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Pediatrics in the Marshall Islands

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The delivery of health care to children living on isolated island communities presents unique challenges to health professionals. An evolved method of providing longitudinal services to infants and children residing on islands of the Marshall Island chain—a central Pacific portion of the Micronesian archipelago—is presented. The difficulties associated with provision of comprehensive health care in a vast ocean area are discussed.

Editors' Note: One of our reviewers comments as follows: "Although this article may not seem exactly relevant to the average practitioner, most pediatricians know little about this part of the world and are poorly informed about the people, the poverty and neglect, and the medical-socioeconomic problems. Physicians should be concerned and wish to be informed about all children and their health problems."

THE DELIVERY of health care to children living on isolated island communities, where accessibility is often impossible rather than merely difficult, presents unique challenges to diagnosis, treatment, and health maintenance that are not found in most other remote areas. A health care team, directed by physicians at Brookhaven National Laboratory working under contract with the United States Department of Energy, has been involved in the delivery of health care to several atolls in the Marshall Islands. The Marshall Islands are comprised of 29 coral atolls and five mountain top islands located in the central Pacific ocean

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approximately 2,500 miles southwest of Honolulu, Hawaii (Fig. 1). The 35,000 inhabitants of the Marshall Islands live on small islands that total only 70 square miles of land scattered over a vast ocean area of 300,000 square miles (Fig. 2). The two major population centers are located on Kwajalein and Majuro atolls. Approximately 8,000 Marshallese live on the island of Ebeye on Kwajalein atoll and 15,000 live on Majuro atoll. Majuro also serves as the seat of government for the Marshall Islands. The Marshall Islands, together with the Caroline and Mariana Islands, comprise the Pacific archipelago of Micronesia.

In this tropical setting, a combination of mobile and stationary health units has evolved that provides a medical infrastructure for some island inhabitants. The current strategy incorporates day-to-day medical care by resident health aides (provided by the Government of the Marshall Islands Health Services), supplemented by more in-depth interval medical care provided by physicians of Brookhaven National Laboratory and the Government of the Marshall Islands.

Background

On March 1, 1954, 259 Marshallese living on Rongelap and Utirik atolls were accidentally exposed to radioactive fallout as a result of a nuclear device exploded at Bikini atoll. The medical consequences of exposure to radioactive fallout, which was estimated at 175 rads of whole body gamma radiation of Ron-

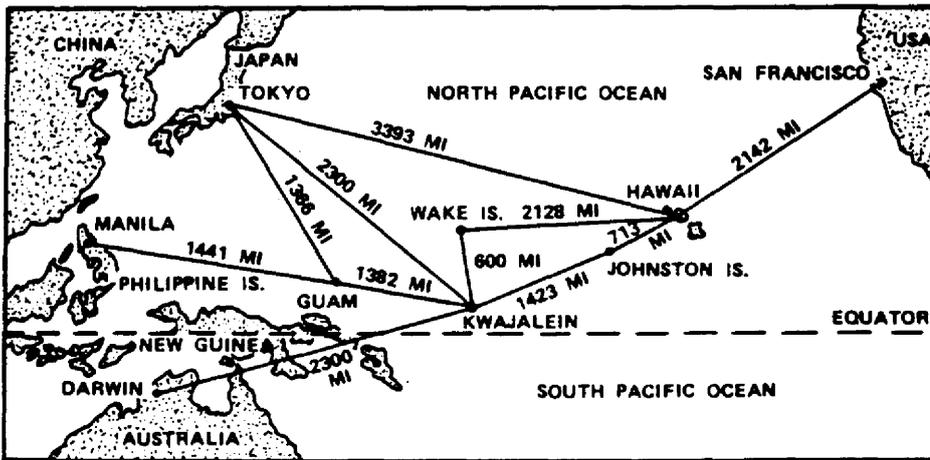


FIG. 1. The Pacific Ocean with distances to the Marshall Islands represented by the distance to Kwajalein atoll.

gelap and 14 rads of whole body gamma radiation on Utirik, have been well described by Conard *et al.*¹ While all survived the acute effects, the major findings in the Rongelap group were "beta" skin burns with epilation, transient depression of the blood count, and internal absorption of radionuclides.² No acute findings were documented in the Utirik group. Medical evaluation in the ensuing years revealed a high incidence of thyroid nodule formation and thyroid hypofunction with transient growth retardation.³⁻⁵ Due to the internalization of radioactive iodines, these findings were found

particularly among children residing on Rongelap who were less than 10 years of age at the time of their exposure. One case of acute myeloblastic leukemia, occurring in a 19-year-old male who was one year of age in 1954, had been diagnosed in 29 years of medical surveillance.⁶ There has been no evidence of an increase in birth defects in children of exposed parents and mutant proteins have not been uncovered.⁷ Medical monitoring of the children and grandchildren of exposed persons continues.

