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COVER: Assistant Secretary of Defense for Health Affairs, William Mayer is Secretary Caspar Weinberger's point man for medical matters involving all the armed services. Dr. Mayer's views on military medicine is the subject of an interview on page 7. Photo by HM3 Thomas Kelley, NSHS, Bethesda, MD.

Traveler's Diarrhea Studied on South American Deployment

On Operation UNITAS XXVI, Navy medical researchers are studying the infamous malady, Travelers' Diarrhea.

UNITAS is a joint exercise with several South American navies. CDR Joel Escamilla, MC, is a microbiologist from the U.S. Naval Medical Research Institute Detachment in Lima, Peru. He came aboard USS *Saginaw* (LST-1188) to study Travelers' Diarrhea and is the second of three researchers joining UNITAS working on the problem.

"Diarrhea is a major problem in South America," Escamilla said. "The disease, usually caused by a microbial infection, can adversely affect mission personnel within hours after exposure." Many South American countries lose their share of the much needed $100 billion tourist industry because visitors fear "Montezuma's revenge" and, consequently, travel elsewhere.

Escamilla is working to identify the causes and treatment of the many types of diarrhea. "There is a long list of microbes that can cause diarrhea, including salmonella, which causes the malady commonly known as food poisoning."

His patients are the sailors and marines on *Saginaw* and other UNITAS ships. He begins by assembling a thorough background on the patient. Which ports did he visit? What food did he eat there—raw fish, unwashed fruit, food from a street vendor?

Escamilla then takes blood, stool, and other samples depending on the symptoms. A portion of each sample is checked for parasites and certain bacteria. The remainder is frozen in liquid nitrogen and shipped to the Naval Medical Research Institute in Bethesda, MD, for further study.

Escamilla determines the antibiotic susceptibility of the organisms found in the specimens. "Common antibiotics such as penicillin and sulfa drugs," he said, "can be ineffective against many of the microbes that cause diarrhea."

"The ordinary antibiotics have no effect against intestinal parasites. If you try to treat them that way, they will continue as if you were doing nothing," he said. Escamilla is working to cure the cause, not just the symptoms. With the proper remedy, the patients "will recover more quickly and are assured they won't carry parasite infections home to their families."

The results of this research are designed to help maintain the military readiness of future deployments. But, it may also help the U.S. tourist enjoy more of their vacation time in South America. □

—Story by JO3 David King, Commander, South Atlantic Force, U.S. Atlantic Fleet.

HMC Sabas B. Carinio assists CDR Escamilla in researching one of the leading medical problems facing U.S. servicemen in South America.

Subendocardial Infarction

CDR Timothy P. Blair, MC, USN

Considerable attention has been given recently to the nonspecificity of the electrocardiographic diagnosis of subendocardial infarction.(*1,2*) Furthermore, review articles have examined the clinical significance of this entity. (*3,4,5*) There continues to be interest in this area as manifested by the publication of additional evaluation of large numbers of patients.

Experimental studies with radiolabeled microspheres have indicated the potential vascular space of the subendocardium is up to 40 percent greater than the subepicardial zone.(*6*) However, this apparent plethora of blood supply is compromised by high intramural tension during systole which restricts perfusion to diastole.(*7*) The superimposition of coronary disease results in further restriction of blood supply to the subendocardium.

In 1944 Wilson et al.(*8*) emphasized ischemia can produce alterations in the QRS complex, including the development of prominent Q waves. Prinzmetal(*9*) later challenged this view and argued the subendocardium did not alter the QRS complex. In 1957 he refuted this view, but the refutation did not achieve the same notice as the initial study.(*10*) Durrer et al.(*11*) noted an infarct extending through only one-quarter of the myocardium could produce Q waves. Raunio et al.(*12*) found 60 percent of patients with a subendocardial infarction to have alterations in the QRS, and 33 percent fulfilled conventional QRS criteria for the diagnosis of myocardial infarction. Furthermore, 17 percent of the patients with transmural infarction had EKG changes limited to ST depression. Sullivan et al.(*13*) also emphasized even small endocardial infarctions can produce Q waves. Abbott and Scheinman(*14*) found a 44 percent incidence of transmural myocardial infarction in patients with EKG alterations limited to the ST-T segments.

The clinical limitations of the electrocardiogram in the diagnosis of subendocardial infarction were noted in 1950 by Yu and Stewart.(*15*) They observed the course of nontransmural infarction was unpredictable and occasionally severe and differentiation from transmural infarction was only possible with the EKG.

The development of coronary care units focused attention on myocardial infarction. Some observers felt the diagnosis of "subendocardial infarction" conveyed a better prognosis because it reflected a lesser degree of cardiac damage. Despite this belief, Lown,(*16*) in an early paper, noted a mortality of 28 percent for subendocardial infarction compared to 26 percent for anterior transmural and 10 percent for inferior transmural infarction. He did, however, note there was no mortality associated with an infarction with EKG changes isolated to the T wave.

In 1973 Scheinman and Abbott(*17*) emphasized the serious adverse consequences of subendocardial infarction: their prospective study revealed a 37 percent mortality in patients with subendocardial infarction, but only 19 percent in transmural infarction. The incidence of heart failure and shock was the same. The study was complicated by an incidence of prior infarction of approximately 40 percent in both groups. Interestingly, a subgroup consisting of patients with isolated ST-T changes and less than a 100 percent rise in cardiac enzymes had only a 3 percent mortality and a lower incidence of failure and shock.

Madias et al.(*18*) emphasized the similarity in arrhythmias, mortality, and shock in transmural and nontransmural infarction. CPK levels were about 50 percent lower in the latter group. All patients with fatal subendocardial infarction had sustained a previous infarction.

The first invasive hemodynamic comparison of transmural and subendocardial infarction was performed by Rigo et al.(*19*) They did not note a difference in heart rate, mean aortic pressure, cardiac index, or stroke work. The pulmonary artery wedge pressure in transmural infarction was slightly (16 mmHg), but statistically significantly, greater than subendocar-

Dr. Blair is on the staff of the Cardiology Division, Naval Hospital, Bethesda, MD 20814-5011.

TABLE 1
Mortality Rates in Transmural and Nontransmural Infarction

Study	Year	No. of Subjects	Mortality Rates (Percent) TMI	NTMI	Duration of Followup
Scheinman and Abbott(*17*)	1973	230	19	37	In hospital
Madias et al.(*18*)	1974	104	9.8	9.3	In hospital
Rigo et al.(*19*)	1975	160	22	13	In hospital
			18	19	20.2 months
Cannom et al.(*25*)	1976	188	16.8	7.5	In hospital
		155	30	47	40 months
Madigan et al.(*20*)	1976	50		2	4 weeks
				4	10.6 months
Szklo et al.(*26*)	1978	1,236	30.2	13.3	In hospital
			27.1	28.3	3 years
Geltman et al.(*30*)	1979	173	16	6	4 years
Fabricius-Bjerre(*27*)	1979	276	41	51	5 years
Mahony et al.(*31*)	1980	635	8	0	In hospital
			20	13	In hospital
			7	0	1 year
			16	22	1 year
Thanavaro et al.(*28*)	1980	745	11	3	In hospital - 1st MI
Hutter et al.(*29*)	1981	196	20	9	In hospital
			28	14	3 months
			40	40	48 months
Marmor et al.(*32*)	1981	200	15	12	In hospital
Coll et al.(*34*)	1983	458	6	0	In hospital - 1st MI
			10	06	4 years
Krone et al.(*33*)	1983	593	6.6	2.1	6 months - 1st MI
			20	17	36 years
Zema(*36*)	1985	114	15	4	In hospital - 1st MI
Connolly et al.(*37*)	1985	1,221	18	9	1 month - 1st MI
			21	16	60 months

Adapted from Moreno and Scholken.(*4*) Reproduced with permission of the publisher.

dial infarction (13 mmHg). There was no difference in ejection fraction or extent of akinesis on radionuclide angiography, or in mortality during hospitalization or at 20 months. The number of patients, if any, with previous infarction was not noted.

The results of coronary angiography in subendocardial infarction were initially reported by Madigan et al.(*20*) All patients had at least a 75 percent obstruction of one vessel: 32 percent had double-vessel disease and 28 percent had triple-vessel disease. At 10 months of followup only 24 percent were angina-free: 31 percent had stable angina and 40 percent had unstable angina. Of the patients treated medically, 21 percent sustained an infarction and 3 percent died. Schulze et al.(*21*) confirmed the similarity in coronary anatomy and left ventricular function in patients with transmural or subendocardial infarction. Madigan subsequently reported the effective relief of angina by coronary bypass surgery in patients with unstable

TABLE 2
Q-Wave Infarction Versus S-T Infarction: Similarities

Both either transmural or nontransmural
Number of decreased vessels
Degree of occlusion throughout coronary arteries
Ejection fraction
Hypotension
Ventricular arrhythmia
Late (> 2-year) mortality

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angina following subendocardial infarction.(*22*) Fuster et al.(*23*) also from the Mayo Clinic, found angiographic coronary collateral to be present in 78 percent of patients with angina and only 35 percent without angina in the transmural infarction group. In the nontransmural group, 93 percent had "abundant" collaterals and angina. They concluded the collaterals prevent necrosis, but leave a peri-infarction zone which may be potentially arrhythmogenic.

The instability of subendocardial infarction was further emphasized by Koussousky et al.(*24*) when they discovered 37 percent of patients with subendocardial infarction developed an extension to transmural infarction during hospitalization at a mean of 10 days after the initial infarction. No patient without extension died, while 15 percent with extension died from pump failure.

Cannom et al.(*25*) found patients with transmural infarction to do worse during hospitalization, but at 40 months of followup there was a 47 percent mortality in nontransmural infarction and only 30 percent mortality in transmural infarction. Szklo et al.(*26*) similarly found the in-hospital prognosis was worse for transmural infarction, but at 36 months there was no difference in mortality between the two groups.

Fabricius-Bjerre et al.(*27*) followed patients for 5 years after infarction: survival rates, not significantly different statistically, were 59 percent in transmural infarction, 51 percent in subendocardial infarction, and 41 percent in infarctions with prior and elevated enzymes, but nondiagnostic EKG changes. The prognosis was worse for patients older than 65 years, with preadmission cardiovascular disease or diabetes mellitus, cardiac complications during admission, and those who required medical treatment upon discharge.

Some of the confusion regarding the comparative prognoses was due to the exclusion of patients with new infarctions superimposed on older infarctions. Thanavaro et al.(*28*) evaluated 745 patients with an initial myocardial infarction and found nontransmural myocardial infarction had a significantly lower mortality than transmural infarction (3 percent vs. 11 percent). Nontransmural infarction also tended to be smaller, with only 40 percent having SGOT >120 IU compared to 69 percent of transmural infarction. Transmural infarction had more heart failure and shock, but the differences did not achieve a level of statistical significance. Supraventricular dysrhythmias and atrioventricular conduction blocks were more common on transmural infarction, but when subgroups with comparable SGOT levels were compared, the differences diminished.

Hutter et al.(*29*) also noted a lower hospital mortality for subendocardial infarction than transmural infarction. However, by 40 months, mortality in all categories was 40 percent and was later greatest in the subendocardial infarction group. There was no difference in the incidence of angina, which exceeded 50 percent in all groups. By 54 months 57 percent of patients with subendocardial infarction had sustained a recurrent infarction—significantly greater than the 12 percent in patients with previous anterior myocardial infarction and 22 percent in those with inferior infarction. Sixty-nine percent of patients with subendocardial infarction had a recurrent infarction in the same distribution as the initial infarction. The authors felt a more aggressive approach might be warranted in the management of the patient with nontransmural infarction because it was an unstable ischemic event with a great risk of later infarction associated with a high mortality rate.

Geltman et al.(*30*) did not find a difference in survival between subendocardial infarctions and transmural infarction at 4 years. Mahony et al.(*31*) emphasized the importance of the initial EKG: 96 percent of patients with an initially normal EKG had an uncomplicated course, as opposed to 46 percent in those who initially had an abnormal EKG.

Marmor et al.(*32*) examined factors presaging early recurrence of infarction. In patients with subendocardial infarction, 43 percent of patients had a recurrence with a mortality rate of 16 percent as opposed to be only 7 percent in patients without an extension.

