development, bone structure and method of healing, in order that the nurse may recognize aberration from the normal pattern and pursue an effective course of action. Application of principles of body mechanics and proper alignment must begin on admission and continue as a basic requirement in the rehabilitation of each patient. Not only must the nurse herself understand proper methods of lifting and posture, she must also teach others these principles. In addition, such terms as hyperextension, flexion, adduction and abduction must become a part of the orthopedic nurse's vocabulary. To function effectively in her role as team leader these terms must be understood. Prevention of deformities with provision for support to damaged or weakened muscles is essential. Foot drop, decubitus ulcers, and upper and lower limb contractures can often be prevented with proper nursing measures. In addition, the orthopedic nurse is aware of the prevalence of fat embolus development in patients who have received extensive traumatic injuries, and the expectant treatment of this complication.

The story of a specific patient's medical-nursing care and personal adjustment to battle injuries illustrates the applied theories in practice of the Orthopedic Unit. The patient is identified by the name "Marine", and is typical of the vast majority of patients. "Marine" was admitted on the same night that he was injured with most of the other members of his company. He had received multiple fragment wounds from a grenade, which had completely destroyed his left eye; a fragment had penetrated the other eye. He sustained a below-elbow amputation of his right forearm with extensive injuries to the left arm, chest, throat, buttocks and both lower extremities. "Marine" was taken to the operating room for debridement of all wounds, exploration of a throat wound, and surgical closure of all wounds including modification of the right below-elbow amputation. From the recovery room, "Marine" was received by the Orthopedic Unit. Immediate care included taking and recording of vital signs and continuous observation for signs and symptoms of anoxia and circulatory impairment, as well as the ability to adjust to extensive trauma. Complete laboratory and X-ray studies were obtained. Positive identification of the patient was made and pertinent data had to be accurately recorded in the chart. Ironically, this patient had been discharged to duty from our ship

only three weeks previously after recovering from malaria.

Many patients, as did "Marine", receive large doses of antibiotics in addition to fluid therapy. This is a time-consuming but important responsibility for the nurse. Such patients appear to derive great benefit from intravenous therapy which not only provides fluids but also reduces the need for frequent intramuscular injections that may be nearly impossible to administer due to extensive soft tissue and muscular damage. "Marine" was given only sips of water initially which he found difficult to swallow following throat surgery. This problem was soon resolved as he became able to eat and drink adequate amounts. The importance of proper nutritional therapy must be recognized by the nurse and deleterious habits of diet must be corrected. The patients are usually very happy to receive a hot, well prepared meal after eating C-rations, but "Marine" who had to be fed, received quite a blow to the manly ego. Since many require assistance, other patients who are able are encouraged to assist at meal time. This has proven to be very helpful and relieves patient embarrassment.

At the first opportunity after admission, patients receive a complete bath and head washing. For "Marine" who had bandages on his chest and buttocks, all dressings were changed using povidone-iodine antiseptic. "Marine's" left arm was bandaged as was his right stump, and they were maintained in an elevated position by a fore-and-aft sling, an ingenious device which eliminates the use of excessive pillows, prevents edema of the injured part, prevents complete immobilization of the patient and facilitates nursing care. The fore-and-aft sling is constructed with a minimum of time and effort utilizing ace bandages and tongue blades attached to the ends of the bed.

Casts are a common, but vitally important aspect of orthopedic nursing. Posterior splints are frequently used in our hospital, as they were for "Marine", who had splints on both legs. Immediate care after a cast has been applied includes observation of exposed toes and other skin for signs of poor circulation, cold, pallor, cyanosis, edema, pain, and loss of motion and/or sensation. Failure to observe and report any of these symptoms could lead to paralysis within twenty-four hours. The many types of casts and principles of cast care will not be reviewed here, but the nurse in orthopedics must be familiar with them, their purpose, and the usual length of time required for various bones to heal. Such knowledge makes nursing care more interesting and affords the opportunity to support and reassure most patients. "Marine's" posterior splints became a source of inconvenience to him in getting out of bed. Therefore, because his leg injuries involved only soft tissue and muscle damage without bone involvement, the posterior splints were removed on the second day of his hospitalization when all wounds were cleansed and covered with sterile dressings. This permitted "Marine" to be up in a wheel chair, off his back (which was causing him discomfort and required considerable attention to prevent added skin breakdown). Frequent skin care and backrubs were not sufficient to prevent limited skin breakdown while confined to bed. The skin readily healed after "Marine" was permitted to sit up and his morale improved upon being permitted to socialize from a wheel chair.

All the ramifications of a personal readjustment to life as an amputee must be thoughtfully considered. It has been observed that the most traumatic and disabling amputation is that of an upper extremity, especially if it is the dominant arm as it was with "Marine". Not only is the problem of cosmesis imposed; the actual incapacitating factors are obvious. Care of the stump itself is relatively simple for the short period aboard ship; usually it remains surgically wrapped and is observed for signs of complication and drainage. No problems resulted from "Marine's" amputation while a patient aboard ship. He was able to talk about the amputation and expressed interest in the new electrical arms now being developed, in research being conducted at the University of Pennsylvania, and a bilateral upper arm amputee, a veteran participating in this research work. "Marine" related his fear of being rejected by his fiancée and talked about his home in the States. He came from Delaware and was apparently well educated. His family maintained contact with him during his stay and this appeared to relieve much of his anxiety.

Another aspect of orthopedic nursing is that of caring for a patient in traction, which involves clinical knowledge of crutches, slings, braces, fracture beds and equipment. Traction provides a means of immobilization of an affected part, while permitting the maximum function of the unaffected parts. Rehabilitation begins at this point and is an important aspect of nursing care until the patient is able to function at the highest level of his mental and physical capabilities.

Recreation, personal and spiritual needs vary with each patient but are of vital importance. Aboard the SANCTUARY not only is a well-prepared Red

Cross Social Worker available to nurses or corpsmen in any area of the hospital, but also a recreational therapist provides constructive relaxation and social activities for patients. These necessary services, either brought to patients on the wards or made available in the Red Cross Center, afford patient-to-family contact via a "ham" radio-phone system, or dictation of letters, and provide comfort articles. Inestimable guidance and support is provided by the chaplains who infuse courage and hope into the hearts of those that live and work so closely with trauma and death.

