

we were using inhalation anesthesia, probably we should not have changed, but when properly taken care of, patients do well under spinal anesthesia. The desirability and advantages of a free airway have been fully covered. The free airway protects the heart from strain and lessens the likelihood of postoperative edema. The technic mentioned for readying patients for intubation is much quicker, safer and easier than soaking for complete relaxation, with ether or cyclopropane. Spasms, which put a strain on the heart, are avoided, too. With the nontoxic agents nitrous oxide and ethylene available for inhalation, "pentothal sodium" in low percentage drip supplemented by tubal injection if needed, curare as a supplementary relaxant and an assured free airway with plenty of oxygen, there are few cases in which anesthetics cannot be safely used. I agree with what is said about supportive therapy. Little preparation for immediate replacement of blood loss in support of these patients is still too often the case. Sufficient oxygen and blood, with careful anesthesia, will permit much surgical treatment to be done safely in most cases. All patients should be thoroughly ventilated with air after surgery. We accomplish this by flowing carbon dioxide through a hose over the face. As soon as several deep inspirations are accomplished, the carbon dioxide is discontinued. After surgical treatment this is accomplished by deep respirations at frequent intervals if the patient will cooperate. If not, the carbon dioxide "kick" is practiced. Thorough ventilation at frequent intervals is good preventive pulmonary therapy. We believe in an excess of oxygen when at all indicated.

DR. MARY KARP, Chicago: The anesthetic problems met in the aged are not those of age itself but of the complicating diseases. Our interest in the geriatric patient became emphasized through the study of unselected surgical cases presenting complications of hypertension, coronary disease and other cardiac disease. We found that the problem tended to be a geriatric one, as 67 per cent of the patients were elderly, 50.1 per cent being between the ages of 50 and 70 and 17 per cent over 70. It is interesting to note the variations found in percentages of deaths and complications during the hospital stay after the use of different anesthetic agents and methods in our series as compared with the essayist's. In patients over 60 years of age, the death and complication rates were considerably higher after spinal anesthesia, 10.8 per cent and 36.9 per cent respectively, than those following inhalation, 1.5 per cent and 12 per cent. After ethylene-ether anesthesia, the death rate was 31.3 per cent and the complication rate was 19.8 per cent. No deaths or complications occurred in those patients receiving cyclopropane anesthesia alone. However, when ether was added to the cyclopropane no deaths occurred, but the complication rate was high, 37.7 per cent. The death and complication rates in the cases in which curare was used as an adjunct were similar to the rates seen after ethylene-ether anesthesia. The complication rate following intravenous anesthesia was comparable to that of the inhalation group as a whole, and no deaths occurred. Those elderly patients with cardiac disease appeared to tolerate spinal anesthesia in our series less well than did those under 60 years of age, while results with inhalation methods were similar in the two age groups. In the aged, cyclopropane gave more satisfactory results as an inhalation agent than did ethylene ether. The variations that are experienced in our work as compared with those of the essayist may be due to the fact that in our series the aged were all patients with cardiac disease and that we used 60 years as the dividing line instead of 70. Dr. Dillon's precautions may well be observed. Spinal anesthesia is not employed by him when the preoperative blood pressure is above 180 mm. of mercury systolic or when there has been a significant drop in blood pressure following premedication, and the level of anesthesia is kept below the tenth thoracic segment. These precautions may well explain his excellent results. Dr. Dillon's paper is highly significant and emphasizes that basic understanding of the patient's pathologic processes, judicious preoperative and postoperative management, careful selection and administration of anesthetic, meticulous attention to the nutritional status, water and electrolyte balance and adequate oxygenation should make management of the geriatric patients no greater a hazard than the managing of the younger age groups.