A large series by Krone et al.(*33*) found mortality at 6 months to be 6.6 percent after a first transmural infarction and 2.1 percent in nontransmural infarction, but by 3 years it was 20 percent and 17 percent respectively. Only 1.8 percent of patients with transmural infarction experienced a second infarction within 60 days of the initial infarction, significantly less than the 7.4 percent in subendocardial infarction. The authors believed the first year prognosis was related to the

amount of myocardial damage, but by the third year the type of infarction (Q wave vs. non-Q wave) and age older than 60 years, were the best independent predictors of cardiac mortality.

Cardiac catheterization after a first infarction was performed by Coll et al.(*34*) In contrast to Hutter,(*29*) they found no difference in mortality from transmural or subendocardial infarctions during hospitalization or at 48 months. Transmural infarctions had significantly greater left ventricular end diastolic pressure (14 mmHg) and lower ejection fraction (46 percent) than did nontransmural infarction (10 mmHg and 64 percent). The better ejection fraction in the latter group may have been due to the exclusion of patients with a prior infarction. Multivessel disease was present in 59 percent of transmural infarction and only 33 percent of nontransmural infarction. Twenty-nine percent of the latter group had normal coronaries. Patients with equivalent ejection fractions had similar survivals, regardless of the EKG type of infarction. They concluded a more aggressive approach to nontransmural infarction, in the absence of symptoms, did not seem warranted.

Nicholson et al.(*35*) obtained similar invasive data after a first nontransmural infarction: mean ejection fraction was 60 percent, 57 percent had single-vessel disease, 22 percent had two-vessel disease, and 3.5 percent each had three-vessel disease and left main disease, and 15 percent were normal. Angina was present at 25 months of followup in 62 percent of patients, and was treated successfully with medicine in all but 13 percent of patients who required coronary bypass. Only four patients had recurrent infarction and one died; it was not thought they would be retrospectively identified by knowledge of their coronary artery disease or LV function. Since angina could be managed medically in most cases with a good outcome, they did not feel routine coronary angiography was indicated in asymptomatic patients less than 60 years old after a first non-Q wave infarction.

Zema et al.(*36*) found a first infarction to have a better prognosis if it was non-Q wave (4 percent mortality) instead of Q wave (15 percent). No patient with infarction and changes limited to T wave died. Multivessel coronary disease was present in about 65 percent of both groups, but a positive exercise stress test was present in 32 percent of transmural infarction and 60 percent on non-Q wave infarction. Complex ventricular ectopy occurred with the same frequency in both groups. Fixed thallium perfusion scintigraphic defects were more common in Q wave (90 percent) than non-Q wave infarction (64 percent).

In a recent, very large series from the Mayo Clinic, Connolly et al.(*37*) found subendocardial infarction to have a 30-day mortality of 9 percent and to be 18 percent in transmural infarction. There was no significant difference by 60 months (16 percent vs. 21 percent). Angina was slightly, but significantly, more frequent at 3 months in subendocardial infarction than transmural infarction (23 percent vs. 17 percent), but was the same by 1 and 5 years. There was a 4 percent reinfarction rate in both groups at 60 days. Overall, there was no late difference in death incidence, coronary artery bypass grafting, heart failure, or angina.

Conclusion

- The EKG does not allow perfect discrimination of different forms of infarction. However, it appears patients who have an initial infarction without EKG changes, or with changes limited to the T wave, have a good in-hospital prognosis. Patients with Q-wave infarction have the worst prognosis, while those with changes limited to the ST-T segment have an intermediate prognosis.

TABLE 3
Q-Wave Infarction Versus S-T Infarction: Differences

	Q-Wave Infarct	S-T Infarct*
Fresh thrombosis	More	Less
Collateral vessels	Fewer	More
Damage		
↑ Enzyme levels	Higher	Lower
↓ Tracer concentration (PET**)	Homogeneous	Unequal
LV wall abnormality †	More	Less
Improved by bypass	Less or none	More
Tendency to expand	More	Less
Prodromal symptoms	Less	More
Vomiting	More	Less
Atrioventricular and intraventricular blocks	More	Fewer
Congestive failure	More	Less
Early mortality	More	Less
Recurrent infarction	Less	More

* Without QRS abnormality
** PET = Position emission tomography
† Some studies differ
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- Since mortality is directly related to the total amount of necrotic myocardium, ST-T infarctions and Q-wave infarctions superimposed on previous myocardial damage have similar prognoses.
- Since the coronary pathology tends to be the same in different groups regardless of the EKG manifestations of infarction, it is not surprising the incidence of late complications (angina, recurrent infarction, mortality) tends to be the same.
- There does not appear to be sufficient evidence to warrant an unusually aggressive approach to patients with ST-T infarctions. They should be managed in the same manner as Q wave infarctions since their long-term course is the same.
- Subendocardial infarction is an anatomic entity and its use should be restricted to those with tissue available to establish that diagnosis.

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Assistant Secretary of Defense Mayer Speaks on the State of Military Medicine

Diane M. LaMacchia

Assistant Secretary of Defense William Mayer's extensive and varied medical career includes an early connection with Navy medicine. He is a former lieutenant in the Navy Medical Corps who served his internship at the Naval Hospital, Philadelphia and was chief of psychiatry at the Naval Hosptial, Yokosuka, Japan, from 1946 to 1952. Having also served during the Korean War as chief of neuropsychiatry aboard USS Repose, *Dr. Mayer retains a special interest in hospital ships.*

Originally from Illinois, Dr. Mayer was director of the California State Department of Health when Ronald Reagan was Governor of California. Later, President Reagan brought Dr. Mayer to Washington to head the Alcohol, Drug Abuse and Mental Health Administration. He became Assistant Secretary of Defense for Health Affairs in November 1983.

USNM: You were quoted in the press in September as saying the United States is not ready for war because we could not take care of our wounded. Since that time have any steps been taken to improve medical readiness?

Assistant Secretary Mayer: Yes, actually a great many. And I should qualify the statement that we're not ready for war by saying that as we plan for possible conflict, we plan for a worst case scenario. It's not that we're totally unprepared to take care of casualties, but based on the possibility of a general war, we haven't yet achieved the amount of deployable medical equipment and the numbers of the specific kinds of specialists that we need.

What we've done to improve our readiness status involves several different initiatives. The first was an acceleration of the procurement of deployable hospitals and other kinds of medical units. The procurement process is both expensive and very time-consuming. It takes usually more than 2 years from the time we order a set of medical equipment for a field hospital, for example, until the time we get it. Budgeting for those needed supplies in the past has tended to slip from year to year because higher priority weapons systems or modifications and modernization of our war-fighting capability were needed, and something had to give.

Until last year, the planned procurement of overseas medical gear had not fared well in the budget process. That has changed dramatically and we're beginning to see the results of it. We have had great support, both from the upper military levels in the Pentagon and from Congress, to improve our medical readiness capability in equipment. So we've added a few thousand pre-positioned beds in Europe and several hundred in the Far East. We have inventoried all our gear on hand. The planning staffs for the utilization of this equipment, in both Pacific and European theaters, have been beefed up by members of all the services, and we're beginning to feel that within the next few years we'll have the materiel in place to feel much better prepared in the awful case that a war should break out.

Have you been able to address the question of personnel?

Part of the personnel problem is that the services have had different methods for determining what their personnel requirements are in medicine. Partly this is understandable, because it is different to provide medical support for a crew of a nuclear submarine than it is for a group of marines hitting a beach some place and, in turn, quite different from the medical support needed for an air squadron in the Air Force or for a highly mobile, maneuvering Army ground force. Those are very service-

Diane M. LaMacchia is deputy public affairs officer at the Naval Medical Command (MEDCOM-00D4-1), Washington, DC 20372-5120.

specific kinds of requirements and they do generate a different set of numbers and types of people necessary to do the medical part.

But most of the medical establishment is not in combat units. Most of the medical establishment is incorporated in the 168 hospitals and 400 clinics. And, so, one of the major steps that's been taken to improve our readiness situation is to establish a method that is uniform across the services for determining medical personnel requirements.

What other improvements have been undertaken?

We have also made arrangements with friendly nations to accept our patients in an emergency at the outbreak of a war and to use the host nation's medical facilities to augment or to fill in until we can move overseas the additional help we need. In addition to prepositioning new beds we have extended our host nation's support agreement. Now it's risky to rely too much on a host nation, because if they're in a war too, those beds are likely not to be available to use, but they are a help.

Another thing that we have done, both in the Pacific and the European commands, is to establish flying teams composed of surgeons and the support staff and materiel necessary for them to operate on 50 to 100 seriously wounded cases. There are about a dozen of these teams spread around Europe, people who are on staff seeing patients every day in hospitals. They can be dispatched within 3 hours and they can go anywhere.

Is this an interservice group?

Each service has some of those teams.

The Navy has what we call MMART's (Mobile Medical Augmentation Readiness Teams). Is this the same thing?

Photos by HM3 Thomas Kelley

Our ability to give good health care to the young person who's serving in the Sinai and to his dependents, has a great deal to do with whether that soldier or sailor is able to do his job in a relatively effective way.

The same kind of thing. It's been much expanded now, so the Air Force has flying surgical teams, the Army has special triage teams. If there is a major need—and the recent hijacking incidents involving the Egyptian airliner and the *Achille Lauro* had the potential for generating a very substantial number of casualties—a special Crisis Action Team is activated at the European command headquarters. It has access to all the medical teams, regardless of what service they come from. That central team, which is tri-service, can determine what teams are needed and how best to get them there quickly. We can even set up a 100-bed field hospital within 24 hours practically any place in the European theater. The Air Force has four 24-bed surgical hospitals that are air-transportable and can be mobilized in a matter of hours. There are similar teams in the Far East and even in Central America, at our southern command. Those teams give us the capability of intervening medically and surgically in the first 8 to 10 hours after the incident, which is the time that is critical to survival.

How would you summarize the major steps taken thus far?

We have established teams, accelerated procurement of materiel, made arrangements with host nations, and gotten a more consistent assessment of what our personnel requirements are.

In addition there are a lot of other smaller things, like an increased emphasis on medical play in all field exercises. We flew whole medical units, for example, from Wilford Hall, an Air Force hospital in Texas, directly to England. They took over a hospital, which is in turn-key status so you can light it up and have it working in a matter of hours. A large number of the staff flew from Wilford Hall directly to England. They fell into this hospital and turned it on. We did similar things in Germany with Army Reserve units. That's a real change; medical play of that sort has not taken place in major exercises to the extent it is now.

The Navy will soon be commissioning the two hospital ships, *Mercy* and *Comfort*. What do you see as the peacetime role of these ships?

I realize that Gramm-Rudman and other budgetary considerations may get in the way, but I would like to see these ships actually used to enable our service medical people, mainly from Reserve units (from all three services, not just the Navy), to interact with both military and civilian medical staffs in those allied and friendly nations in their probable area of deployment, and to do this as sort of a major worldwide continuing education process. These ships would not be at sea continually. When they're near a first world country like Scotland, we could conduct jointly with the University of Edinburgh and some civilian

universities in this country really massive graduate education programs on disaster medicine, one of the world's great needs today.

We might also carry on board some of our deployable medical gear—a field hospital—off-load it, set it up, exercise it, let the medics, using standardized deployable gear, actually work with the equipment. This would be far better than any exercise we have ever conducted before.

We could also tie up for a few weeks in a Third World country to conduct what Project Hope did on a much smaller scale. This would enable us to do massive immunization and public health programs for nations of the Third World.

We would be able to show the American flag in a way the Navy's never been able to do before. It's one thing to have the battleship *Missouri* sitting out there, but it's quite another thing—and I think more in keeping with the American ethic—to have a great big, white, monster of a ship with red crosses and a great big American flag there to establish closer relationships with the medical people in those countries.

I've talked to many people in those countries, and they're enormously enthusiastic. We can learn from them; we can expose our reservists to parts of the world that they will otherwise never see unless they go to war there. We can create a reservoir of good will that we have no other way of doing.

How would this undertaking be financed?