When the Orthopedic Surgeon has determined that a patient is able to travel, he is prepared for medical evacuation from the ship. It was a well motivated and responsive "Marine" who left our ship only five days after admission. From the same flight deck where he had been received, "Marine" was borne away in a medevac helicopter toward another hospital, a new way of living, and most important, toward home. Already imbued with a realistic grasp of his situation, "Marine" had laid a suitable foundation upon which to build throughout the arduous period of readjustment that lay ahead.

The following article is taken from the text of a paper presented by the author at the meeting of the Association of Military Surgeons, Far East Chapter at Tachikawa Air Base, Japan, in November 1969. CAPT G. Fred Kelly, MC USNR is a Flight Surgeon and Senior Medical Officer at NAS, Agana, Guam.

MEDICAL SUPPORT TO THE TRUST TERRITORY

CAPT. G. F. Kelly, MC USNR.

There are many different ways and places to practice the art of medicine. I would like to present a way and place to practice medicine which you may find different and interesting. Have you ever heard of NUKUORO, LAMOTREK, WOLEAI, SATAWAL or KAPINGAMARANGI? These are but a few of the more than 2,000 islands which spread out over an ocean area as large as the Continental United States, yet have a total land area of about 700 square miles. These islands make up the Trust Territory of the Pacific. Since the end of World War II, the United States Department of Interior has administered certain Pacific islands in trusteeship under the United Nations. Although the island of Guam occupies a central position both geographically and culturally in these islands, it is not included in the Trust Territory.

The Secretary of the Interior has announced that steps would be taken to end the trust arrangements between the United States and Micronesia. Discussions are being held to determine how the trust will be terminated. Micronesia could become an independent nation or it could become a territory of the United States much like Guam is today, or like Hawaii was before statehood. Other possibilities are under consideration of course, but the final decision will be up to the people of Micronesia—94,000 individuals who live in one of the most unusual parts of the world.

Where else are you likely to see a sea plane tied up to a coconut tree? Such is the first view of an aircraft of any type for many of the residents. Incident to a recent medical air evac mission to EURIPIK, it was determined that this represented the 3rd aircraft in history which had been seen by the inhabitants. Two Japanese planes had crashed in the lagoon during the war; our HU-16 was the first one to land and take off successfully. The impact of such an event on a remote population must be tremendous. As a practical demonstration of a friendly desire to help the populace, I can think of no more spectacular way than to swing down out of the sky to heal the sick or remove them to a large well-equipped hospital for treatment.

The Naval Air Station at Agana is responsible for search and rescue activities within the joint SAR Sector, Guam; this sector includes many of the Trust Territory Islands. Since emergency transportation to these remote islands is possible only by sea plane, we are called upon to provide medical assistance and air evacuation services which might otherwise be impossible. This set of circumstances has afforded an unusual opportunity to observe the culture and preventive medicine problems of many of these remote Micronesian and Polynesian islands.

I'm not prepared to draw conclusions as to the status of preventive medicine in these islands, however, some observations are too obvious to over-

look; the classical deformity of rickets and other deficiency diseases; the ever present fly which covers every open sore and makes it impossible for visitors to remain still without also being covered with the pest; the complete lack of suitable water supply and adequate sanitation. Some of these outer islands are nearly as untouched by civilization as HAWAII was 200 years ago. Their culture is almost entirely dependent upon fishing and agriculture; subsistence cultivation is practiced.

Many Micronesians live in the larger islands of the district centers such as Saipan, Yap, Truk, and Ponape. Here there are unmistakable signs of outside influence. These centers have hospital facilities and physicians. There are 6 hospitals staffed by 42 physicians. Thirty-two of these are Micronesian medical officers trained at the Fiji School of Medicine. On each of the remote islands or atolls is a Health Aid who is roughly equivalent in training to a Hospital Corpsman. The Aids provide medical care to the local islanders within the scope of their training and contact the district center hospital by radio for advice in any case when necessary. These Health Aids do an outstanding job, providing day to day medical care to perhaps 300 to 1,000 persons on a tiny atoll. They are sometimes 400 miles from the nearest medical facility and as much as 1,000 miles from anything comparable to the U.S. Naval Hospital at GUAM. The local district hospitals leave much to be desired but under the circumstances provide excellent medical care to the local population. A new $3,000,000 hospital is now under construction at Truk. It is being staffed with well trained physicians and medical officers to handle a wide range of cases up to and including chest surgery. Dr. William Peck, Director of Health Services for the Trust Territory, has an increased budget from $1,300,000 three years ago to $4,500,000 for the fiscal year. Within the near future he plans to be able to greatly improve medical care to those living in or near the district centers. There is a problem of enticing well trained physicians to settle for a life in such a remote area. Even the district centers are remote. Facilities which we normally take for granted are simply not available. For the adventurous and the dedicated, it can be a very satisfying life.

It is not feasible to station a physician at each of the remote islands, but ships visit each of the atolls about every 6 weeks in order to resupply the islanders with necessities and trade for copra. Whenever possible a physician accompanies these field trips to provide periodic medical care. Patients in need of evaluation or elective surgery are transported to district hospitals for such care. Whenever an emergency occurs the local Health Aid contacts the physician at a district hospital by radio for advice. If emergency air evacuation is advised, a message is sent to the Joint SAR Coordination Center at NAS Agana. Several options are presented: provide an air evac flight to one of the Trust Territory hospitals or to the U.S. Naval Hospital at GUAM; air lift specialized medical assistance to the patient; divert a ship to the island for surface transportation or medical care of the patient; provide emergency medical supplies to the patient by air lift or air drops; request the 79th Aerospace Rescue and Recovery Squadron to drop paramedics for emergency medical care (no occasion for this procedure has occurred in the past); provide any combination of the above services.

The real workhorse of these services has been the HU-16 (Albatross). It is slow, noisy, has limited usefulness in severe weather and sea conditions, and is sometimes a maintenance headache, but it is the only available aircraft which can do the job. We are further limited by the fact that an open sea landing in the HU-16 is extremely hazardous. Some of the islands have no sheltered lagoon for landing. Some have no suitable anchorage so that even if the sea swells and wind conditions permitted an open sea landing, we would have to transfer a patient from the open canoe with the props turning. We are not anxious to attempt this. One incident occurred last year which illustrates some of our problems. We attempted and were unable to make an open sea landing at SATAWAL to pick up a young woman with an incomplete spontaneous abortion. We were able to divert a Coast Guard ship to transport the patient to LAMOTREK and then air evac her to GUAM. Upon arrival at the U.S. Naval Hospital she was reported to have four grams of hemoglobin. On this same trip we transported a four-year-old girl (brought by ship from an outlying island) with severe amebiasis, and an elderly man with a luetic aortic aneurysm from LAMOTREK.