The Brookhaven National Laboratory medical team,

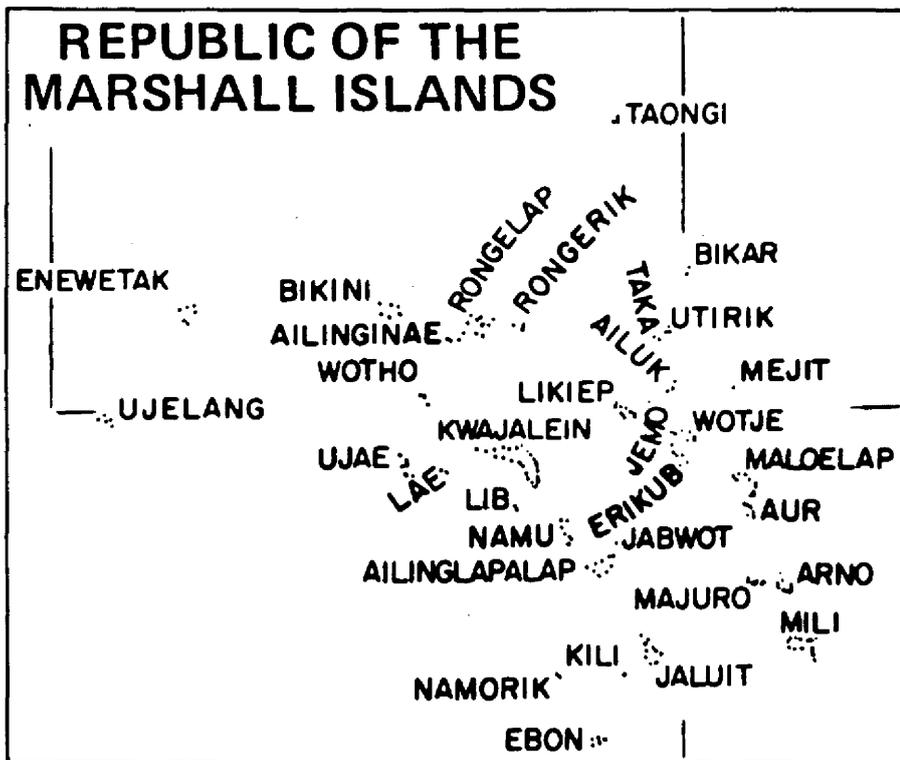


FIG. 2. The Republic of the Marshall Islands.

PEDIATRICS IN THE MARSHALL ISLANDS

which is charged by the Department of Energy pursuant to Public Law 95-134 to provide diagnosis and treatment of radiation-related diseases occurring in inhabitants exposed to radioactive fallout, has broadened its health service over the intervening 29 years to include a comparison unexposed population of Marshallese, as well as the children of both exposed and unexposed groups. There is, in addition, an informal agreement under which the medical team undertakes to assist the Marshall Islands government in its efforts to provide health care to all residents of Rongelap and Utirik atolls.

Health Care Delivery

An annual six-week pediatric survey provides complete medical examinations and care to children 15 years of age and younger. A similar survey for adults is also undertaken, at which time a sick call is provided for the children. The medical teams, comprised of Marshallese and Americans, include physicians, a pediatric dentist, nurses, laboratory technicians, and an x-ray technician. Both Rongelap (population approximately 220) and Utirik (population approximately 450) atolls have a permanent health clinic staffed by a health aide whose training is roughly equivalent to a physician's assistant. These clinics do not have the capability or facilities to perform laboratory and dental functions. For this reason, the medical team utilizes a ship under the United States government charter that is appropriately fitted to provide essential laboratory and dental support. Laboratory services on board include electronic blood cell counting and sizing, differential leukocyte and platelet counts, serum electrolytes, blood chemistries (including liver function tests, glucose, creatinine, amylase and hemoglobin A_{1c} levels), culture and sensitivity testing for both aerobic and anaerobic bacteria, routine microscopic evaluation of urine and stool, and serum preparation for tests that must be sent to outside laboratories. Standard x-ray services, with the exception of barium studies, are available, as are electrocardiograms.

The ship is anchored in the lagoon and adult patients and/or laboratory specimens are ferried back and forth to the ship by small boats. For reasons of safety, children are examined ashore. On the larger islands, the ship is used to supplement on-shore medical facilities.

Between the twice yearly visits of the medical team, a Brookhaven physician based on Kwajalein atoll makes periodic visits to Rongelap and Utirik, providing follow-up to problems identified by the medical team and addressing their current health needs. The problem

of continuity of care, especially for chronic diseases, is one of the most difficult aspects of health care in an island setting, and on-going instruction and reinforcement of health aides is critical to any success in this area. The health aides residing on Rongelap and Utirik atolls have access to radios that, when operational, provide a means of contact with medical facilities on Majuro. Now that airstrips have been built on the outer islands, periodic visits and any indicated medical referrals can be facilitated.