DR. JOHN B. DILLON, Los Angeles: I agree with Dr. Caine that ethylene might be a highly desirable agent. We have not used it much for the aged and we use it little because cautery frequently is used. Postoperative ventilation is almost an absolute necessity for these patients because if they are allowed to go into respiratory depression they certainly will contract pulmonary disease. The greatest need has been emphasized this morning by another essayist, the desirability of a recovery ward. I do not see how we can do our best for the patient unless we have recovery wards. We do not have one. We have had over 1,200 cases in which patients were over 70 years of age. We are averaging better than 100 a month. We have had just the 1 death on the table. I am not surprised that spinal anesthesia has a higher death incidence than other types of anesthesia, but I feel that the anesthesia for these patients must always be chosen for the patient and never for the operation. There are so many ways of giving anesthetics that no one particular method should take precedence, despite the fact that in 50 per cent of our cases spinal anesthesia was used. I am convinced that in the type of case in which anesthesia can be kept below the tenth thoracic segment, spinal anesthesia is physiologically sound. Also, I think that if we consider patients over 70 years of age as "cardiacs," whether or not they have demonstrable cardiac disease, we will go a long way toward reducing our difficulties.

Special Article

HEALTH AMONG THE NAVAJO INDIANS

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NOTE.—The following special report on medical conditions among the Navajo Indians was made by a group of physicians who were sent by the Department of the Interior as representatives of the American Medical Association. The arrangements were made by a committee of the American Medical Association, which is advisory to the Hon. J. A. Krug, Secretary of the Interior. The team, which was developed from Southwestern Medical College in Dallas, Texas, comprised Dean W. Lee Hart, Dr. Ozro Woods, Dr. Martin S. Buehler, Dr. Francis Reichsman, Dr. Salmon R. Halpern, Dr. John Henry Fish and Dr. Arthur Grollman. This project was approved by the House of Delegates of the American Medical Association.—ED.

THE PRESENT SITUATION

Undernutrition and Vitamin Deficiency Among the Navajo Indians.—The Navajos share almost uniformly a state of definite undernutrition. The only exceptions are the children who have been in boarding schools and the Indians living around Shiprock, where better food is available.

The Wide Prevalence of Tuberculosis.—Pulmonary, bone and gland tuberculosis are seen in every hospital and in every group of children. Adequate records are not available that permit an accurate statement of the incidence of tuberculosis. The often quoted statement that it is six times as common as throughout the United States seems reasonable. The prevalence of tuberculosis is definitely related to undernutrition and poor hygiene.

High Death Rate of Infants and Children.—The hospitals were almost half occupied by children, mostly with diarrheas and with acute infectious diseases. Here again poverty and ignorance stand as principal cause. The feeding of the infants and children has not changed or improved in many generations.

Lack of Preventive Measures in Control of Communicable Diseases.—An incomplete program reaches the children in most of the schools. The many children who do not attend school are entirely missed.

Present Health Program.—The health program is built around a system of widely scattered hospitals, five of which are operating, three closed, and one without a physician. Some Indians live 100 miles from a hospital over almost impassable roads. During part of the year when many of the roads are impassable, most of the Navajos do not have access to any kind of medical service. At best the poor communications, lack of sufficient ambulances or other transportation makes the statement true for a large part of the population. At best only relatively few patients reach the hospital early enough in the course of their disease to benefit most from treatment. Hospital death rates are high. Many patients arrive in a dying condition.

About half the beds in the hospitals were occupied by patients who did not need hospital care. They were kept long after recovery, or had not been ill enough to justify admitting, or were "boarders" (mothers nursing sick babies, or babies or children awaiting recovery of mothers). With the exception of the Tuberculosis Division at Fort Defiance, none of the hospitals were much more than half full (some beds were closed due to budgetary limitations).

With the exception of the hospitals at Crown Point and Fort Defiance the patients were receiving inadequate medical care. This was due to poorly qualified and insufficient medical personnel. These older physicians have not had the advantage of recent medical training and do not know modern methods of treatment and how best to use the facilities of the hospitals. Since personnel is the fundamental requirement of a good health program, it will be discussed in a constructive manner in the recommendations.

There is practically no preventive medical program and no sanitary engineering service. The social welfare program is not sufficiently developed to be really helpful to the medical service. There is no medically directed health education program. A health education program can hardly function successfully unless it is directly tied in with the health service.

As a general statement the health problem of the Navajo may be stated as the prevention and controlling of infectious and communicable diseases in a widely scattered, poorly nourished, ill housed people. Metabolic and degenerative diseases that are relatively uncontrollable are very uncommon.