One unusual problem with which we must contend is the almost complete lack of weather information and navigational aids. To find the island we must rely upon dead reckoning and LORAN fixes. Dead reckoning is difficult when you are continually dodging thunderheads, and LORAN in the HU-16 is notoriously unreliable in this part of the Pacific. When we run into bad weather on one of these

missions we must either let down through the overcast and find the island or turn around and return to GUAM. We are usually on an instrument flight plan but radar tracking is out of the question. There are no radio beacons or approach plates. We always feel fortunate upon finding an island without having to go into a search pattern. There is one bright side of the story; the possibility of a mid-air collision is practically nil.

Once the island is found, wind direction is determined and a clear area inside the lagoon is visualized from the air, landing is usually not much of a problem. Taxiing and taking off is sometimes a different matter. Sea lanes are not marked, charts are outdated, and coral heads which are easily visible from the air are completely invisible from the cockpit of a taxiing aircraft. If this were not enough, the art of taxiing a sea plane is something like driving an automobile on ice or sailing a boat without a rudder. It's not impossible but luck has a lot to do with the outcome. We have had two incidents requiring extensive repair to the hull of the HU-16 during the last year.

Upon arriving at a destination we face the same problems which confront any other boat. We must anchor, run up to the beach, or tie up to something. Our choice depends on local conditions such as wind direction and velocity, sea-state, coral heads or other obstructions, and water depth. In some atolls it is necessary to anchor out and transport the patient to the aircraft by outrigger canoe. In other cases such as on WOLEAI, we have been able to drop the gear, roll up on the sandy beach and tie-up to a coconut tree. Even this is not without hazard. After the tide went out it took every able-bodied man, woman, and child on the island to push us off the beach.

The people on these outer islands have been most appreciative of our efforts. Whenever time and conditions permit they show their appreciation by a warm smile or a native dance. On NUKUORO they treated us to a feast in true Polynesian style and a dance which lasted far into the night. Even on some of the Micronesian islands where the nature of the people prevents much show of emotion, we were greeted with large smiles and warm handshakes, and always by the conventional flower leis.

I have said that our medical support in some areas has been less than spectacular. This is not to criticize the efforts of anyone. The Peace Corps volunteers have lived with the people and provided educational opportunities which would not have been available otherwise. The Trust Territory medical personnel have provided good medical care on a limited budget. Health Aids do not have equipment or training to perform even the simplest laboratory procedures so that any statistics on the incidence of infectious disease are useless. We see some unfortunate individuals with what appears to be advanced tuberculosis of the spine, but we have no idea what the incidence of tuberculosis in the outer islands really is. We see cases of advanced amebiasis but we have no way of knowing how prevalent this disease is or if it is due to the inadequate and contaminated water supply. We see cases of aortic aneurysm, and various deformities, but do not know what the incidence of congenital anomalies really is. We see human excreta deposited in loose piles along the otherwise beautiful beaches on some islands with millions of flies swarming over everything. Other islands are extremely clean with practically no flies. A priceless opportunity to study the real impact of sanitation on the health of a population is presented.

A more detailed study of the health conditions on the outer islands is needed and could be accomplished in similar manner as the survey of the starfish problem which was conducted last summer. In that study, marine scientists were transported to selected islands by the Navy in order to survey the extent of infestation by the Crown of Thorns Starfish and damage to the reefs. In like manner, physicians and technicians could be transported to selected islands in order to survey the extent of preventable diseases and health impairment of the inhabitants.

With the increased interest in the Trust Territory, a study such as this would do much toward assisting these people to better their future. Perhaps it is true that they choose to live on these tiny atolls isolated from the rest of the world and perhaps they should be willing to accept some of the hazards of an isolated existence. It simply is not possible to have emergency medical care available at all times and they understand this. But the fact that we try to assist them in any way possible does reflect a sincere desire to share the benefits of our society. Perhaps we can learn something by observing their way of life. . . .

ONE HORSE HOSPITALS

We are indebted to Captain J.H. Boyers, MC, USN, Commanding Officer, who provided the following copies of old correspondence discovered in the archives of Naval Hospital, Annapolis, Md. As CAPT Boyers remarked, it is evident that ONE HORSE HOSPITALS did exist in the past although Annapolis was not one of them.

REQUISITION FOR SERVICES OR SUPPLIES (On shore). No. 22-08

U.S. Naval Hospital, Annapolis, Md., August 9, 1907 190

To the SURGEON GENERAL U.S. NAVY:

The following named services or articles (which latter I hereby certify are not in store in any unreserved stock, or obtainable here under existing contracts) are required for proper care of hospital grounds
(Here state specifically the purpose for which services or articles are necessary.)
and will be absolutely necessary for the needs stated by Sept. 1, 1907,

190__Appro _____
(To be entered at Bureau)

1.	One horse, work, to weigh not less than 1200 lbs.	300	00

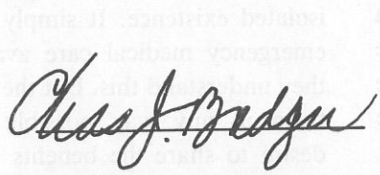
The work on the grounds requires the constant use of one horse and will do so for a year to come.

The ambulance at this hospital is so large that it takes the two horses we now have to pull it.

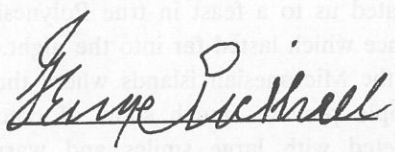
This horse could be kept for work on grounds and for emergency use in the ambulance.

There is sufficient stable room for another horse.

