St. Paul-Ramsey Medical Center. Hospital and Medical Center Records.

Copyright Notice:

Version 3
August 20, 2018

FINAL REPORT

of the

SUNDS Planning Project

A summary of the current state of knowledge about Sudden Unexpected Nocturnal Death Syndrome occurring in Southeast Asians with recommendations for research and community action

Prepared with the financial support of
The Saint Paul Foundation, Mardag Foundation,
F. R. Bigelow Foundation, Edwards Memorial
Trust, Northwest Area Foundation, and private donors.

St. Paul-Ramsey Medical Center 640 Jackson Street St. Paul, MN 55101

FINAL REPORT OF THE SUNDS PLANNING PROJECT

A summary of the current state of knowledge about
Sudden Unexpected Nocturnal Death Syndrome
occurring in Southeast Asians
with recommendations for research and community action

Neal Holtan, M.D., M.P.H., Director
Dave Carlson
Jean Egbert
Rachel Mielke
T. Christopher Thao

Saint Paul-Ramsey Medical Center
640 Jackson Street
Saint Paul, Minnesota 55101

November 1984

ACKNOWLEDGEMENTS

The SUNDS Planning Project expresses its thanks to The Saint Paul Foundation, Mardag Foundation, F.R. Bigelow Foundation, Edwards Memorial Trust, Northwest Area Foundation, and the private donors whose generous contributions made this report possible. Thanks are also due to St. Paul-Ramsey Medical Center for its assistance during the Project's six months of work.

Margaret Bringewatt, Janice Godes, Marjorie Habenicht, Craig Hedberg, Kathleen Johnson, Sandra Krause, Teng Ly, Ellen Rau, DeAnn Rice, Tom Rogers, Win Terrell, Cheng Thao, Choua Thao, Vicki Thelen, Geu Vang, Leng Vang, Ly Vang, Dao Yang, and Fue Yang all deserve special recognition as members of the Project's Advisory Board. Others who assisted the Project were: Ronald Munger, Bruce Bliatout, Joseph Westermeyer, Mark Mahowald, Linda Hedemark, Fran Kaiser, Tom Davin, Mark Eberhardt, Rob Tauxe, Diana Rankin, Gloria Congden, Dave Ziegenhagen, Dang Her, Ted Kellogg, Sam Hall, Rick Kingston, Marshall Hurlich, Marc Pritzker, and Ricardo Uy.

One of the primary goals of the Project was to collect published references relevant to SUNDS. The authors of this report apologize for any errors in annotation of the references.

Finally, we wish to thank Karen Wilhaber, Cheryl Larson and Jan Raster for typing this report. And we would like to thank Joe Regan and Kristina Wilson of the St. Paul-Ramsey Medical Center's Duplication Center for all their speedy assistance.

This report is dedicated to the memory
of those who have died from the Sudden
Unexpected Nocturnal Death Syndrome.

TABLE OF CONTENTS

1. INTRODUCTION

Over the past decade, as large numbers of refugees from Southeast Asia have come to the United States, a frightening syndrome of sudden unexplained death has appeared. Since the first reported death in July 1977, more than 80 persons of various Southeast Asian ethnic groups have died from SUNDS, the Sudden Unexpected Nocturnal Death Syndrome. This report is the culmination of six months of work by the SUNDS Planning Project, an effort to bring together previously disconnected strands of knowledge in an attempt to help those trying to solve the mystery of the sudden deaths.

According to most estimates between 700,000 and 800,000 Southeast Asians have fled their homelands and settled in the U.S. since 1975. In Minnesota, almost 25,000 refugees have begun a new life after escaping from war or political persecution in Cambodia (Kampuchea), Laos, and Vietnam. For some, danger has followed them here. The difficulties of adjustment have been compounded by the loss of leaders and loved ones to the fatal syndrome which strikes apparently healthy young men in their sleep.

The SUNDS victims have ranged from 16 to 63 years of age, but most are between 25 and 44. All but one have been male, and all but one died between 9 P.M. and 8 A.M. In those cases which have been witnessed, the first signs of distress are choking or gurgling noises and difficulty breathing. Some witnesses have noted seizure-like activity, and in a few cases, medical personnel have documented an abnormal heart rhythm called ventricular fibrillation. Most victims, however, are simply found unresponsive.