I think it should be financed in several ways. There are a number of private volunteer organizations who today are delivering health care and delivering relief supplies (for example during the Ethiopian famine). There are foundations and other sources of funds outside of government for this kind of humanitarian medical activity. The goal of the World Health Organization is encompassed in the motto, Health for All by the Year 2000. They don't mean having a Mayo clinic in every place in Africa, but they do mean at least extending basic health services—not just direct health care—but sanitation, water supply purification, the kinds of things that are the underpinnings of health.

As I said initially, we've got budget problems. It can't be supported totally by the United States nor should it be by the government or by the Navy. Using it as a joint training platform, we can tap Army, Navy, Air Force, Reserve training funds because this would be very, very good training. We could seek support from private voluntary organizations. If I can interest Congress and the White House in this project, I think it really is an opportunity for international cooperation that has no duplicate.

You recently wrote an article, published in *The Atlanta Constitution,* in which you said the military health care system is attempting to fulfill two vastly different important missions and doing neither as well as it should.

With the new hospital ships, we could show the American flag in a way the Navy's never been able to do before.

Do you see this problem—of the overburdened health care system—being resolved by a change in the concept of the peacetime mission, which now includes the care of dependents and retirees, to the care of active duty personnel only?

Absolutely not. The concept won't change for two reasons. The first is that we have a legal responsibility to those people. That's really not the first in importance but that is a fact. It is the statutorily required mission of the military health care system to care for the people that I mentioned, the dependents and the retirees and their dependents.

The most important reason we will continue to provide at least as much health care to the non-uniformed people as we provide today is because this has emerged as such an important part of the expectations of our fighting forces—their honest belief that it is an entitlement. Our ability to give good health care to the young person who's serving in the Sinai and to his dependents has a great deal to do with whether that soldier or sailor is able to do his job in a reasonably effective way. Our leadership in the Armed Forces has become much more concerned with families and with their well-being in recent years than they ever were before. There's great emphasis on the family programs, and health care is a terribly important part of it. So we don't anticipate any change, except for the better, in the amount or the kinds of care we give to those people who are entitled to it.

At a Senate armed services subcommittee meeting you attended, a representative of the National Military Family Association testified that CHAMPUS (Civilian Health and Medical Program of the Uniformed Services) should be dismantled. Then you were quoted in *The New York Times* as saying that CHAMPUS

costs both beneficiaries and taxpayers more than it should. What would be the effect of dismantling CHAMPUS?

Well, let's define what we mean by dismantling CHAMPUS. It doesn't mean in any way reducing or eliminating a program to provide medical care to our beneficiaries. I don't like even to use the phrase abandoning CHAMPUS or dismantling it, because that suggests that we're going to stop giving care. But the way CHAMPUS does business clearly needs to be revised.

CHAMPUS was designed 19 years ago in a totally different American health care environment. It was first thought of as a kind of safety valve so that whatever patients couldn't be cared for in military hospitals would have a fall-back position. They could go to civilian physicians, and we would pay them. We pay them, under the law, on the basis of the usual and customary fees that are charged in a community, and we pay at the 80th percentile for those fees. We pay total bill charges when one of our beneficiaries is treated in a civilian hospital.

In both of those relationships, CHAMPUS, which is in a branch of my office, has no authority to impose on the provider of care any standard except that he or she be licensed and be willing to accept our patients.

And not all physicians will accept CHAMPUS patients?

Only 36 percent of physicians today will even accept CHAMPUS patients unless the patient pays and then it's up to the patient to deal with CHAMPUS, submit claims, sometimes discovering that the service they got was not authorized in the law under CHAMPUS, and being stuck for the bill. And even if they do successfully ask CHAMPUS for reimbursement—which in most cases they do—they only get, in the case of a dependent, 80 percent of what we say, under the rules is a reasonable charge, and if they're retired, only 75 percent.

Now when a military dependent of active duty goes into a civilian hospital, they only pay what they would pay in a military hospital, which is about $7 a day. But when a retired person goes into a nonmilitary hospital, that retired person has to pay 25 percent of the total bill charged. Many people aren't aware of this, but 1 week in an American hospital today can cost as much as 1 full year in college. Incredible! This can impose an economic burden, particularly on our lower ranking people, that is intolerable.

What is the alternative?

Fortunately, at this point, we face a health care market place in which competition has grown, in which there is a surplus of services available, and in which physicians more and more are grouping together in group practices or something called preferred provider organizations, or working for the large health care delivery chains like Kaiser, Hospital Corporation of America, American Medical International, or Humana.

What we would like to do is explore with the medical industry a contractual arrangement or a set of them, perhaps regionally or nationwide, whereby they would agree to meet all our standards for quality assurance, for utilization control, and for the array of services the dependent or retired person would get, and on a fixed price basis, not a cost plus basis. Cost plus should have gone out by the end of World War II; they can crank all kinds of apparently legitimate pluses into the cost. But on a fixed price contract, with the contractor at risk (with built-in safeguards so that he doesn't go broke in the process), with our ability to inspect and review what they do and complete authority to go into their facilities and make sure they're doing what they say they're going to be doing, and imposing the quality assurance standards that we insist upon, I believe that it will be possible to obtain the same, or better care, than we've been able to give now, at less cost to the government and to the individual patient.

We have established flying teams composed of surgeons and the support staff and materiel necessary to operate on 50 to 100 seriously wounded cases.

Will this mean that dependents and retirees will be going to civilian hospitals?

About 25 percent of dependents and retirees get their health care in the civilian market right now. Even if we are able to strike an arrangement with a provider or set of providers to give care, I don't see any great increase in the numbers of patients that are taken care of outside versus the ones that are taken care of in our hospitals. Over time there may be somewhat more use of civilian facilities because they may be more convenient and more readily available to the patients.

So we don't have a plan to take business out of the military hospitals. But I should say this: To have a ready medical force, we need to have available a certain minimum number of skilled

surgeons, orthopedists, anesthesiologists, operating room nurses, people who see enough clinical material consistently to maintain their skills at a very high level. And this becomes especially true in some of the more esoteric specialties like brain surgery, heart surgery, things of that sort.

We've done some preliminary studies and find there are still fairly substantial numbers of surgical patients being treated in outside hospitals instead of military hospitals and there are huge numbers of very routine, general medical patients—colds, flu, sprains, minor injuries—that crowd our military treatment facilities.

Is the idea to treat the inpatients in military hospitals and the clinic patients in civilian facilities?

Well, it's not really inpatients vs. outpatients so much as it is changing the mix of patients, again, very gradually so as to increase the work of our uniformed physicians in those specialties where it's of most use ultimately in going to war, and letting more of the routine kinds of often less serious things be taken care of in the civilian community.

So the distinction is less between treating dependents and retirees vs. active duty and more between what has to be done for the patient—the surgical procedure vs. the everyday cold treatment.

Right. We want to do as much as possible of those things that keep our medical forces finely tuned to go to war.

What kind of time frame are you talking about for this change from the way CHAMPUS operates now to your new conception?

I would hope that by next fall we can request proposals and see, once and for all, whether this is a feasible and, in fact, beneficial way to try to deliver our care. Because we're going to go on assuring all 10 million of the people entitled to care that they're going to get it, and that we're going to be responsible for its quality and its accessibility.

Under the current system, many of our hospitals, which were not designed to do very much outpatient work, are literally flooded with patients. We see over 50 million outpatients a year. The practical result of that is that if you go even to some of our finest hospitals and some of our newest ones, you find the waiting rooms are full, the waits are long, the clerks, who are the lowest ranking people or the lowest paid civilian employees, often feel put upon, and that transmits to patients. And appointments are sometimes hard to get, in spite of the fact that we're automating patient appointment scheduling. While that's true to a certain extent in medicine generally around the country, it seems to be more true in the military hospital, probably because it wasn't designed to do that kind of work, and partly because if you are a lower ranking member, you really can't afford even the 20 percent of the outpatient bill that you might have to pay if you go downtown, particularly when an outpatient visit can cost $150. If you are an E-3 or an E-4, 20 percent of $100 is a serious consideration. So a very important thing we want to try with this is to reduce the amount the patient herself or himself has to pay.

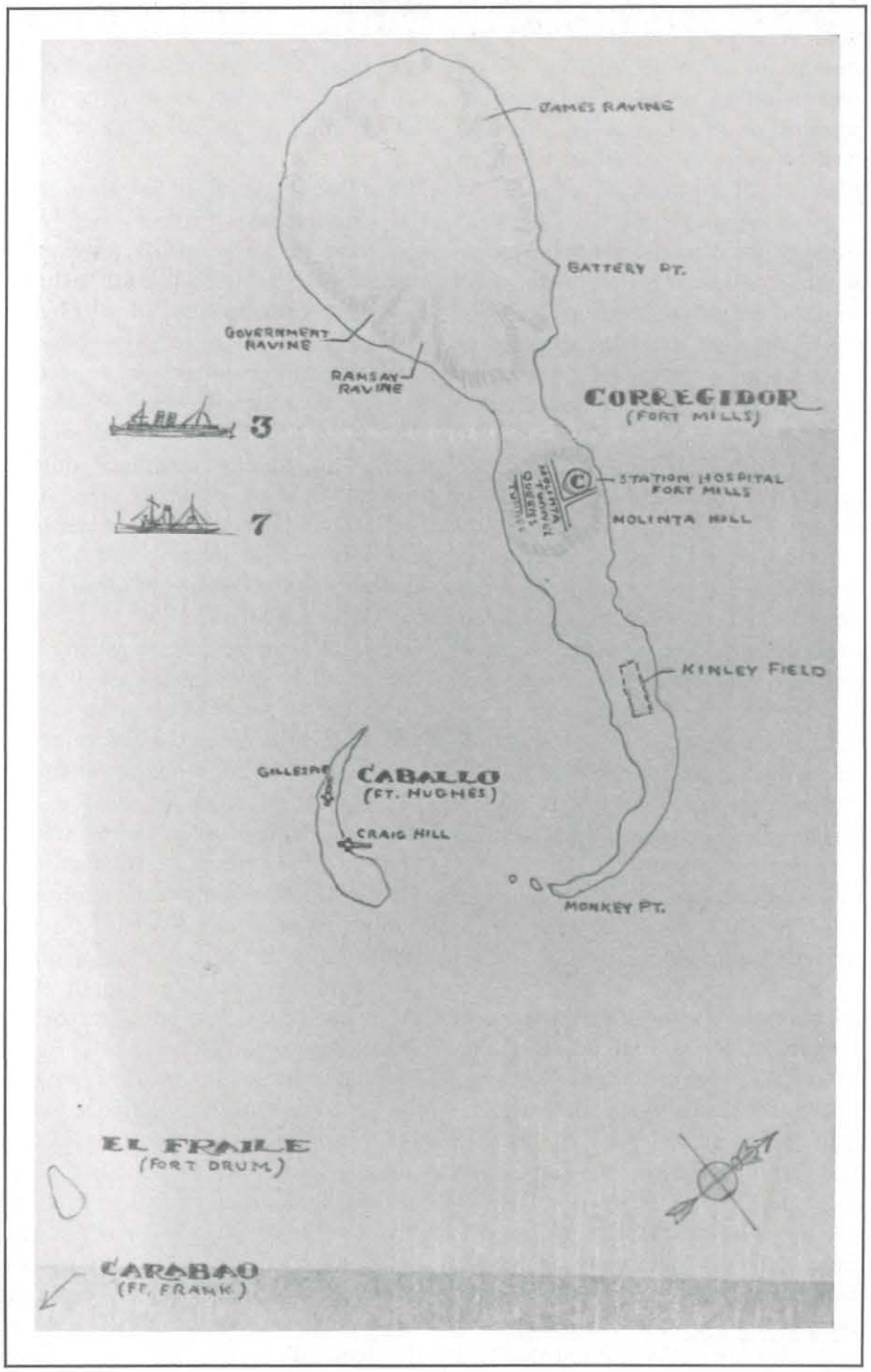
And eliminate some of the paperwork?

Hopefully, 90 percent of the paperwork. We've developed a very good system for identifying people who are eligible for care; it's called DEERS (Defense Enrollment Eligibility Records System). Under the DEERS program in its first year we saved in excess of $30 million by identifying automatically, through our computer system, those people that were getting care who are really not entitled to it and were therefore using money and staff time that our own beneficiaries were entitled to. I think we can make an arrangement that is less costly to the patient, and, because it's a fixed price contract, less costly to the government, and that makes health care much more acceptable and easily available. But we're not going to be shoving our patients out into the civilian community just helter skelter.