APPROVED:



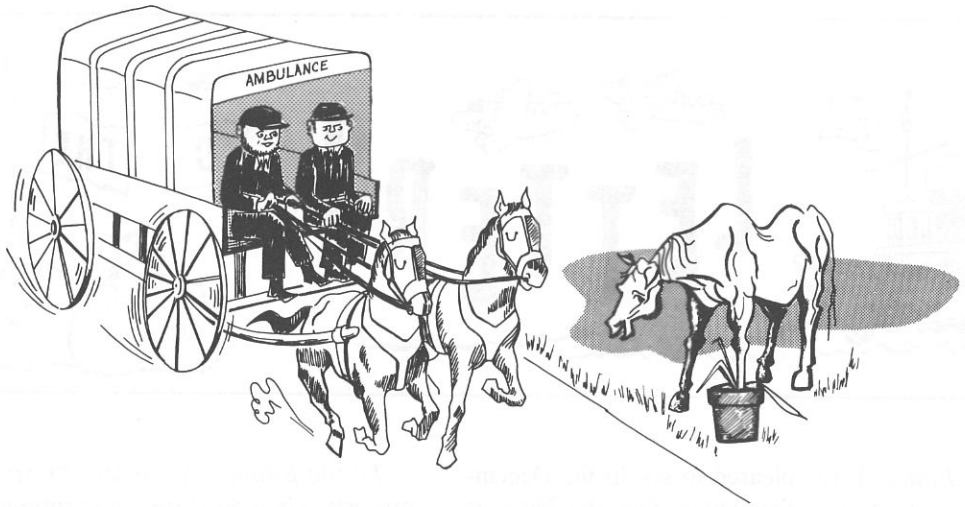
U.S.N. Commandant



Surgeon, U. S. Navy

NAVY DEPARTMENT, BUREAU OF MEDICINE AND SURGERY, _____, 190

Approved: The public interests require delivery to the above mentioned services or articles within the time stated, if practicable.



WASHINGTON, D.C.

August 16, 1907

My dear Doctor:–

Your letter of April 13th, in regard to your requisition for one work horse, has been received. The requisition will not be approved.

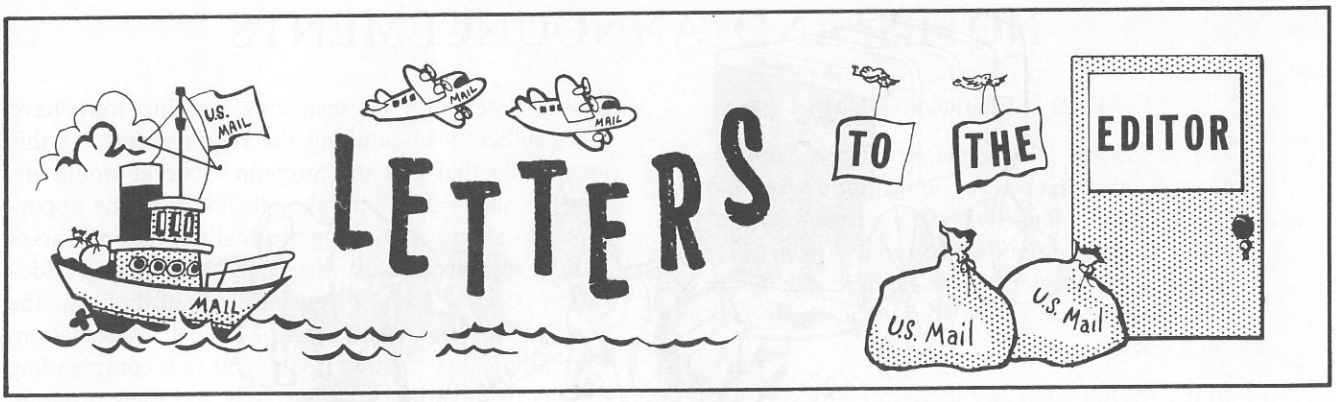
It is considered that all necessary hospital work, ambulance service and the work about the grounds can be performed by the team of ambulance horses. Your statement that ambulance calls are so frequent that it is impossible to use this team for other work seems to the Bureau necessary of some explanation. You are therefore directed to prepare and forward to the Bureau a statement of the amount and character of ambulance calls during the past month and, also, a statement of any other work that may have been required of this team.

It is to be distinctly understood that horses at naval hospitals shall be used for strictly hospital purposes only, and the Bureau will not look with favor on their use for any other purpose. Many of the naval hospitals, of greater capacity than the Annapolis Hospital, have but one horse, and our largest establishments, such as the New York Hospital, have but two horses to take care of the grounds, do ambulance duty and all other work connected with the institution.

Very truly yours,

Surgeon General, U.S. Navy.

Surgeon
George Pickrell, U.S. Navy,
In Command U.S. Naval Hospital,
Annapolis, Maryland.



To the Editor: I was pleased to see in the December 1969 issue of the Newsletter, that the Navy is taking an active role in establishing basic information that is necessary for a rational attack on the malaria problem in Vietnam. Some of the wording in the article, however, perpetuates a misconception widely held not only by the laity but also by medical personnel.

Although elimination of the carrier mosquito has occurred on rare occasions in the past, the aim of malaria programs is usually control or eradication of the parasite. Reduction of the carrier mosquito for an adequate period of time to the point where one case of malaria gives rise to less than one new case does not require *elimination* of the carrier mosquito.

The difference between vector eradication and disease eradication is important and fundamental and requires greater precision of expression than is generally used.

Sincerely,
Thomas E. Frothingham, M.D.
The Corvallis Clinic
530 N.W. 27th Street
Corvallis, Oregon 97330

To the Editor: I have been reading the Navy Medical Newsletter for the last 25 years and want you to know that, from where we sit, the December, 1969 issue was the best ever.

Yours truly,
CDR M. H. Backer, Jr., MC USNR
Commanding Officer, Naval
Reserve Medical Company 9-22
St. Louis University
10345 Watson Road
St. Louis, Missouri 63127

We wish to thank Dr. Backer and all others who took the time and trouble to offer their best wishes and encouragement.

To the Editor: An article, "Cervicofacial Actinomycosis is Not So Rare", was submitted for consideration for publication in U.S. Navy Medical Newsletter in response to the editor's request for such material in the December 1969 issue. Recent correspondence implied that subject article will be scheduled for the Dental Section of the Newsletter.

Since it is felt that Medical Officers and Medical Department Representatives on independent duty have the opportunity to initially see most of the cases under discussion, it is felt expedient to place the article in the Medical Section of the Newsletter.

It is doubtful that many Medical Officers on independent duty read either the Dental Section or ORAL SURGERY, ORAL MEDICINE, ORAL PATHOLOGY in which the full article appears, therefore, it is respectfully suggested that subject article be placed in the Medical Section if published.

CAPT H. S. Samuels, DC USN
Chief of Dental Service and Head,
Dept of Oral Surgery
Naval Hospital
Philadelphia, Pa. 19145

Many share CAPT Samuels' concern, and division of the Medical Newsletter into sections by corps has been discontinued for this reason. Provision of high quality health care demands harmonious coordination of many disciplines. Readers are urged to peruse the entire magazine; much of it has been printed with a view toward enhancing respect and communication among all members of the Navy Medical Department. No man is an island. Perhaps at no other point in time has personal commitment become so vital—to remain blithely uninvolved is to be dead.