RECOMMENDATIONS

Establishment of an Adequate Field Service.—The proposed plan of replacing and enlarging these small scattered hospitals is perhaps unsound. The poorest of these facilities are as good as or better than the average for rural people throughout the country. No more hospitals should be built until the present facilities are used effectively and to capacity. As in any other population, the great majority of the ill persons can be satisfactorily treated early as ambulatory patients.

A field service should be established, each unit to consist of a well qualified physician and a nurse, preferably with public health training, who would operate from widely scattered health centers. Early treatment will reduce the number of patients needing expensive hospital treatment. The field doctor will select the patients who need hospital care or more skilled diagnostic services. When the emergency hospital care is finished the patient will be returned to the field doctor to complete and follow up the treatment. The number needed and location of these field health units can be determined only by experience. The patterns

of rural health services cannot be directly implanted into the Navajo country. They will need adaptation under the most competent direction. The director of the field service should be the chief of the entire health service.

Establishment of Medical Center.—When the field service develops so that most of the Navajos are served, there will probably be need of more general hospital beds. They should be mostly added to Fort Defiance Hospital, some to Crown Point. Possibly Keams Canyon should be kept for the Hopis. The development of transportation service will determine the advisability of continuing the Tuba City Hospital. All the others should be used as health centers or in some supplemental use as soon as the beds can be replaced by increasing the capacity of the medical center.

The concentration of patients will do two things. It will reduce the excessive patient cost per day that now prevails and would make specialists available to all patients. Air strips are being built and adequate rapid transportation of patients should soon be available.

A diagnostic outpatient service using the specialists at Fort Defiance and complete laboratory facilities which are badly needed should be organized. Simple boarding care should be furnished these ambulatory patients that would be referred in by the field service for consultation. In many instances they can be referred back to the field service physician for treatment.

Improvement of Medical Personnel.—The need of competent physicians has been emphasized. This means men and women with modern medical training and in many instances physicians who have had complete specialty training. These men cannot be secured under the civil service pay scale. The Veterans Administration found this to be true. The isolation that goes with living widely scattered in the Navajo country is an important factor. Premium pay must be given for field service. Good physicians will not stay in the Navajo medical service unless provisions are made for them to keep their training up to date, nor would they tender good service if they stayed. Consulting service should be developed with a twofold purpose: to provide the patients with the best medical care and to give postgraduate training to the personnel (a similar plan was used by the Army in the Eighth Service Command with unusual success). This will require not only the best consultants but men who are teachers. Such men are most easily secured from the faculty of a good medical school. Arrangements could be made for a full time consultant's pay. The medical school could send in succession specialists who would spend one or two months. These specialists would work in the hospitals caring for patients. The field doctors could join the hospital staff for regularly scheduled teaching programs. A reasonable pay scale and a good consulting and teaching plan will attract good physicians to the Navajo Medical Service. Of course, the same applies to nurses.

The professional services of both physicians and nurses should be supplemented by the use of more Navajos as aids. Because of the language difficulties they will be a necessity in the field program. They will be most effective in a health education program.

Improvement of Nutrition.—Any health service is going to be limited by the serious undernutrition of, especially, infants and children. An ill nourished body cannot be completely protected from disease by the most satisfactory scientific health service. The poor nutrition of the Navajo is due to lack of money to buy

sufficient food and to ignorance in selecting diet and poor food habits. As physicians recommendations for the economic plight of the Navajos are not our problem. They would be a happier, more useful people if they had economic relief. As an emergency measure, if they could receive agricultural surpluses and buy basic foods at more nearly cost their nutrition could be improved materially. Education in nutrition can only go hand in hand with the opportunity to have better food.

Cooperation with the Health Services of Arizona and New Mexico.—The Navajo Reservation is a dangerous reservoir of communicable diseases, especially tuberculosis. From ten thousand to fifteen thousand Navajos leave the reservation yearly largely for seasonal employment. With rare exceptions there is no health-screening or preemployment examination. It was astonishing that satisfactory working arrangements had not been made with the health departments of the neighboring states. The health departments of Arizona and New Mexico were visited, and they pledged their cooperation. Special effort should be made by the Indian Service to work with these health departments. They have many common problems. Case-finding records of communicable diseases, especially venereal diseases and tuberculosis, should be exchanged and notification of follow-up studies should be reported. Cooperative effort in collecting vital statistics will be necessary to correct the almost entire lack of any useful data now available.