When Deputy Assistant Secretary Jarrett Clinton came to speak before a gathering of Navy quality assurance personnel at Bethesda last fall, people expressed concern about how physicians, nurses, and other Navy Medical Department personnel were expected to carry their already heavy workload and spend additional time and energy consuming quality assurance duties involved in the peer review mandated by DOD initiatives. Will there be additional resources, money, and billets, available to the services to implement the DOD initiatives?

Some. We already were given 324 additional civilian personnel, which, given that we have 168 hospitals, is not a lot of people. We were given authorization for that additional number of people just to work on quality assurance. Perhaps even more importantly, we have recognized that quality assurance in medicine requires often a minute examination of what is sometimes a very elaborate, long medical chart and the recording of innumerable bits of data. We have started to install, and already have in place in 76 hospitals around the world and, within the next few months, we'll have in all 168 hospitals, an automated system called AQCESS (Automated Quality of Care Evaluation Support System). It will be the most advanced computer application in medical quality assurance that has ever been undertaken anywhere in the world and will reduce the demand on professional staff time for quality assurance activity. □

Yangtze Patrollers—Bilibid POW's



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Sketch of Manila Bay defenses.

The November-December 1985 U.S. Navy Medicine *ran part I of an article based on the career of LT George T. Ferguson, MC. With the fall of Corregidor on 6 May 1942, Ferguson became a prisoner of war and he and his comrades had to face the humiliation of confronting their captors. Japanese soldiers, stung by the gallant resistance they had confronted, looted the Americans' personal effects and showed other signs that captivity would not be a pleasant experience.*

Captivity

For several days after the surrender, the Japanese surveyed their new prize. George Ferguson reported to the U.S. Army commander at the Malinta Tunnel hospital, where he teamed up with LT Fred Berley, MC. They made a little camp for themselves outside the tunnel complete with fireplace. Unfortunately, the food had run out. Three other Navy doctors joined the group—Carey Smith, John Bookman, and Murray Glusman. Bookman and Glusman had found some stored food and, despite the sign the Japanese had installed nearby warning that looters would be shot, they took the chance and cut the others in on the loot. One morning, about 3 a.m., Ferguson and Glusman stole a 50-pound tin of flour from under a Japanese sentry's nose. "From then on we were together—having lots of fun stealing from the Japs. It was a share and share alike group with a definite one for all—all for one attitude," recalled Bookman. (*1*)

Many prisoners were moved to the 92d Garage Area, a paved, flat, 10-acre field that once served as a motor pool

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A pre-war postcard view of Bilibid.

for the 92d Coast Artillery. In all, nearly 12,000 men occupied the site with little food and water. During the day they baked from the sun and suffered the intense heat that radiated off the concrete. Swarms of biting blue flies added to their torment.

Ferguson and the medical staff remained inside the Malinta Tunnel for several more weeks before being moved out. By that time, he found his old friend and classmate, LT A.L. Smith (see page 17). Dr. Smith had been captured at Fort Hughes (Caballo Island) which guarded Corregidor's southeastern flank. On 10 June 1942 the two toasted their fourth year in the Orient. "Smitty celebrated the occasion by 2 good stiff jolts of scotch in Ward #6 (me too)."(*2*)

Bilibid

On 3 July they and their patients left for Manila and an uncertain future. As the trucks wound through the city streets they "still saw some V for victory fingers" among the Filipinos.(*3*) Their destination was Bilibid, the infamous Spanish-built criminal prison near the old walled city of Intramu-

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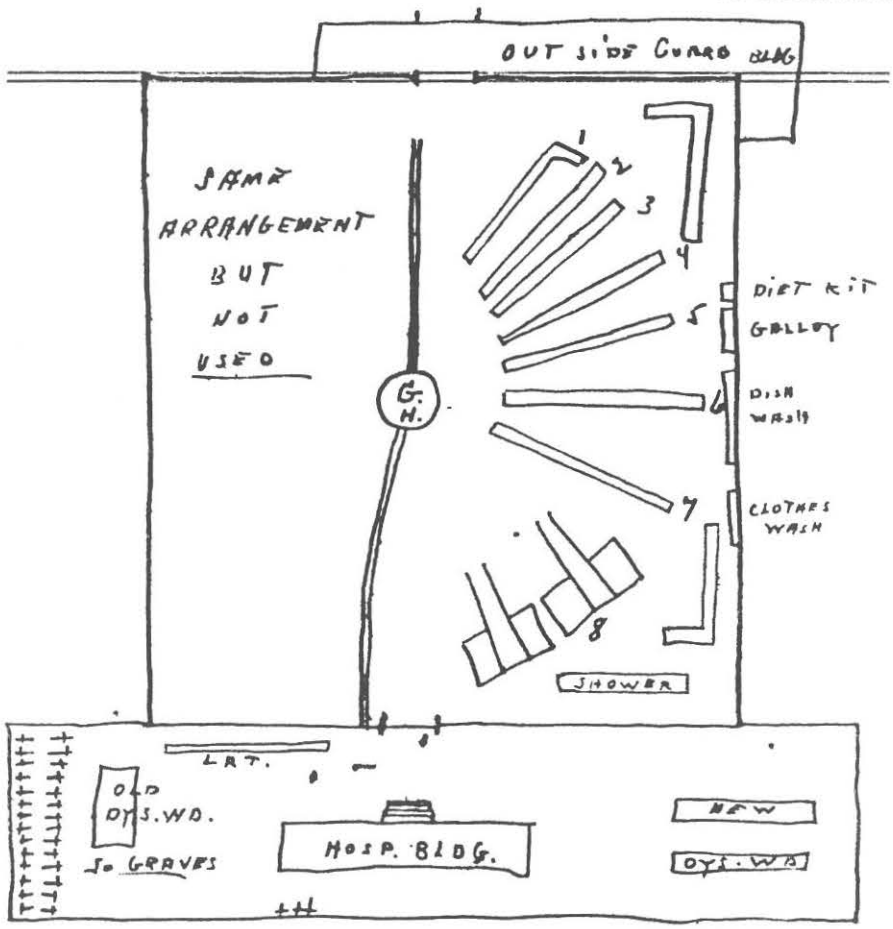


Ferguson sketched the prison's layout in his diary.

ros. The prison, built in 1865, had massive 20-foot-high walls covering a city block. A tall guard tower rose from the prison yard, and cement cell blocks radiated outward like spokes of a giant wheel. CDR Thomas H. Hayes, MC, former chief of surgery at the Naval Hospital, Canacao, described it:

> Inside the high whitewashed stone walls, there is a lower and upper compound divided by a high wall. In the upper compound is a new central building which has never been completed and intended for a hospital. The top floor and roof is still incompleted and there are no windows, and the entire interior remains rough and unfinished. Thru a barred gate from the upper compound one enters into a prison yard with two cell blocks. These cell blocks are made like cages in a row for housing larger animals in a zoo, each cell holding about 15 men, and each block having about six such cells on a side.(*4*)

The new arrivals found a primary hospital already functioning, staffed by the medical personnel from Canacao and headed by CDR L.B. Sartin, MC. But overall, Bilibid was a jarring sight filled with "a dirty filthy mess of humanity."(*5*) Disease and malnutrition already were evident.

The new inmates' first meal was rice and green soup with a few pieces of carabao meat floating in it. And the meals got much worse as time went on. Patients and doctors subsisted mainly on musty rice swept from warehouse floors, occasionally vegetable soup, boiled camote tops, and rarely anything with protein. Men slept on the damp concrete floors until they were able to build wooden bunks and salvage some old, dirty mattresses.

Ferguson was assigned to surgery on an orthopedic ward but his patients, mostly the injured from Bataan and Corregidor, were so malnourished, healing would not occur. As dysentery ravaged the hospital, the doctor watched his patients slip away. "'Voice of Freedom' died this p.m. of severe dysentery. He was a living skeleton and nothing to do about him but feed him charcoal . . . . Lord! What a sight some of these poor fellows are."(*6*) The cemetery behind the prison began filling rapidly as more living skeletons arrived. Bilibid had become a clearing house for work details moving north to other camps.

Ferguson and his messmates grew beansprouts for vitamin B and bought other items from Filipinos with what money they had left: "sugar-12¢ canteen cup. Mongo beans-25¢ canteen cup; salt $1.00 small bag; peanuts (200gms)-33¢; canned meat, sardines 30¢-35¢; eggs (duck) 10¢; milk $1.00 per can."(*7*) By August they tried a new dish. "Finally we have come to it. Fish heads + rice. The long heard of food finally has become a reality and is not so bad as it sounds. Merely a tantalizing dish however for there is very little meat in a fish head."(*8*)

Golden Gate in '48

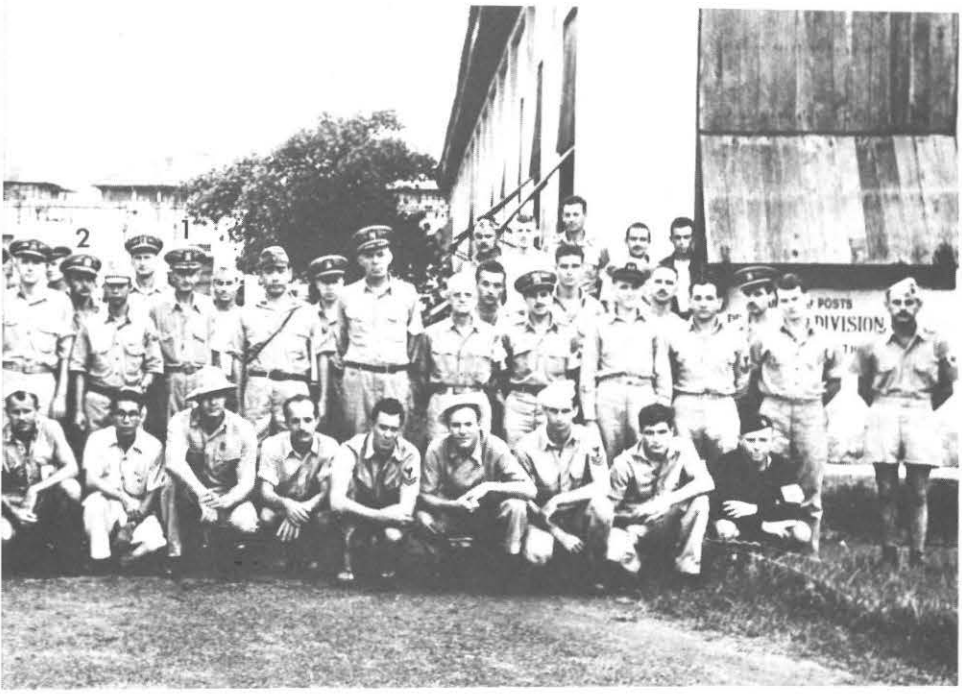
The highly contagious dengue fever hit the camp in late July and early August with Dr. A.L. Smith one of its victims. The symptoms were mental depression, loss of desire for food, severe backache, and headache. The fever and length of the disease varied from 3 to 10 days. Other vitamin deficiency diseases abounded. Two of the worst were the two varieties of beriberi. With "wet" beriberi, the victim's feet swelled until the edema became generalized throughout the body. The "dry" variety inflicted severe stabbing pain in the lower extremities.

Ferguson was spared from disease and continued to operate when he could. Frequent shortages of plaster for casts suspended all work and when the rains came what plaster there was refused to harden. Life for him and the others became a constant preoccupation with food and the feeling that their country had abandoned them. There were rumors of prisoner exchanges, that the Japanese had shelled the coasts of Washington and Oregon, that Allied landings in France had been turned back, and that the war might last 6 more years. "The Golden Gate in '48" was not totally unthinkable, at least for those who thought they could survive that long.

Dr. Ferguson ended his diary on his birthday, 1 Jan 1943. His last entry acknowledged the arrival of some rare Red Cross packages. "A great help but *we need food.*"(*9*)

Nine months later he and his three messmates, Bookman, Berley, and Glusman, were transferred to the Cabanatuan prison camp north of Manila. Life was different there. The four shared a room and were detailed as woodcutters and carpenters. The physical labor and better food kept them in good shape. An occasional civet cat, caught in the nearby forest, augmented their protein supply.