Whether or not this column becomes a dynamic forum of provocative, meaningful, functional discussion depends upon our readers whose participation is essential. Will you take the necessary time to contribute?

NOTES AND ANNOUNCEMENTS

DoD MEMORANDUM

The following Memorandum of the Secretary of Defense is reprinted for the information and guidance of all Medical Department personnel. BuMed requires feeder information from time to time in order to provide accurate, prompt replies. All hands are requested to make priority effort when responding to such inquiries.

In my March 27, 1969 memorandum to you I expressed my concern about our promptness and courtesy in responding to Congressional inquiries.

I regret to say that over past months, we have had a number of unfortunate incidents of laxity which have caused us considerable embarrassment. Given our present budgetary constraints and their consequences, we simply must do a better job of responding to inquiries of the Congress with timely and substantive answers.

While my earlier memorandum addressed Congressional inquiries, no less important are inquiries from Governors, and the responsible American public who are entitled to ask questions and to receive prompt answers.

I again ask your personal attention of these matters.

s/Melvin Laird
Secretary of Defense

THE PHYSICIAN'S RECOGNITION AWARD

The Surgeon General strongly endorses the AMA's efforts to stimulate all physicians to continue their education on a regular basis throughout their medical careers to maintain high standards of professional competence.

At the Clinical Convention in December 1968, the American Medical Association House of Delegates established The "Physician's Recognition Award" for participation in Continuing Medical Education. The purpose of the award is to accord recognition to physicians who participate regularly in continuing medical education and to encourage other physicians to engage in this important activity.

Medical officers in the Navy have ample opportunity to participate regularly in continuing medical education. Of course, those medical officers participating in approved graduate education should have little or no difficulty in qualifying for the award.

On the other hand, physicians not engaged in approved internship or residency training may have more difficulty in fulfilling the requirements for this award. To that end the Surgeon General would encourage such officers to take advantage of the opportunity to attend continuing medical education courses offered by institutions listed in "Continuing Education Courses for Physicians" published in the Journal of the American Medical Association. Parenthetically, it should be added that commanding officers of large teaching hospitals and their program directors should make every effort to have those courses sponsored by their institution approved and listed in the Journal of the American Medical Association as a Continuing Education Course for Physicians.

Other methods for obtaining credit are:

1. Education leading to an advanced Degree in a Medical Field
2. Participation in Medical Research
3. Teaching
4. Scientific presentations or publications
5. Attendance at Scientific Meetings
6. Attendance at AMA Scientific Assemblies and Professional Society Scientific Meetings
7. Preparation and Presentation of a scientific exhibit

It is the Surgeon General's wish that as many Navy Medical Officers as possible qualify for the Physician's Recognition Award.

Further information and applications may be obtained by writing directly to:

Department of Continuing Medical Education
American Medical Association
535 North Dearborn Street
Chicago, Illinois 66610.

CURRENT VACANCIES IN RESIDENCY TRAINING UPDATED

The following vacancies exist in the residency training programs to begin in the summer of 1970:

	Year Level		
Specialty	*First*	*Second*	*Third*
Anesthesiology	Bethesda Philadelphia		
Dermatology		San Diego	
General Practice	Camp Pendleton		
Hematology*	Bethesda		
Orthopedics			Boston San Diego

Specialty	Year Level First	Second	Third
Pathology	Bethesda Philadelphia San Diego	Portsmouth	
Pediatrics	Boston Philadelphia		
Psychiatry	Bethesda Philadelphia	Bethesda Philadelphia	
Pulmonary Disease*	San Diego	San Diego	
Radiology		San Diego	
Surgery		Philadelphia	Philadelphia

*Fellowships which may be entered following 2 years of Post Doctoral Training in Internal Medicine. Currently there are no residency training opportunities available at the Naval Hospital, St. Albans, Long Island, New York.—Code 316, BuMed.

NAVAL DENTAL CORPS GRADUATE TRAINING PROGRAMS

The Dental Training Committee met recently in the Bureau of Medicine and Surgery to select officers for Internships, Postdoctoral Fellowship Training, Graduate/Postgraduate Courses at the Naval Dental School, and Residency Training in naval facilities. The Training Committee previously selected dental officers for long courses of instruction at civilian universities. The summary of officers selected for training for Fiscal Year 1971 is as follows:

Internships	32
Postdoctoral Fellowships	19
Graduate/Postgraduate Courses Naval Dental School	32
Residency Training—Naval Facilities	37
Long Courses—Civilian Universities	37
	157

AMERICAN BOARD OF PEDIATRICS REPORTS

Official word has been received from the American Board of Pediatrics concerning the performance of the 8 examinees from the Naval Hospital, San Diego, Calif. The program at San Diego Naval Hospital is rated as NUMBER ONE among the 197 hospitals tested. A rating in the top 3% was achieved in "Newborn, Metabolic Disorders, Growth and Development, and Infectious Diseases"; rating for "General" was in the top 1%.

The American Board of Pediatrics forwarded reports to the Program Directors having 5 or more residents participating in the written examinations for certification for the first time in 1968-69. All scores were standardized to permit data from the 1968 and 1969 examinations to be combined, and to permit comparisons between various subjects. The results are based on standings of representatives from 197 major programs throughout the country.

To the residents, their instructors, and to the Commanding Officer of the Naval Hospital, San Diego: Congratulations for a job well done.

DENTAL OFFICER ELECTED TO COUNCIL ON DENTAL THERAPEUTICS

LCDR Samuel V. Holroyd, DC USN, has been elected to the Council on Dental Therapeutics by the House of Delegates of the American Dental Association.

Doctor Holroyd earned a Master of Science degree in Pharmacology after graduation from West Virginia University School of Dentistry and taught Pharmacology at West Virginia University prior to being commissioned in the Dental Corps.

Doctor Holroyd, who also has a Master of Science degree in Periodontology, served as instructor in Pharmacology and Periodontics at the Naval Dental School and has published numerous articles in professional journals.