Since it seems a natural development and it is the intent of Congress as stated in last year's appropriation committee that more responsibility of Indian affairs should be gradually assumed by the states, this vital matter of common health problems should be one of the first cooperative efforts. The burden lies largely with the Indian Service.

SUMMARY

The Navajos receive incomplete and poor health service. The incidence of preventable diseases is high. The incidence of the relatively uncontrollable diseases seems relatively low. The present plan of medical care will not solve the problem.

Medical care must be taken to the Navajo in the form of accessible field service. Hospitals should be reduced in number, enlarged, and better service rendered. A highly developed diagnostic center is needed for ambulatory patients. Good medical service can only be furnished by well trained physicians who demand good pay and inservice training opportunities. Large capital expenditures are not immediately needed. Present hospital facilities are less than half used effectively.

Local and state health services should be met more than half way to initiate cooperation in common problems. The control of funds and planning and direction of the health services should be completely in medical hands. A medically directed health education program should be developed.

The Navajos want and will accept graciously and appreciatively the health services that they deserve.

HOPIS

The health problems of the Hopis are not as acute or distressing as those of the Navajos. The Hopis are more industrious, better farmers and are much better nourished. They live in villages and have attended school.

They now have an incomplete field service furnished by one nurse. A physician and more visiting nurses for field service with improvement of medical care in their hospital at Keams Canyon would give them a reasonable health service.

At present their hospital is about half occupied by Navajos who feel out of place and largely uncomfortable.

Clinical Notes, Suggestions and New Instruments

BRUCELLA AGGLUTINATION TESTS AND VACCINATION AGAINST CHOLERA

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The appearance of Brucella agglutinins in significant titers following the administration of cholera vaccine has been reported to occur in 7 of 8 persons.¹ In further observations² on an additional 20 subjects given the standard two dose cholera vaccination, 80 per cent showed positive Brucella agglutination reactions in dilutions of $\frac{1}{40}$ or higher, and 60 per cent showed positive reactions in dilutions of $\frac{1}{160}$ or higher. One person showed agglutinins in dilutions as high as $\frac{1}{2,560}$ partial and $\frac{1}{1,280}$ complete. The reaction to the opsonocytaphagic test also became positive after vaccination in 80 per cent of the 20 subjects. In 65 per cent of them, the test became strongly positive with phagocytosis by 80 to 100 per cent of the cells. The brucellergen cutaneous test did not elicit a positive reaction after vaccination.

Studies on the antigenic interrelationship of *Vibrio comma* and the Brucella group indicate that a common antigen exists, identified as an H antigen of *Vibrio comma*.³

We have previously directed attention to the diagnostic confusion which may arise from the production of Brucella antibodies in response to cholera vaccination.⁴ The agglutination test is the most commonly used procedure for the diagnosis of brucellosis. A positive reaction even in low titers frequently, albeit deplorably, is used to confirm a clinical diagnosis of brucellosis in the presence of vague symptoms. Some 3,000,000 veterans have been vaccinated against cholera during their military service. It therefore becomes important to evaluate the magnitude of this likely source of diagnostic confusion.

METHODS AND MATERIAL

Brucella agglutination tests were performed on serums obtained from 100 persons who had been vaccinated against cholera during military service. Fifteen of the subjects were veterans in apparent good health. Eighty-five were patients in a U. S. Navy Hospital. None of them were suspected of having brucellosis, and they were hospitalized for a wide variety of illnesses. Five diagnoses accounted for 72 per cent of the patients. They were as follows: cyst teratoma, 23 cases; peptic ulcer, 20 cases; fracture, 10 cases; osteomyelitis and periostitis, 5 cases, and bacillary dysentery, 3 cases. Six patients were judged to

Aided in part by a grant from Swift and Company.

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