In February 1944 the Japanese announced that a medical detail was being sent to Japan. Berley, Glusman, and Bookman were chosen, but Ferguson, who admitted to having once had amoebic dysentery, was to stay behind. The comrades had shared their food, money, clothing, and even their mail. They had become more like brothers than friends. The night before parting they continued a year-long bridge game in which low man promised to treat them all to a banquet in San Francisco. They played late into the evening, finally moving the table outside and quitting when it got too dark to see. Glusman was left low man but "swore that the game was not finished. We'd continue it in Japan—or aboard the transport coming home."(*10*)



NAVMEDCOM Archives

Left: *Propaganda photo of American POW's at Bilibid, August 1942. CDR Sartin (1) was the prison hospital's first commanding officer and CDR Hayes (2) succeeded him. Many of the men in this picture, including Dr. Hayes, died on the prison ships.* Below: *LTJG Ferguson posed for his passport photo before leaving for the Asiatic Station in 1939.*

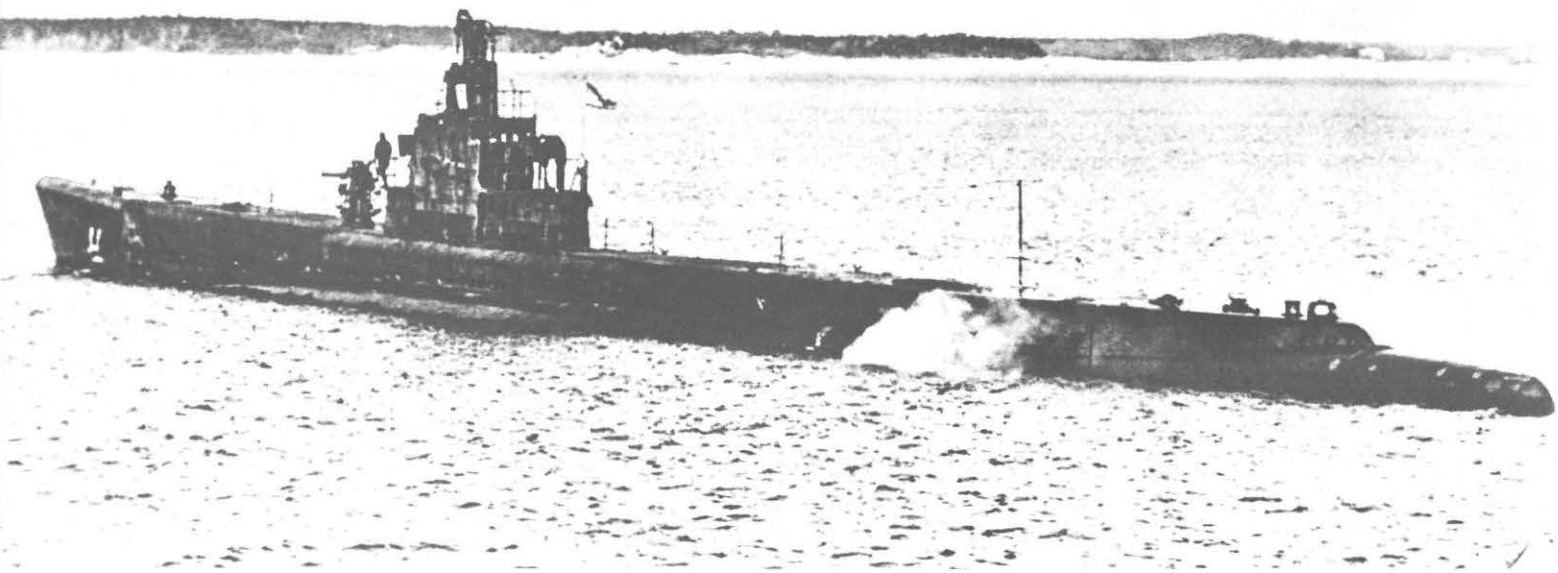
Courtesy Lucille Ferguson

In the morning the draft formed up. Ferguson insisted on helping Fred Berley take his meager belongings to the gate.

Eight months later a new draft was selected to go to Japan. This time even a history of amoebic dysentery made little difference. The prisoners, Ferguson among them, returned to Bilibid, where the doctor saw many of his old buddies. It was a short-lived reunion.

The Death Ships

MacArthur was returning to the Philippines as he had promised. Nimitz's aircraft carriers would lead the way. On 22 Sept 1944 over 200 Navy fighter-bombers from those flattops hit Manila, damaging or destroying over 40 enemy ships in Manila Bay. CDR Hayes, now the commander of the Bilibid prison hospital, thrilled to the sight of his long absent country-



A torpedo from USS Snook *(SS-279) most probably sank the* Arisan Maru.

men. "Through cracked shutters we could seen the planes peel off and let go stick after stick. Anti air fire, bombs falling and exploding shells in the compound kicked up quite a fuss. The Port area was catching hell . . . . The Yanks have come . . . ."(*11*)

The Yanks' return meant a new Japanese POW policy. Camps were to be thinned out by sending prisoners north to Japan. There were two main reasons. The POW's would augment the labor-hungry home islands, and their evacuation would preclude the possibility of large numbers being liberated if the Philippines were retaken.

Even as American air and submarine activity increased, the Japanese gathered drafts of men and shipped them north on unmarked transports. They selected only the healthiest; those too ill to be of any use would remain behind.

October 11, 1944 dawned rainy. With no sign of American planes, the Japanese marched a large draft down to the pier area, where the POW's boarded a freighter for Japan. LT Ferguson was among the men who crowded into the confining hold of the 7,000-ton *Arisan Maru*. The ship steamed south after dark to join an assembling convoy. The following day, after joining 13 other vessels, the freighter continued south. American air raids had increased to such a pitch that ships broke from the convoy and sought shelter for 6 days among the coastal islands. The *Arisan Maru* prisoners in the airless, broiling hold subsisted on two meals of rice and one canteen of water per day.(*12*) U.S. planes continued to pound Manila and its environs for several more days before a lull enabled the *Arisan Maru* to return to Manila.

On 21 Oct the freighter rejoined the convoy and sailed north escorted by two destroyers. The interim destination was Takao, Formosa. Aboard were an undetermined number of Japanese soldiers and civilians and over 1,800 POW's, the latter crammed into a space measuring 90 by 50 feet.

It was a particularly heartbreaking voyage for George Ferguson and 11 other medical officers and 25 corpsmen. Without supplies or medicine they could only watch helplessly as the pitifully broken down prisoners gradually lost the will to live. A third of them suffered from malaria and dysentery. Many ranted deliriously in the stifling, fetid hold. A few prayed for death to release them from their suffering.

Two days later U.S. Navy submarines spotted the long convoy. The position was about 225 miles due east of Hong Kong. On 24 Oct USS *Shark* and USS *Snook* silently moved in for the kill. They could not know of the *Arisan Maru*'s precious cargo.

About 4:45 p.m. three torpedoes sped forward. Two bracketed the freighter fore and aft missing their mark. The third hit squarely amidships. Of the prisoners there were but five survivors.

Epilogue

There were other prison ships and other POW's died on the way to Japan. Hundreds succumbed to disease, starvation, and asphyxiation in the packed holds. Many like George Ferguson and his comrades were ironic and accidental victims of American bombs and torpedoes.

The U.S. Army entered Manila in February 1945 and liberated the survivors of Bilibid. Hidden from the Japanese in the prison yard were documents of their captivity sealed in canisters buried in five separate caches. George Ferguson's green-covered diary was one of the items recovered. There were few other mementos. The men who lived through Cavite, Bataan, and Corregidor and witnessed the young doctor's skill and heroism under fire never forgot him. They shared his captivity at Bilibid and Cabanatuan and his humanity and love of life moved them. Drs. Smith, Berley, Glusman, and Bookman recalled that nothing George Ferguson experienced during the darkest days came close to breaking his spirit. And his loss over 41 years ago is still painfully fresh in their minds.

A year after the war ended George Ferguson was awarded the Bronze Star posthumously. The citation is his epitaph.

For heroic achievement as a Member of the Naval defense of the Philippine Islands, from December 7, 1941, to May 6, 1942. Skilled and courageous in the performance of his hazardous duties with the FOURTH Regiment, United States Marines, Lieutenant (then Lieutenant, Junior Grade,) Ferguson rendered outstanding assistance in the manning of outlying first aid stations despite constant Japanese long-range shellfire and bombing. When the Japanese made their final desperate assault on the beaches of Corregidor, he repeatedly braved the intense barrages of fire to rescue and evacuate the wounded, and administer first aid until the capitulation of the island fortress. His heroic, untiring efforts, resolute spirit in the face of adversity and unwavering devotion to duty reflect the highest credit upon Lieutenant Ferguson and the United States Naval Service. — JKH

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Guest of the Emperor

CAPT Alfred Littlefield Smith, MC (Ret.), was a lieutenant when Corregidor fell on 6 May 1942. His nearly 34 months in Bilibid left him ill, malnourished, and nearly blind. Yet, he points out, it may have been his poor condition that kept him off the death ships. In fact, he was the only officer from the crew of USS Luzon *who came home. Forty-one years later he still asks the question repeated by others who somehow survived the camps, "Why am I here and not my buddies?"*

U.S. Navy Medicine *spent many hours with Dr. Smith in his Richmond, VA, home as he told of adventures on the Yangtze Patrol, remembered friends and comrades from long ago, and relived a painful chapter that was a common experience for thousands of Americans who were, like himself, "guests of the emperor."*

USNM: What was your first assignment after reporting to the Asiatic Squadron in 1939?

Dr. Smith: The Cavite Navy Yard dispensary in the Philippines. I was there about 6 months before being assigned to the U.S. Naval Hospital at Canacao near Manila and then the Fourth Marines in Shanghai before I was transferred to Camp Holcomb in North China. In August of 1940 we evacuated to Shanghai, where I went on river patrol duty aboard the USS *Luzon*.

What was it like being a Yangtze Patroller? In his diary George Ferguson mentioned that because of a healthy crew, he seldom had to practice medicine?

To be truthful, there often wasn't much to keep us occupied. You're on a ship with a hundred sailors, all rough and ready and well-tattooed. You'd hold sick call and find that nobody's sick. My workday began at 8 o'clock and was over by 8:05.

What did you do with all that spare time?

We patrolled up and down the river until I knew the Yangtze better than the back of my hand. I saw things I had never seen before. One time I went ashore, not too far from where the *Panay* was sunk. There was a little Chinese hospital that had a ward filled with about 30 people. It seemed very strange that no one was sitting up or showing any signs of life. "What's wrong with them?" I asked. They all had leishmaniasis. I had never seen a single case in my life and suddenly there was a whole ward full.

Were the Japanese very much in evidence?

Oh yes. When we patrolled the river we went through territory they controlled. And it was the same when we played golf. To get to the golf course we had to stop at a Japanese checkpoint. When they saw the American flag and stars on the bumper they usually waved us through.

Photo by the Editor

Dr. Smith

When did things really begin heating up?

In November of '41 a telegram came ordering the Fourth Marines and river gunboats to proceed to Manila. By then the *Luzon*'s sides had been raised and reinforced with planks.

That must have been a memorable cruise.

When we passed Formosa we could see Japanese ships waiting. They signaled for us to stop and head back to China. But RADM Glassford [William A. Glassford, Jr.,] replied that he was proceeding south. One of the cruisers aimed its guns but didn't fire. I didn't know it at the time but one of our submarines was accompanying us. I never saw it until we approached Luzon and it surfaced nearby. Later I learned that had the cruiser opened fire it would have been torpedoed.

It took us 4 days through the worst weather I'd ever seen. The *Luzon* had never been in the ocean before and even though we had boarded her up she took water and rolled like crazy. Once she tipped 45° one way and 46° the other. Dishes on shelves with a side rail came over the rail and smashed all over the deck. When we got to Manila someone pointed out that the sides of the boat had bent between each rib.

Do you recall the date you got there?

It was December 4th. I had already been out there 2½ years and should have been back in the States. Transportation was sitting right there in Manila Harbor. I think ADM Hart [Thomas C. Hart, Commander in Chief, U.S. Asiatic Fleet] knew what was up.