TWENTY-SECOND ANNIVERSARY DENTAL TECHNICIAN RATING

On 2 April 1970, the Dental Technician rating will have been established 22 years. Although this date marks the birthday of the rating, the hospital steward who in 1873 was assigned to assist Thomas O. Walton, D.D.S., Acting Assistant Surgeon at the Naval Academy, could be considered the first Navy dental technician, but history did not record his name. Until the time dental technicians became a separate rating, hospital stewards, and later pharmacist mates, served as dental assistants wherever dental officers were assigned.

The first formal course of instruction for dental assistants was convened in February 1923 at the U.S. Naval Dental School, located at that time on 23rd and E Streets in Washington, D.C., the present site of the Bureau of Medicine and Surgery. There were 11 men in the class. By way of comparison, there are 400 dental technicians presently enrolled in formal training courses for general dentistry, prosthodontics, maxillofacial prosthetics, research assistant, dental repair, and medical administration.

There are now over 4,000 dental technicians on active duty on 317 ships and stations throughout the world. They can be justifiably proud of their contributions to the dental health care of Navy and Marine Corps personnel, retired personnel, and eligible dependents.

STUDY UNDERWAY TO DETERMINE THE EFFECT OF EARPLUGS ON COMMUNICATIONS IN ROTARY-WING AIRCRAFT

The standard Navy flight helmets used by aircrews in rotary-wing aircraft provide little attenuation against the intense low-frequency noise present in such aircraft. In an effort to improve communications, aircrews often use excessively loud headphone signal levels to override the noise. Exposure to the intense noise levels and speech levels over extended periods of time could result in hearing impairment. Prior to designing an experiment to determine if the use of earplugs can improve communications in rotary-wing aircraft, some preliminary noise level measurements and speech intelligibility measurements were obtained for 3 flight helmets (APH-6A Standard, APH-6A Sonex, and SPH-3B) in a UH-1D helicopter.

Intelligibility scores obtained from one listener, and recordings of the noise obtained as a manikin head was fitted with each of the 3 helmets, are currently being studied prior to the design of the formal experiment. Noise spectra for the aircraft with the doors closed, and with the doors open, were as follows:

Octave-band Center Frequency in Hz

	31.5	*63*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*	*Overall "C"*	*"A"*
Closed	114	105	101	92	90	70	64	55	50	125	90
Open	118	101	105	100	92	80	68	63	56	120	92

HELICOPTER RESCUE NET

On 19 December 1969, CAPT Roger G. Ireland, MC USN, Director, Aerospace Medicine Technical Division, attended a civic ceremony at Corpus Christi Museum at the request of Mayor BLACKMON of Corpus Christi, Texas. The occasion for the ceremony was the presentation to the museum of the helicopter rescue net (used to retrieve the Apollo 12 astronaut team after their landing in the Pacific Ocean) by Mr. Billy Pugh, inventor of the net.

In May of 1967, CAPT Ireland (then Director of the Navy Aerospace Crew Equipment Laboratory at Philadelphia Naval Air Engineering Center) considered application of the Billy Pugh Rescue Net to the Navy Helicopter Search and Rescue Mission. CAPT Ireland recognized that the device was similar in principle to an experimental helicopter open sea rescue net which he had designed for the Navy in 1955. He had initiated action to evaluate and eventually procure the device through the Naval Air Systems Command and Deputy Chief of Naval Operations for Air via CAPT Mack Nortman USN, the coordinator for aviation safety for DCNO (Air).

In September, CAPT Ireland recommended that NASA evaluate the device for application to the splash down site recovery operation planned for the Gemini and Apollo manned space flight programs. The Billy Pugh net is now in wide use in the Navy and is the recovery device used by the NASA team.

RADM N. G. Ward USN, Assistant Chief of Naval Operations for Safety, and other naval officers of his organization including CAPT Ireland who has additional duty in the Office of the Chief of Naval Operations, Op-98, were each presented a key to the city. They also received certificates of appreciation which were presented at a banquet following the ceremony.

AEROSPACE MEDICINE MEETING

From 15-17 December 1969, CAPT Roger G. Ireland, MC USN, Director, Aerospace Medicine Technical Division, attended the Scientific Program Committee Conference at Mayo Clinic, Rochester, Minnesota, which finalized the program for the 41st Annual Aerospace Medicine Association meeting to be held in St. Louis, Mo.

The 41st Annual Scientific Meeting of the Aerospace Medical Association will be held 27-30 April 1970 at the Chase Park Plaza Hotel, St. Louis, Mo. As one of the highlights of the Honors Night banquet, President-Elect, CAPT Ralph L. Christy, Jr.,

MC USN, will be installed as president of the Association for the coming year. Navy personnel attending the daily meetings in uniform have the option of wearing either service dress blue or service dress khaki. The uniform for the Honors Night banquet will be dinner dress blue.

AMERICAN ACADEMY OF GOLD FOIL OPERATORS MEETING

CDR Paul P. Hatrel, DC USN, participated in a group table clinic "Graduate Training in Operative Dentistry at Indiana University" presented at the American Academy of Gold Foil Operators Meeting held on February 13, 1970, at Chicago, Illinois.

CDR James V. Gourley, DC USN, participated in the Clinic Session of the meeting.

CDR Hatrel is enrolled in the graduate program in Operative Dentistry at Indiana University and CDR Gourley is enrolled in the graduate course in Operative Dentistry at University of Washington.

INDEX MEDICUS ABBREVIATED

The National Library of Medicine now publishes an "Abridged Index Medicus" in cooperation with The American Medical Association. Distributed monthly, each issue cites about 100 English-language journals which have been selected from NLM's computer-based MEDLARS (Medical Literature Analysis and Retrieval System) by an advisory committee of physicians, medical editors and medical librarians.

Each issue is arranged in 2 sections, Subject and Author; cited articles are indexed under several subject headings. Subscriptions may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

ACCIDENT PATHOLOGY COURSE

Washington, Jan 26—The Armed Forces Institute of Pathology will hold a short course in Accident Pathology from May 4 to 6, 1970. The course will emphasize the investigative and pathologic aspects of vehicle accidents and accidents in the aquatic environment.