Research into an explanation of these deaths has not yet produced any breakthroughs. Several chapters of this report describe previous research efforts. Investigators have become interested in similarities between SUNDS and syndromes of death during sleep described in parts of Asia (bangungut, a syndrome of sudden death in Filipino men living in Hawaii and Philippines, and pokkuri disease from Japan).

Who are the people affected by SUNDS in the United States? In 51 cases reported by the Centers for Disease Control, the victims represented four primary ethnic groups: Hmong (29), Laotian (12), Kampuchean (6), and Vietnamese (4). The sudden deaths have an usually high incidence among Laotians, particularly Hmong refugees from Laos. In fact, the SUNDS death rate (87/100,000) among Laotian men age 25-44 is comparable to the sum of the rates of the four leading causes of death in all U.S. males of that age group.

The Hmong, who have suffered the most incidents of SUNDS, have roots going back to ancient China. Beginning in the early 19th century, Hmong--called "Miao" or "Meo" (Barbarian) by the Hun Chinese--migrated south to freer lives in the mountainous northern regions of Laos. Until recently the Hmong comprised nearly one-tenth of the entire Laotian population. Their tight social organization based on family and clan and on an agricultural lifestyle remained basically unchanged. Beginning in the 1950s, war ravaged the Hmong culture. Fighting first to preserve French rule in Indochina and then to protect Laos' independence from Communist forces, the Hmong eventually became allies of the

U.S. in its war against North Vietnam. Because of their cooperation with the CIA and the American military, the Hmong were persecuted when the Pathet Lao took control of the Vientiane Government in 1975. Afterwards, the strong population of 300,000 dwindled and dispersed as Hmong sought refuge from terror in Thailand's refugee camps.

More than 60,000 Hmong have relocated to the U.S. One of the largest Hmong communities has begun to rebuild in St. Paul/Minneapolis. The transition has not been easy, and the 15 cases of SUNDS in Minnesota add a tremendous anxiety to community life for the Hmong in this area. The syndrome is as baffling to them as it is to researchers and even more disturbing. Some men set their alarm clocks to ring every half hour during the night--just to be sure they are still alive. "I worry," one man says, "and I cannot make my body to sleep."

Agencies working with the Hmong agree that SUNDS is a major cause of fear and concern in the community. Sensing this concern and frustrated with the lack of progress combatting SUNDS, a group of health care and social service professionals met with refugee leaders and representatives of The Saint Paul Foundation in December 1983 to make a plan to address the pressing needs: a lack of communication between refugees and researchers and between refugees and medical providers; problems in the utilization of emergency medical resources; misunderstandings over research goals and outcomes; and a lack of organization.

Funding was obtained for a six-month planning project which would "promote discovery of the cause and cure of SUNDS and foster programs for prevention and intervention." On April 24, 1984, staff and volunteers began work on the objectives. An Advisory Board was formed to make recommendations about the accuracy and feasibility of the Project's activities. Its members, leaders of the refugee community and experts from health and social service, also provided links to the various audiences and assisted in the collection and distribution of information.

An "information system" evolved to store published articles, data from interviews and other information, and make it accessible to providers and refugees. The task of information distribution became the Project's aim, and brochures, newsletters, targeted mailings and personal presentations enabled the project to inform thousands of people about SUNDS. Meetings of epidemiologists and other researchers and health workers were convened to promote agreement on case definition, investigation protocols, prevention strategies, and recommendations.

Finally, the comprehensive review of the issue of SUNDS led to the formulation of a long-range plan for SUNDS with proposals for future research and community intervention. This final report is a step toward implementing the long-range plan.

We hope that the summary of information in each chapter is an accurate reflection of the references listed, and we encourage you to consult these sources. Please join the fight against SUNDS by implementing the recommendations which you find reasonable.

1. References

Garrett, W.E.: The Hmong of Laos: No Place to Run. National Geographic January 1974; 145:78-111.

Describes family and community life among the Hmong who were being driven from their mountain homelands into the mainstream of Laotian culture. After 14 years of fighting for the U.S. Central Intelligence Agency against communist armies, 30,000 Hmong had been killed. With a coalition government of Pathet Lao and Royal Lao in control of the country, the Hmong were being forced to leave their remote villages in northern Laos for resettlement.