Courtesy Alfred L. Smith

NAVMEDCOM Archives

LTJG Smith before he left for the Asiatic Station in 1939. Right: *The river gunboat USS* Luzon.

You mean he knew the war was coming?

Yes. My orders and many others' were on his desk waiting to be signed. On Sunday, the day before Pearl Harbor, a CDR Harris and some other officer went out to the golf course. After the 18th hole everyone came into the clubhouse for a drink. Harris sat down nearby ADM Hart and asked him about the orders. Hart said, "Your orders are on my desk with a stack that high. If everything is all right tomorrow at 10 o'clock come by and I'll have them signed."

I just can't believe that Hart didn't know something was going to happen. The next morning at 4:10 the pharmacist's mate came down, tapped on my door and said, "Doctor, don't turn on the light and don't light a cigarette. We're at war with Japan." Needless to say, no one went to the admiral's office to pick up any orders.

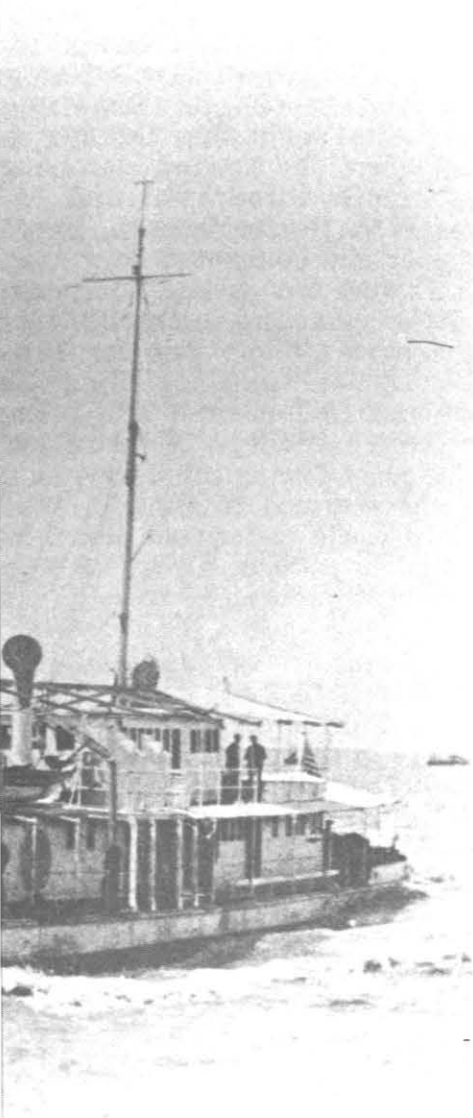
I guess ADM Hart figured he needed all the trained men he could get.

Probably so. He may have been tipped off by Washington that something was up. Well, then the American President Lines ship with my stateroom shoved off and went back to the States. And there I was. The same thing happened to George Ferguson.

How long was it before things began getting rough?

About 24 hours. We saw them bomb Nichols and Clark Fields. Two days later, 21 bombers flattened the Cavite Navy Yard in less than an hour. I was sitting on the *Luzon* about 200 yards offshore. We were a small target and obviously not worth hitting.

Around Christmas—I'm not sure of the date—I recall the skipper standing on the bridge with a pair of binoculars. He saw two bombers coming toward us and shouted, "Full steam ahead, right hard



rudder." The ship took a nosedive forward and the bombs dropped where we had been.

Not long after that, we were ordered to sail to Bataan and patrol the coast at night. The Japs would wait until dark and land behind our lines on barges.

How long did that last?
A few weeks at most before we ran out of fuel oil for the gunboat. We then sailed out into Manila Bay and moored just off Fort Hughes to help with beach defense. Hughes was on one of the small islands.

When the Japanese began shelling Corregidor they also hit Fort Hughes?
Oh yes. Once they took Bataan they set up their artillery on the beach. We hid in the bushes, in fox holes, or wherever we could find cover. The range was about 4 miles and they could hit wherever they wanted. Their aim was very accurate. They could easily see where the shells landed from a spotter balloon. By then we had no air force left. I take that back. We actually had one P-40 left. It was pretty beaten up and wired together so it could just barely fly.

About that time, we were told that a submarine was leaving Corregidor and we were all expected to write a letter home. It didn't matter who you wrote to just as long as there was mail for that sub to take. One old sailor protested, saying he had no one to write to. They said, "You'd better find someone because the captain is not gonna like this." So he sat down and wrote: "Dear Mr. President, Please send us another P-40. The one we've got is all worn out." And Roosevelt got it.

How did you feel the day Corregidor surrendered?
I was determined to get back to the States. That was not the attitude of everyone there. Many of them had already given up hope. I figured that someday the Yanks and tanks

NAVMEDCOM Archives

Hospital ward in Bilibid shortly after liberation in February 1945.

CDR Smith, third from right, front row, back home with his colleagues.

Courtesy Alfred L. Smith

would be back and when they came I'd still be around.

What became of you after the Japanese brought you back to Corregidor?
They brought us to what they called the 92d Garage Area. It was a mass of humanity with scarcely any room to lie down. During the day we'd bake in the sun with no shelter. There was no sanitation. We'd have a line waiting for water 200 or 300 long just to get a canteen of water. You got a mess kit full of rice with flies so thick on it you would take a spoon of it and before you would get it to your mouth you couldn't see the rice. Just before you put it in your mouth you'd blow the flies off and eat the stuff. You had no choice; there wasn't anything else.

We were there over a week before they took us by ship to Manila and from there to Bilibid. From that day on I never got outside that prison.

In his diary, George Ferguson writes about the sanitary conditions in Bilibid.
It was pretty bad. The only good thing I could say about that place is we had running water.

Was rice the main course throughout your imprisonment?
It was the only course. We were fed moldy, musty rice that had been swept up from the floors of warehouses. The Japanese boiled it and it had a very sour taste. You could smell it a mile away. They put it in buckets set on rollers. Those that wouldn't eat it are still out there.

Sometimes we got camote tops. The camote is the Filipino equivalent of a sweet potato. The tops were boiled in rock salt. That was the extent of our greens. On rare occasions we had fish. The Japs didn't clean them, just fried them whole. At first we would pick out the bones, but after a while we ate them from end to end like a cookie.

I read that mongo beans were occasionally available.
Some of the prisoners had Filipino contacts on the outside. Mongo beans look like peas, no bigger then birdshot but are rich in protein. One time a dog got caught in the wire surrounding the camp. We skinned it and boiled it in rock salt. Dogs are not bad eating. Another time the Japanese brought ducks into the prison to eat the garbage we threw out but they got beriberi and starved to death.

What was your average day like in Bilibid?
Every day was pretty much the same. Between work details, we played chess and cards.

Where did the cards come from?
I remember we bought a deck from another prisoner for $50. U.S. currency wasn't worth anything anyway. Fifty bucks for a deck of cards was a real bargain.

Before I got sick I saw patients in the hospital we had set up. We had practically nothing to run it with—no medicine and few instruments. We did have a makeshift operating room, but sterile facilities didn't exist.

Heck, we had every disease you could think of in there—malaria, pellagra, dengue, beriberi, xerophthalmia, yaws, scurvy, elephantiasis, tuberculosis, and general malnutrition. I was sick in bed most of the time with swollen ankles, painful feet, nausea, vomiting, diarrhea. It was at that point that many people said, "Oh hell, I'm not gonna eat that moldy stuff anymore." And they didn't and went right down hill and died. We buried a lot of men behind that prison.

When did you first notice that your sight was going?
I had been having some trouble with the sun. My eyes seemed more sensitive than usual. But the blindness came suddenly. I think it was in September of 1942. I was reading a book about the Presidents, the life of Andrew Jackson. I was on page 42 and put it aside for the night. The next day I couldn't even find the page number let alone the page. We had an ophthalmologist there at the time. He took one look at my eyes and said I had probably had optic neuritis but now I showed signs of optic atrophy. The nerve endings had almost completely disintegrated.

Was this caused by a vitamin A deficiency?
No, vitamin B, thiamine hydrochloride. Lack of vitamin A causes xe-

rophthalmia, ulcers on the corneas. We had plenty of those cases. When I got back to the States they poured vitamins into me every which way but it didn't do much good.

I understand that one of your comrades had a contraband radio hidden somewhere so you knew how the war was going.

Down at the other end of the hall were four warrant officers. One of them appeared to be a little on the stupid side. He had built himself a stool to sit on. Underneath, he had a compartment with a radio he had put together from scavenged parts. The Japanese appointed these warrant officers to take a head count every day. Often, these counts took place after dark and so the Japanese had to furnish flashlights. Needless to say, the batteries didn't last very long in those flashlights. Anyway, they would get news on the radio. They knew the Americans had landed in Bougainville and the southern islands but they didn't tell us. They couldn't tell us. They would wait until the Japanese would send out a working party or there would be a transfer of men. About 4 hours after the newcomers would arrive, the "stupid" one would say. "I heard a good rumor. Americans have landed in Leyte." Never would you get the news right away, only after some group was sent out on a detail to clean up a street or something and they'd come back. Nobody knew where the rumor came from.

After the Americans came, the warrant officer set his stool out on the ground and opened up the top and there was the radio. That was the best kept secret in the camp and the stupid routine was one of the best acts I've ever seen.*

When did you learn that the Americans were on their way back to the Philippines?

I don't remember the date but it was sometime in '44. It was a bright sunshiny day. Two Japanese planes were practicing dogfighting. Right out of the blue, they turned tail and headed north in a hurry. Within 5 minutes bombs were hitting the port area. We figured our boys weren't too far away. This was right about the time the Japanese began sending our men on convoys north to Japan.

Did you see George Ferguson frequently?

I didn't see him every day but it was frequently. He was very active, caring for patients. He always appeared to be in good health and always cheerful. He was a good morale builder for those who thought they were doomed. And there were plenty who felt we would never get out of that place alive. I remember the day George left for Japan. He just waved and said, "So long, see you later."

*The radio man was LT Homer T. Hutchinson, a former mining engineer.

What was your liberation like?

On the night of February fourth, 1945, about 8 o'clock in the evening, halftracks and tanks suddenly roared past the prison. You could hear machinegun bullets bouncing off the walls. The tanks never stopped but kept on going. I remember the very first American I saw. He was knocking the boards off the windows with his rifle butt. He looked in and said, "What are you guys doing in here?" He was very fit looking, dark-skinned, and wearing a funny kind of helmet we'd never seen before. We were accustomed to the old, flat variety. Someone answered him. "We've been in here for a long time. Who are you?" "I'm from Ohio with the First Cavalry," he replied. "You mean you're an American?" He said yes, and then someone shouted, "Well then, dammit, give me a Lucky Strike!" He didn't have a Lucky but he did give the guy a Camel. We knew right then that the Yanks and tanks were back and we were free.