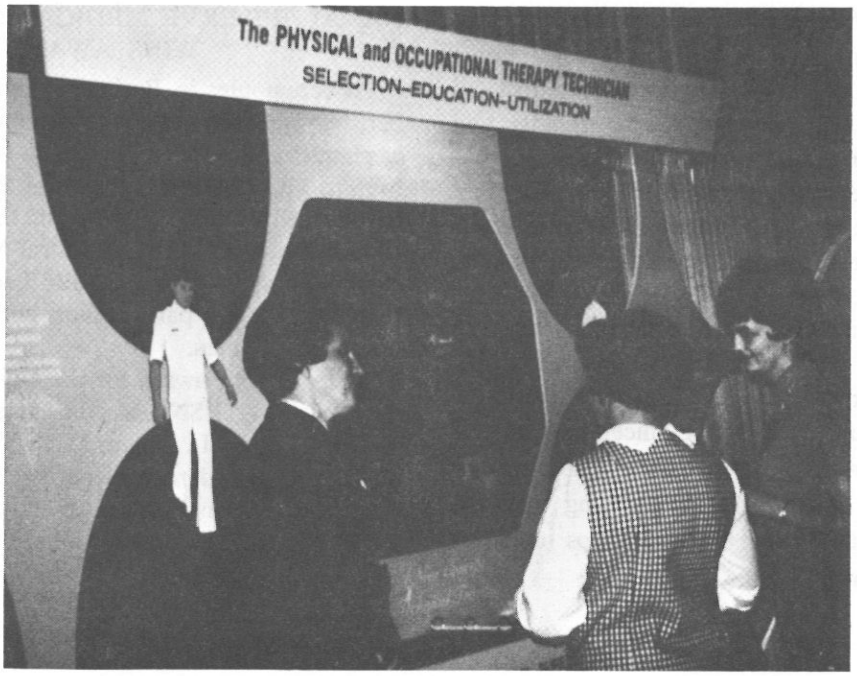
The course is open to pathologists, pathology residents, submarine medical officers, accident investigators and persons in allied fields. Persons interested in attending should write the Director, Armed Forces Institute of Pathology, Washington, D.C. 20305.

NAVY OCCUPATIONAL THERAPISTS AT DALLAS CONFERENCE

The Navy was represented at the Forty-Ninth Annual Conference of the American Occupational Therapy Association in Dallas, Texas, November 3 through 7, 1969, by six officers. An exhibit titled "The Physical and Occupational Therapy Technician" was also presented.

The exhibit is designed to introduce the new curriculum of the combined program of Physical and Occupational Therapy Technic at the Navy Medical School, NNMC, Bethesda, Maryland. This school is the first of its kind in the Nation and is being followed with great interest by directors of many other technical and professional schools. The graduates of this school will qualify as both occupational and physical therapy technicians and can be assigned to either type of department. They are also eligible to apply for certification as occupational therapy assistants (COTA's) upon completion of the course.

CDR Mary Rooney, MSC USN, Head, Occupational Therapy Branch of the Physical and Occupational Therapy Division, NMS, served as exhibit monitor. Great interest and enthusiasm were shown by conferees, especially university directors involved in organizing new COTA programs. They seemed particularly interested in the Navy's requirements for admission, course content and training aids.



CDR Rooney answers questions concerning the Navy's educational program.

Over 1,000 Occupational Therapists participated in the Conference. CDR Lillian P. Hoover, MSC USN, District of Columbia Occupational Therapy Association President, attended the pre-conference and conference meetings as the BUMED representative. In addition, the following active duty Navy occupational therapists were present: LCDR Helen Delaney, St. Albans, New York; LTJG Arnold Friedman, Great Lakes, Illinois; and LTJG Claudia Johnson, Bethesda, Maryland. CDR Joan Beckwith, MSC USN, BUMED Assistant Director for Medical Specialist Officers, attended from Washington, D.C.

COMMAND CHANGES

RADM H. G. Stoecklein has assumed duties as Staff Medical Officer for the Commander-in-Chief, Atlantic Fleet. He relieved RADM W. Welham, MC USN who retired after more than 33 years of service. RADM Welham was awarded numerous personal awards throughout his illustrious career, including the Legion of Merit for exceptionally meritorious conduct in performance of outstanding services while assigned duty as Fleet Surgeon, US Pacific Fleet. During retirement ceremonies, RADM Welham was further cited for recognized achievements. "As physician, administrator, and naval officer, Admiral Welham contributed immeasurably in enhancing the prestige of the Navy Medical Department, and it is a privilege to record here our appreciation and gratitude and confer upon Admiral Welham this Certificate of Merit in recognition of a distinguished career in the service of his country."

CAPT G. M. Ricketson, MC USN, who formerly served as the Executive Officer of the Naval Hospital, Oakland, Calif., has assumed command of the Naval Hospital at Camp Pendleton Marine Corps Base.

MERITORIOUS UNIT COMMENDATION

All personnel attached to and serving with Company C, First Medical Battalion, from 16 January to 19 April 1968, and who were actually present and participating in the operations described, are authorized to wear the MERITORIOUS UNIT COMMENDATION Ribbon. Cited for meritorious service in medical support of Task Force XRAY, Company C was the only First Marine Division medical facility operating in the Hue-Phu Bai area during this period when the Tet Offensive occurred. Upon arrival, Company C began erecting facilities of Medical Unit Self-Contained Transportable (MUST) #1, which had just arrived as the physical plant for the hospital. Within 48 hours the facilities were set up and oper-

ational. During this period, uninterrupted medical and surgical care was provided to Task Force XRAY and Third Marine Division personnel, to US Army, US Navy, and Vietnamese military and civilian personnel as well. Most services were rendered under adverse conditions, but not once were treatment and patient care interrupted. When rockets were impacting in the area, immediate repair of the unit commenced while casualties of the attack were being received and treated. The average company strength was 10 Navy officers, 63 hospital corpsmen, and 26 Marine enlisted. "The spirit and devotion to duty demonstrated by the officers and men of Company C, First Medical Battalion, in accomplishing the assigned mission was in keeping with the highest traditions of the Marine Corps and the United States Naval Service."

NAVAL RESERVE MEDICAL COMPANY 12-6 WINS AWARD

At ceremonies in Berkeley, California in December, Naval Reserve Medical Company 12-6 received a plaque and trophy presented by RADM H. P. Mahin, MC USN, in recognition as the best Unit of the Phased Forces Program in the Twelfth Naval District for Fiscal 1969. Admiral Mahin praised the work of the Unit, which has had an outstanding record of reserve participation and performance for a number of years.

Accepting the award for the Unit was CDR C. R. Graham, MC USNR-R, the present commanding officer. CDR R. L. Nolan, MC USNR-R, UNIT CO during the period recognized by the award, also received a personal letter of commendation from RADM L. B. McCuddin, USN, Twelfth Naval District Commandant.