Health Status

During the 1982 pediatric mission, a total of 513 children, varying in age from 2 days to 15 years, were examined. A broad spectrum of problems were encountered. Well child care (preventive maintenance, health education, safety, counseling, and immunizations) formed the bulk of the cases, but conditions such as incontinentia pigmenti, toxoplasmosis, and lepromatous leprosy in a young adult added to the uniqueness of the experience. Of 487 problems identified, the most common findings were skin and scalp infections (28.1%), dental disease (14.6%), and ear/hearing abnormalities (11.4%). Although the islands of Utirik and Rongelap had previously had a high prevalence of intestinal helminths,⁸ studies performed on this trip indicated a relatively low prevalence, the result of an intensive mebendazole (Vermox) intervention program. Satisfactory sanitation habits have been difficult to establish, primarily because of a limited supply of fresh water. Multiple ear problems included acute and chronic purulent and serous otitis media, and pebbles and other foreign bodies in the ear canals. Some of the ear problems appeared to be related to the significant amount of time children spent playing and swimming in the warm tropical lagoons.

The selection of pediatric oral agents for treatment of identified problems frequently presented a therapeutic challenge. The liberal use of antibiotics by health aides has been associated with the emergence of significant bacterial antibiotic resistance, even in this remote island setting. Cloxacillin suspension preparations, which generally might be indicated for treatment of impetigo in infants and young children, are stable for less than 48 hours at temperatures greater than 70°F unless refrigerated. The year-round mean temperature in the Marshall Islands is greater than 80°F and virtually none of the homes on the outer islands and only a few in the population centers have electricity. Thus, stability became one of the critical factors in selecting oral agents for the pediatric population.

Because of their stability in tropical climates, erythromycin ethylsuccinate and trimethoprim/sulfamethoxazole were particularly useful therapeutic agents.

Examination of children was facilitated by the great amount of trust the children exhibited to their adult caretaker. The Marshallese have an extended family network. Therefore, the primary adult caretaker may not be a biological parent. Children exhibited little fear or anxiety when held by their adult caretaker.

The logistical problems of providing health care to an island community may be best exemplified by the following case reports.

Case 1

On the island of Ebeye (Kwajalein atoll), an 18-month-old male was brought to the clinic with the complaint that the child had been noted to have "trouble breathing since he was born." The child had been seen on multiple occasions by several local physicians and previously was diagnosed as having "bronchitis" and had received several courses of antibiotics. The physical examination revealed a small, irritable, tachypnic infant (20th percentile for length and well below the 5th percentile for weight) with a heart rate of 140/min and a liver palpable 5 cm below the costal margin in the midclavicular line. His blood pressure was noted to be 130/30 mm Hg in the right arm, and the peripheral pulses were bounding. A grade IV/VI machinery murmur was heard over the precordium maximum at the left base. The electrocardiogram revealed left ventricular hypertrophy. The chest roentgenogram showed marked cardiomegaly, predominantly left sided, and markedly increased pulmonary vascularity. The infant was diagnosed as having a patent ductus arteriosus with congestive heart failure and was treated with furosemide (Lasix). Referral to a center in Honolulu was initiated. Corrective surgery was successful. The successful outcome is most likely due to presence of the medical team and the correct diagnosis by the team's pediatric cardiologist.

Case 2

Upon arrival of the ship on Utirik island, a 7-month-old female with a 3-week history of fever, rapid breathing, and decreased appetite was brought to the clinic. She had been treated with oral ampicillin for 2 weeks without improvement. Despite her progressive deterioration, no effort had been made by the health aide to obtain radio consultation or initiate evacuation prior to the arrival of the medical team. Examination revealed a febrile, tachypneic, undernourished female in marked respiratory distress with decreased lung sounds on the right, and rales and rhonchi bilaterally. Chest x-ray revealed consolidation of the right lung field. Arrangements were made with the Government of the Marshall Islands and the Kwajalein Missile Range for transfer of the patient to the U.S. Army hospital on Kwajalein. An Army aircraft with a nurse and respiratory support personnel was dispatched from Kwajalein to air evacuate the patient for appropriate hospital care. The process, which took less than 12 hours to

complete, was possible because of the recent completion of a small coral airstrip at Utirik. Prior to completion of the airstrip, transfer would have required emergency diversion of a ship followed by a 30- to 40-hour boat ride to the hospital facilities on Majuro or Kwajalein atoll. It is unlikely that the child would have survived if the pediatrician and medical team had not been present.

Summary

A method of providing health services to children on island communities has been presented. It incorporates day-to-day coverage by paramedical personnel, supplemented by interval visits of physicians supported by facilities for laboratory diagnosis. The program described cannot be called a "model" because the current approach is an evolved rather than a planned strategy, and there is no objective measure of its overall effectiveness. Its inadequacies are all too obvious to those who must deliver medical care in such a difficult setting. The logistics of providing health services to island populations make it imperative that health professionals work cooperatively to develop effective models for delivery of care so that all individuals, no matter where they live, may have an opportunity to enjoy a healthful life.

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