Dr. Smith and the Bilibid survivors had their first American chow in many years that day and shortly thereafter he began the long trip back from the Philippines by way of Leyte, Peleliu, Honolulu, and San Francisco, arriving home on 17 March 1945. He was hospitalized at the Naval Medical Center, Bethesda for 16 months and, declared unfit for further service, retired from the Navy in 1946 with the Bronze Star and a Purple Heart. His eyesight improved slightly, allowing him to return to medical school, after which he passed the boards in internal medicine and became a fellow of the American College of Physicians. He worked part-time for the Chesapeake and Ohio Railroad for over 26 years while maintaining a private practice. At age 77, he is now medical director of the Federal Reserve in Richmond, VA. —JKH

Patents for Navy Medical Inventions

W.T. Ellis

Figure 1 is a schematic drawing of a system for optically measuring the CO, CO_2, and O_2 concentrations in blood. The system was developed and patented (U.S. Patent No. 4,509,522) under the auspices of the Navy's Biomedical Research Program. In essence, the system determines the CO, CO_2, and O_2 blood concentrations in a patient by passing infrared radiation from the IR source shown in the figure through a thin section of blood-containing body tissue by means of an optical probe. The radiation exiting from the tissue is then selectively filtered and measured at predetermined wavelengths via the figure's IR detection system to obtain an indication of the CO, CO_2, and O_2 blood concentrations. One of the claims defining the monopoly granted by the U.S. Patent and Trademark Office for this system is set forth as follows:

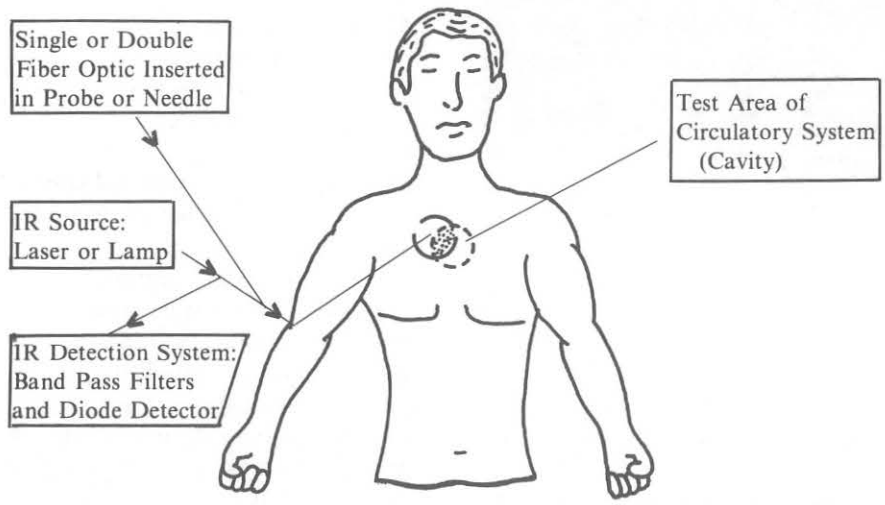


Figure 1. CO, CO_2, and O_2 Concentration Measuring System

A method of determining absolute concentrations of CO, CO_2, and O_2 in blood comprising the steps of:

- passing infrared radiation through a thin section of blood-containing body tissue;
- selectively filtering at 5.13 μm, 4.3 μm, and 9.0 μm wavelengths of radiation exiting from the body tissue;
- measuring respective amplitudes of the filtered radiation at absorption peak wavelengths of 5.13 μm, 4.3 μm, and 9.0 μm; and
- determining the absolute concentrations of CO, CO_2, and O_2 based on a comparison of the radiation passed through the body tissue at these wavelengths to the radiation passed through the body tissues having known concentrations of CO, CO_2, and O_2.

Another invention arising from the Navy's Biomedical Research Program and filed as a patent application is a method for preparing antibodies to haptens. The patent application legally claims the following invention:

A method for preparing antibodies to haptens comprising the steps of:

- injecting IgD molecules from a first vertebrate species and an adjuvant into a second vertebrate species;
- isolating the IgG anti-IgD antibodies produced by said second vertebrate species in response to said IgD molecules;

Mr. Ellis is patent counsel for the Naval Research Laboratory, Washington, DC 20375.

• binding said second vertebrate species IgG to haptens to form IgG-hapten conjugates; and
• injecting said IgG-hapten conjugates into said first vertebrate species selected from the group consisting of goats, rats, mice, rabbits, and humans.

These inventions evolved from the Navy's biomedical research and development programs conducted by the Naval Research Laboratory (NRL), Washington, DC, and by the Naval Medical Research and Development Command (NMRDC), Naval Medical Command, Bethesda, MD.

Navy Patenting. The Navy, like most large corporations, files patents for its biomedical inventions for six reasons: (1) to insure its control over and its free use of the invented technology; (2) to prevent private contractors from patenting the same inventions or variations over the inventions and then charging the Navy patent royalties on the Navy's medical procurements, or attempting to use patents as leverage to obtain a sole course position in Navy contracts procuring equipment embodying these inventions; (3) to obtain revenues from the commercial licensing of Navy biomedical patents through the Navy's Patent Licensing Program; (4) to use Navy biomedical patents as bargaining chips in negotiating licenses for the Navy to use privately owned patents; (5) to use Navy patents as the subject of counterclaims against plaintiffs in suits for patent infringement against the Navy; and (6) to insure that the true first inventors are established and recognized as major contributors to the arts and sciences.

What is a Patent? In general, a U.S. Patent is an official grant which provides a legalized monopoly for 17 years to the first inventor of a unique apparatus, process, or chemical or biological composition. The patent owner may choose to exploit the patent himself, or may choose to license another to manufacture, use, or sell the patented technology in return for royalties. Accordingly, patents are a major source of leverage both in the commercial and the government sectors. With specific regard to the Navy, a valid patent held in the private sector on technology being procured for the fleet can be used to obtain royalties of between 5 and 10 percent of the procured dollar value. In view of the size of the Navy's procurements, such a 5 to 10 percent royalty is generally quite substantial and is typically in the millions of dollars.

Preventing Patenting by Others. As noted above, a primary reason for patenting Navy biomedical inventions is to prevent the patenting and subsequent restriction of the technology by private contractors. To this end, Navy patent attorneys draft the patent application to broaden the scope of the invention disclosure so that it covers all aspects of the theory underlying the invention. This broadening in the patent document prevents defense contractors and private industry in general from patenting minor variations on the Navy implementation. Thus, the Navy's design options are left open for future system designs based on the original theory. This broadening gives the Navy significant control over the invented technology.

Invention Priority Contests. A further important aspect of patenting relates to invention priority contests (determining the first to invent). In this regard, a patent applicant has the legal right to go back to his invention conception date to prove his priority. This legal right is available only to patent applicants.

Classified Inventions. An additional reason for patenting inventions is that the Navy has a significant number of classified inventions which, of course, cannot be published in the open literature. However, a patent application can be filed with a security classification to establish the Navy's inventorship rights. This prevents others from attempting to patent the invention or its variations. The classified patent application will then remain pending before the Patent and Trademark Office until the security classification is removed.

Revenues From Patent Licensing. A further reason for patenting Navy inventions is to obtain revenues from the licensing of Navy patents commercially. This Navy licensing program is relatively new. Under Public Law 96-517, passed in December 1980, the Navy was given the right to license its inventions commercially on an exclusive basis (35 U.S.C. 208). The exclusivity of these licenses provides a significantly greater incentive to private entities to invest risk capital to bring the Navy invention to commercial application.

The Navy has also been given the right to sue infringers of its patented inventions. The first suit for the infringement of an exclusively licensed Navy patent has already been filed by the Department of Justice against a corporate infringer *(United States* vs. *Electronics Limited).*

Cross-License Agreements. Another reason for obtaining patents is for use as bargaining chips or leverage in negotiating cross-license agreements with private companies to obtain the right to use their patented technology. The potential for such cross-licensing has been significantly enhanced due to the licensing and enforcement rights provided under Public Law 96-517.

Such a cross-licensing arrangement would work as follows: Assume that the Navy has patented an implementation for a basic theory and a private company has patented a significant improvement on the Navy patent which the Navy would like to use. Under the law, the private company could not make or sell their improved patented design commercially without a license under the basic Navy patent. Accordingly, a cross-license could be negotiated allowing the private company to market their improved design commerically while permitting the Navy to utilize the company's improved design in Navy procurements.

Similarly, in suits for patent infringement against the Navy where the plaintiff has also been found to be infringing a Navy patent, a settlement

cross-license could be negotiated between the Navy and plaintiff.

Inventor Recognition. A patent also provides recognition to the Navy inventor. A patent documents that the inventor has accomplished something that has never been done before. In particular, it states that an actual implementation of theory has been developed that will advance the useful arts. This type of recognition is especially important for inventors of classified cases which cannot be published in the open literature.

Patents are also used as a basis for making small monetary awards to inventors, another form of inventor recognition.

Program Recognition. Recognition is important not only for the inventor, but also for his laboratory and its research program. Besides adding to the program's stature in the biomedical community, patents arising from a particular project demonstrate that something of consequence is coming out of the project. Thus, the patent may be used to argue for continued or increased research funding for that project and for the program in general.

What is Patentable? Almost any addition to the useful arts may be patented. This includes mechanical or electrical devices, machines, manufactured articles, chemical or biological compositions of matter, chemical or mechanical or electrical processes and methods, and any improvement relating thereto. Additionally, computer software is patentable if incorporated in a specific system. Method of doing business, mental processes, theories and writings are not patentable. However, with regard to theories, implementations of such theories are clearly patentable. In fact, if a patent is drafted broadly on the implementation, it may actually cover all of the implementations of the theory, and thus the theory itself.

The Patent Document. The patent document drafted by an attorney consists of a description of the prior art, a detailed description of the invention, and a set of legal claims which define the limits of the patent monopoly. A typical detailed invention description will describe the general theory upon which the invention is based and then will describe one example embodiment in precise detail. Various other potential embodiments will also be discussed at this point.

The claims define the invention in legal language. The claims for two different inventions were set out above as examples. It can be seen that the claim format for each is a single sentence with the individual elements of the device set off by semicolons or commas.

The claims are written broadly to include a wide range of embodiments of the invention. The breadth of the claims is the key to giving the Navy control over the technology, preserving design options, and preventing others from attempting to patent variations on the invention.

Steps to Obtaining a Patent. An inventor at any installation of the Naval Medical Command should file a "Record and Disclosure of Invention" (NAVSO 5870/35), with the Office of Patent Counsel, Naval Research Laboratory at the following address:

> Naval Research Laboratory
> Office of Patent Counsel
> Code 2004
> Washington, DC 20375
> (202) 767-3438

This office is cognizant over all inventions generated in the Naval Medical Command. The invention disclosed in the invention disclosure will then be evaluated for potential Navy use, technical advancement, and its potential for commercial licensing. If the evaluation is favorable, a search of the prior art in the U.S. Patent and Trademark Office will be conducted. If the invention is found to be novel and unobvious over the prior art, an application will be drafted and filed in the U.S. Patent and Trademark Office.

Conclusion

Patenting Navy inventions insures Navy control over and free use of the invented technology and provides recognition to Navy inventors and their laboratories which can be used to advantage. To facilitate this process, the NRL Office of Patent Counsel has a large patent staff trained to service patent and other intellectual property issues arising in the Naval Medical Command and the Naval Research Laboratory. These other intellectual property issues include copyright and trademark problems, and technical data issues arising from Navy procurement contracts. □

Operational Entomology Training

LCDR T.P. Breaud, MSC, USN

Historically, insect-borne diseases such as malaria, typhus, dengue, and plague have greatly affected the outcome of military campaigns. They have accounted for a large percentage of combat casualties, oftentimes exceeding those caused by enemy action and rendering entire units virtually useless.

An examination of the record illustrates this point. During the Sicilian Campaign of 9 July-10 Sept 1943 hospital admissions for malaria (21,482) exceeded battle casualties (17,375).(*1*) On Guadalcanal in October 1942 the malaria rate was 1,664/1,000/year.(*2*) Similar statistics exist for many areas in the Pacific Theater. BGEN J.S. Simmons stated that "Malaria was the single most serious health hazard to Allied troops in the South Pacific in World War II."(*3*) As recently as Vietnam our forces were still suffering significant morbidity and mortality due to insect-borne diseases. From July 1966 to December 1970 the Marine Corps alone lost 284,413 man days to malaria.(*4*)

Conversely, the record shows that when personnel trained in vector-borne disease control accompany combat units, morbidity and mortality from these diseases is reduced. At Bougainville in November 1943 the Third Marine Division utilized malaria control units from the outset. The result was that the malaria rate never went above 119/1,000/year.(*5*) Malaria control personnel were used on Efate in the South Pacific during 1942-43 to reduce the rate of malaria from 2,678/1,000/year to 144/1,000/year. (*6*) In the future, as in these examples, trained personnel could significantly reduce the impact of vector-borne diseases on combat operations.

The staff of the Disease Vector Ecology and Control Center (DVECC), Jacksonville, FL, recognized this need for advanced training in vector-borne disease control, hence Operational Entomology Training was born. Originally an in-service training program and termed combat entomology, the title was changed and the course expanded to include other contingency operations such as disaster relief.

The 2-week course is designed for preventive medicine and other Medical Department personnel currently serving in Navy preventive medicine billets as well as those serving with the Fleet Marine Force. The training is intensive and consists of classroom, laboratory, and field portions. The philosophy of the course is definitely "hands on" rather than sit back and listen. This is the common thread running through the entire course.