Hall, D.G.E.: History of Southeast Asia. 3rd ed. New York:St. Martins Press, 1968.

Karnow, S.: Free No More: The Allies America Forgot. Geo January 1980; 2:8-26.

Tells the story of the Hmong since 1975, when communist armies took control of Laos. Suffering revenge for their involvement with U.S. military efforts, 80,000 Hmong flee to refugee camps in Thailand. Many die during the difficult journey, and crossing the Mekong River does not guarantee an end to their despair, as they wait for permission to come to the U.S. Article describes life in the refugee camps and the changes in traditional lifestyle brought about by resettlement experiences.

LeBar, F.M., Hickey, G.C., and Musgrave, J.K.: Ethnic Groups of Mainland Southeast Asia. New Haven, CT: Human Relations Area Files Press, 1964.

LeBar, F.M., Suedard, A., Editors. Laos: Its People, Its Society, Its Culture. New Haven, CT, Human Relations Area Files Press, 1960.

Olney, D.T.: A Bibliography of the Hmong (Miao). 2nd ed., Minneapolis, MN: Center for Urban and Regional Affairs, 1983.

Lists items related to Hmong ethnography (kinship and social organization, religion, etc.) and linguistic studies of the Hmong. Also provides index of general works on Southeast Asia, and articles dealing with resettlement issues.

Steinberg, D.J., ed. Cambodia: Its People, Its Society, Its Culture. New Haven, CT: Human Relations Area Files Press, 1957.

Steinberg, D.J., ed. In Search of Southeast Asia: A Modern History. New York, Praeger, 1971.

White, P.T.: Mosaic of Cultures. National Geographic March 1971, pp. 296-329.

A recollection of the author's travels, describing the mixture of people from mainland Southeast Asia.

2. THE EPIDEMIOLOGY OF SUNDS

The first written report of the Sudden Unexpected Nocturnal Death Syndrome (SUNDS) among Southeast Asian refugees in the United States was published in Morbidity and Mortality Weekly Report from the Centers for Disease Control in Atlanta, GA, on December 4, 1981. (CDC, 1981) The five page article entitled the syndrome "Sudden Unexpected Nocturnal Death" and described the characteristics of 38 of its victims, all Southeast Asian refugees.

All but one of the cases were males. Twenty-five were Hmong, 8 Laotians, 4 Vietnamese, and 1 Kampuchean. Median period of time in the United States was 5 months (range 5 days to 52 months) before death. Geographical distribution of the deaths reflected the distribution of the Southeast Asian refugees in the United States.

Interviews conducted with the families of the victims created a profile of the deceased subjects and their manner of death. Medical examiner's reports provided additional information.

Death occurred between 9:30 p.m. and 7:00 a.m. in the 29 persons whose deaths were witnessed by relatives. Twenty-eight of them appeared to be asleep just prior to death, "and one was just falling asleep". None of the victims had complained of illness or symptoms before going to bed, and all were considered by family members to have been in good health. Witnesses of the deaths became aware of abnormal breathing sounds, in some cases preceeded by a brief groan, and victims could not be aroused. Terminal respirations were said to be "deep, labored, and irregular, but without stridor or wheezing". Most of the victims remained flaccid during these events although a few were described as having tonic rigidity. Seven cases were incontinent of urine or feces. Witnesses recalled no signs of pain or terrifying dreams.

Five persons whose deaths were unwitnessed died sometime between midnight and 9:00 a.m. They were found in bed, appearing to have died during sleep. Four other victims reported by coroners had no relatives available for interviewing.

Two of the victims were still alive when paramedics reached them. The two were in ventricular fibrillation but they could not be resuscitated.

The family interviews yielded no clues as to why the victims had died. None of the victims were related to each other but one had a paternal first cousin who had died similarly in Laos. The victims were not known as having clinical symptoms of sleep apnea syndrome.

The report noted that 30 of the 36 cases with completed investigations had no apparent cause of death after autopsies and toxicologic tests. The findings were confirmed by CDC pathologists. Two deaths first ascribed to myocarditis were reclassified as having no apparent cause of death. Findings consistent with myocarditis were accepted in one case. In the other three cases, cause of death was ascribed to coronary atherosclerosis, but in none of them was there

any evidence of coronary artery thrombosis or myocardial infarction. Investigations of the remaining two cases were pending at the time of the report.