FAREWELL HAVEN

The hospital ship HAVEN, one of the last of the C-4s converted to hospital ships for the Navy in World War II, was not commissioned until 1945. She subsequently served as a dispensary at Long Beach, Calif. Laid up in 1967, the Haven has now been converted again and will sail under the new name of Alaskan, as a liquid chemical carrier. A new special midbody was inserted in the conversion, increasing her length from 520 to 665 feet. The existing bow and stern were retained.

Aerial view of USS HAVEN (AH-12) anchored in Inchon Harbor in 1951.

United States Navy Medical Newsletter

CORRESPONDENCE AND CONTRIBUTIONS from the field are welcomed and will be published as space permits, subject to editing and possible abridgment. All material should be submitted to the Editor, Navy Medical Newsletter, Code 38, Bureau of Medicine and Surgery, Washington, D.C. 20390.

NOTICES should be received not later than the third day of the month preceding the month of publication.

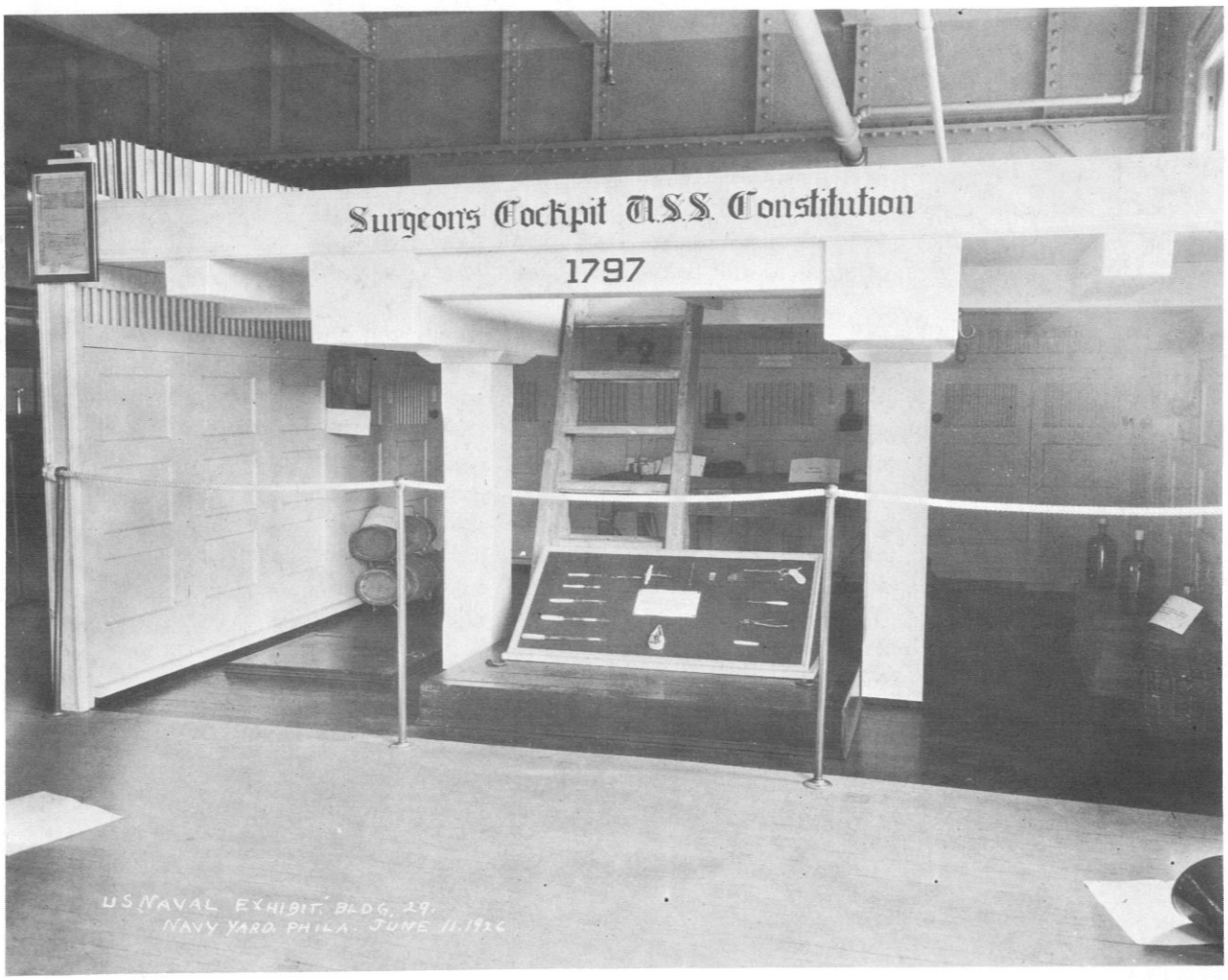
PROFESSIONAL PAPERS AND ARTICLES should be typewritten on one side of the paper, double spaced, with liberal margins. Original and one carbon copy are required. Generic names of drugs are preferred. If the author's present affiliation differs from that under which the reported work was done, both should be given. Unless otherwise indicated, it will be assumed that the article presented has not been previously printed or delivered elsewhere. Papers which have been delivered or printed elsewhere, covered by copyright, cannot be reprinted in the Newsletter without the written permission of the author(s) and copyright holder. It is the responsibility of the author(s) to inform the Newsletter when the material submitted has been previously used or copyrighted. The Newsletter will be happy to request permission to reprint from the copyright holder when this is necessary.

ILLUSTRATIONS are acceptable when they substantially contribute to the understanding of the basic material. Only distinct, glossy, black and white PHOTOGRAPHS which are functional can be printed. Prints should not be mounted, stapled, clipped or otherwise deformed and can be marked lightly on the back with the figure number. Legends should be typed consecutively on a separate paper with the indicated figures; credits for the photography may also be included. Identities of patients should be masked. DRAWINGS, TABLES AND GRAPHS should be minimal in number and properly labeled. They should be neatly done in heavy black ink on white paper, one to a page.

SUGGESTIONS are invited concerning the Newsletter, its content and form. Comments should be forwarded to the Editor.

U.S. NAVAL PUBLICATIONS and FORMS CENTER
ATTN: CODE 306
5801 Tabor Avenue
Philadelphia, Pa. 19120
Official Business

POSTAGE AND FEES PAID
NAVY DEPARTMENT



U.S. NAVY MEDICAL NEWSLETTER

☆U. S. GOVERNMENT PRINTING OFFICE : 1970 393-303/10