Students learn the epidemiology of vector-borne diseases, particularly as related to their control. Instructors emphasize historical examples and discuss future contingencies for each major disease. Learning the military significance of each disease is an important element.

Vector bionomics vis-à-vis disease and control strategies are examined. Students are brought up to date on the status of resistance in both the disease organisms and their vectors. Instructors present the newest control techniques.

Laboratory exercises complement the classroom and stress the correct

Emphasis is "hands on."

LCDR Breaud is assigned to the Navy Disease Vector Ecology and Control Center, Naval Air Station, Jacksonville, FL 32212-0043.

identification of vectors. Students spend considerable time practicing with pinned and labeled specimens and are expected to be able to identify "test" specimens.

Vector surveillance and control equipment ranging from hand-held units to aerial dispersal gear are demonstrated and are followed by several hands-on sessions. Every student is given the opportunity to calibrate and operate the equipment. The strong and weak points of each piece of gear are discussed as well as the situation in which it should be used. This is the most important part of the course; therefore it is stressed a great deal.

An integral part of instruction is the scenario work groups. Students are divided into small groups, assigned a scenario and are required to present their solutions to the class and staff. Scenario "problems" range from fictitious combat operations to disaster relief efforts. During these sessions students are introduced to medical intelligence information and vector ecology profiles. These scenarios require the student to plan, organize, and implement vector surveillance or control programs in a variety of situations. Instructors stress planning which may include everything from drafting predeployment messages to resupply problems in the field. It is during these sessions that students first begin to view what they have learned in a comprehensive manner.

Students use light traps to collect adult mosquitoes and . . .

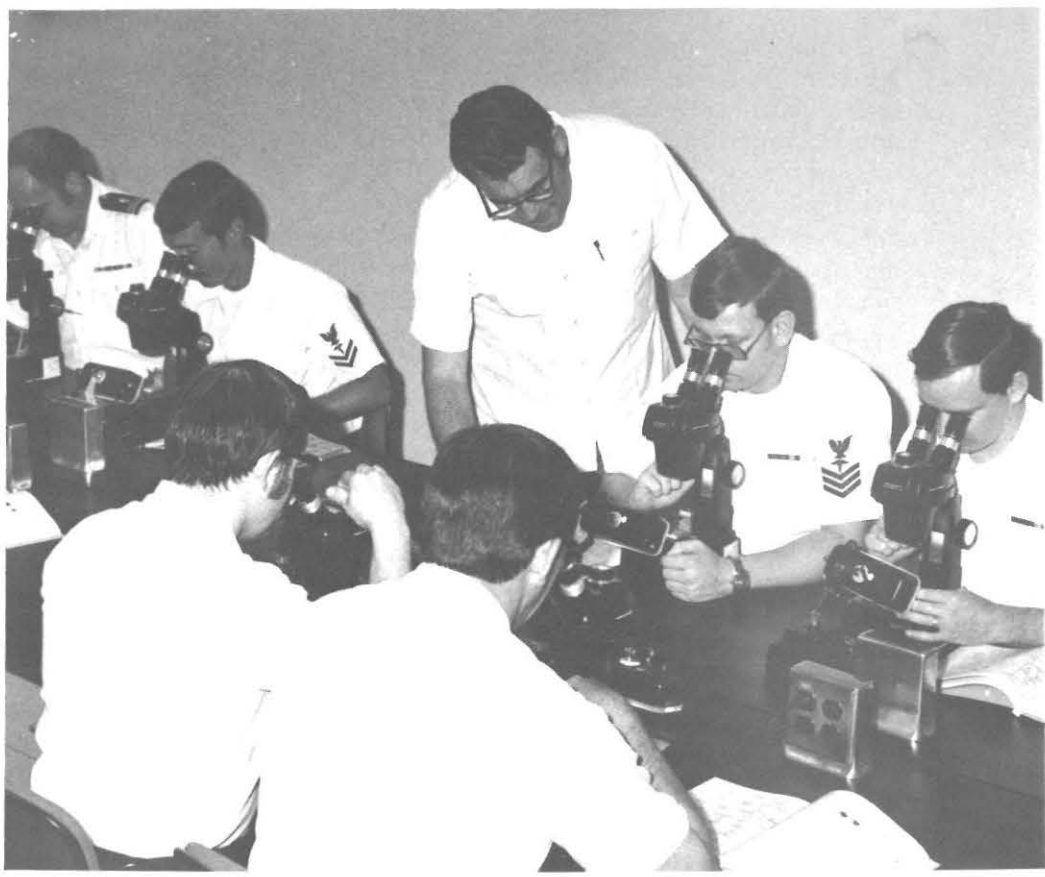
The focus of the course is the 2-day field exercise in which students practice what they have been taught. After issuing each student his 782 gear, the DVECC staff and students head for Camp Blanding, a National Guard installation approximately 45 miles south of Jacksonville. Students set up their own camp, receive instruction in field sanitation, and are expected to demonstrate surveillance and control techniques. They are also required to identify specimens collected in the field.

Each student is given the chance to fly an aerial spray mission using the Navy PAU-9 aerial dispersal unit in an H-1 helicopter. This unit is service-unique and is capable of treating large areas in a short time.

Left: *Preparing to fly a mission.* Below: *The PAU-9 aerial dispersal unit can cover large areas in a short time.*

Upon successfully completing the course, students are able to organize, implement, and modify vector control programs in a variety of contingency situations. They are aware of the threat posed to military operations by vector-borne disease and are able to reduce this threat.

Since its inception in October 1981, 178 Navy, Army, Air Force, and Coast Guard active duty and reserve personnel have completed the course. Currently the course is offered three times a year in April, May, and August. Those desiring quotas should contact the Training Officer at Autovon 942-2428.



. . . learn to identify insects in the laboratory.

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China White
The Bogus Drug

LCDR Jerry L. Brittain, MSC, USN

In the summer and fall of 1980, a curious series of separate and unrelated events occurred that may presage a new and seriously different era of opiate addiction and its treatment, as well as polysubstance use and detection.

During the summer of 1980, in southern California, there began to surface reports of deaths by apparent drug overdoses, deaths from a powerful street drug. While these deaths were similar to narcotic overdoses, the victims showed no traces of heroin or other narcotics upon autopsy. In all, some dozen deaths were reported in southern California which fit this pattern as well as one in Arizona. In Contra Costa, CA, individuals applying to the Contra Costa Methadone Program were refused admission because their urine samples tested as "clean" or negative for opiates, much to the surprise of those in the program as well as those applying for admission. In November 1980 San Diego police observed the body of an apparent drug overdose victim being dumped from a car. Subsequent search of the victim led to the discovery of a tiny white powder that, once again, could not be identified.(*1*)

This article is reprinted from the *Journal of Toxicology: Clinical Toxicology* 19(10):1123-1126, 1982-83 with permission of Marcel Dekker, Inc. When it was written Dr. Brittain was attached to the Navy Drug Rehabilitation Center, NAS Miramar, CA. He is presently a clinical psychologist at the Naval Hospital, Naples, Italy.

The Search by DEA

A pattern was developing from all of these events, a pattern of unexplained deaths from a powerful and mysterious street drug. American Drug Enforcement Agency (DEA) officials were especially concerned. They remained frustrated in their efforts to even obtain a sample of the drug until October 1980 when they were finally able to obtain two very minute samples of the drug of less than 20 mg each. In their special laboratory at McLean, VA, it took three skilled chemists almost 2 months to identify the drug, a process that would normally take only a few hours. (This is one of the longest periods ever required for identifying a drug there.) They were finally able to put together all their research findings and draw a molecular model of the unknown substance. A computerized search of the chemical abstracts showed that, with one variation, they had identified the drug fentanyl. The drug they identified differed only by the addition of a single methyl (CH_3) attachment.(*1*)

Fentanyl

Fentanyl is a component of a morphine-like chemical made by Janssen Pharmaceutica, Inc., New Brunswick, NJ.(*4,6*) It was developed out of research dating back to 1952 in an attempt to synthesize the morphine molecule. It is primarily used in hospitals under the brand names Innovar and Sublimaze.(*6*) Fentanyl is said to be between 80 and 100 times more powerful than morphine. It has been discarded by some anesthesiologists because the line between coma and death is so narrow. Fentanyl is believed to travel directly to the brain after intravenous administration. There, it works on the μ receptor. (The μ receptor is a specific location on every nerve cell in the human body. Fentanyl is apparently the only opiate that works specifically, and only, on one receptor, the μ receptor.) Onset of action of the drug is extremely swift and its effects last approximately 30 to 60 minutes.(*4*) Fentanyl overdose patients must be given immediate first aid including cardiopulmonary resuscitation (CPR), artificial respiration, and the administration of a narcotic antagonist like naloxone.(*1,4*)

The only known legal batch of the methyl analog of fentanyl is the product of Dr. Tom Riley, a University of Mississippi pharmacologist. Dr. Riley

developed the substance several years ago in his course of research into alternative narcotics. He currently holds the patent on it. The drug, however, has not been produced commercially. (*4*) DEA chemists believe that although a high degree of expertise is required to produce it, any competent chemist could make the substance after reading Dr. Riley's description of it in the available chemical literature.

After being contacted by DEA agents, Dr. Riley sent them a sample of his material. When it was compared to the California substances, it was confirmed that they were, indeed, one and the same. Impurities in the California powder have led DEA chemists and other authorities to believe the drug is being clandestinely manufactured, possibly in southern California.(*1,4,*)

China White

The drug, as it is sold on the streets, is a white powder, with a hint of pale yellow.(*4*) It sells for about $700/g. It is "cut" by mixing it with lactose and other filler materials but is difficult to cut because of its high potency. Samples received by the DEA have all been cut, making them 99 parts lactose and 1 part analog.(*3,5*) Even this mix is dangerous because the addict has no idea what he is buying. Officials say it is sold as "China White," a street term used by opiate addicts to denote a particularly pure, potent, rare, and much sought after form of heroin from the so-called "Golden Crescent" or "Golden Triangle" of Burma, Laos, and Thailand. "To get connected with China White is a sort of fantasy for (opiate) addicts," says Darryl Inaba, director of the Haight-Asbury Free Clinic of San Francisco.(*3*)

Like heroin, the substance is heated until it liquifies. It is then injected, producing euphoria. Stanley P. Sohol, director of the special DEA laboratory in McLean, states that from what he knows of the drug and other potent narcotics, the user would probably "get a rush" immediately after the drug's injection, "go on the nod," pass out, and become rigid, possibly to the point of paralysis of the respiratory system.(*4*)

While fentanyl is 80 to 100 times more powerful than morphine,(*3*) an article published in the 19 Jan 1981 issue of *Chemical Engineering* stated: ". . . it (the drug called China White) was discovered to be *1000 to 2000 times more powerful than morphine* when tested in rats."

The drug acts so quickly that many addicts who have tried it and survived an overdose often cannot remember even getting the needle out of their arm before going into a coma. At least a dozen deaths have been directly attributable to the drug, mostly from respiratory arrest.

After the rash of deaths late in 1980 from a drug that appeared to be heroin but was not, authorities began to try to establish a link between the fentanyl derivative and the overdoses. Coroners and other medical examiners were unsuccessful in detecting any sign of the drug during autopsies for three reasons. First, urine, feces, saliva, and blood tests all come up negative during known or routine drug-assay methodology. Secondly, very small doses of the drug can cause death. Thirdly, almost nothing is known about how the body metabolizes the drug.(*1*)

Meanwhile, civil and drug enforcement officials remain frustrated in their efforts to deal with the drug. Ironically, initially the drug was not a controlled substance, and its possession would not have been a criminal matter. Possession and manufacture of the drug would have been a civilian matter of a patent violation. This did change, fortunately, for the drug was finally classified as a class I drug on 22 Sept 1981, partly in response to DEA requests.(*2*)

What worries officials is that California has long been known as a trendsetter in nationwide illicit drug use patterns. The street usage of the drug seems to be dying out somewhat because of its bad reputation. Whether its use will start to rise or spread at this point is something officials are watching closely. PCP (or "Angel Dust") early on got a similar bad reputation and its use died out for a period, only to re-erupt on an epidemic scale nationwide. Whether this happens with China White remains to be seen.

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