In discussing the significance of the cases, the CDC investigators noted that the deaths "may constitute a new syndrome" because of the differences in the epidemiologic pattern between them and other victims of sudden death, because of the quickness of the deaths, and because of the lack of any ascribed cause after extensive investigation. They also noted the high death rate ascribed to SUNDS in the 25-44 age group of Laotian and Hmong males, 87 per 100,000. That rate "is comparable to the sum of the 4 leading causes of natural death (86.9/100,000) among US males in that age group". (CDC, 1981)

A study of sudden non-violent deaths in Baltimore, MD, during a one year period found no deaths of men 20 to 39 years old which could not be explained on the basis of underlying diseases. (Kuller, Lilienfeld, and Fisher, 1966) The sudden death rate was 65/100,000 for all causes. In those deaths which were witnessed, death occurred in less than two hours in fewer than half the cases.

An important investigation of SUNDS was reported by researchers from the Centers for Disease Control in the Journal of the American Medical Association (Baron, et. al., 1983) Additional cases had been identified since the initial report, bringing the total to 51. The characteristics of the enlarged case group were similar to the earlier reported 38 cases. Twenty-nine (including the only female) were Hmong, 12 Lao, 6 Kampuchean, and 4 Vietnamese. Ages ranged from 16 to 63 (median 33). Three-fourths of the cases were between 25 and 45 years of age.

Additional information from interviews of relatives of 45 of the cases revealed that the 38 witnessed deaths occurred between minutes and 8.5 hours after the decedent had gone to bed (median 3.5 hours). Seven witnesses observed the fatal episode in its entirety and confirmed that the victim had been sleeping peacefully when it started. Victims never appeared to regain consciousness and they did not respond to any attempts to rouse them. Witnessed episodes ended within minutes in death.

Deaths occurred between two days and 52 months after arrival in the US (median 9 months). Death rates for the different ethnic groups seemed to reflect the numbers of newly arriving refugees from Southeast Asia, including increased numbers of Hmong and Kampuchean refugees. Death rates over a one year period in 1981-82 were 92 per 100,000 for Hmong, 82 for other Lao, and 59 for Kampucheans.

Families of those who had died reported that the victims had been in good health on the day of death. None had suffered from epilepsy, allergies, or syncope. Spouses could recall no prior episodes of respiratory noises or apnea during sleep. The families reported that none of the deceased used traditional medicines. Review of the events of the day before death did not identify any common social, religious, or occupational factors. Dietary content of the final meal had not been unusual and family members had eaten the same food. Acute, severe situations of stress had occurred within one day of death in only four of the subjects. One other had a history of depression.

Details of past experience in the native country or in refugee camps provided no clue as to cause of death in the subjects. They had not been exposed to chemical warfare agents in Asia to the families' knowledge. They were non-users of drugs or alcohol in the United States. None of the victims were related.

Post-mortem studies of the victims showed non-specific findings, and no apparent cause of death.

Analytic Study

In a second portion of the same study, researchers conducted a case-control comparison using the first 26 cases of SUNDS in Hmong and Laotians. Three control groups were selected. One control group consisted of living persons of the same sex, ethnic group, and age (within five years) matched to the cases. Another control group was similar to the first but of the opposite sex. The third control group was of the same sex but of different Laotian ethnicity. (Baron, et. al., 1983)

Results comparing cases to controls were meager. No single variable was found which differentiated cases from controls. Three of the 15 factors were determined by factor analysis to be significantly associated with SUNDS when groups of variables for the cases were compared with those of the controls (same sex and ethnic group). First, the cases tended to have stayed in the US less than six months, to have left Laos less than three years earlier, to have spent a greater proportion of their income on housing, and to have acquired fewer possessions in the US. Second, although cases had similar amounts of English training, they had less job training. Third, cases had gained weight less frequently than controls and lost weight more frequently. The authors of the study concluded that factors which enhance emotional stress or result from such stress were a "possible precipitating element in these deaths."

The data left two important issues unresolved. It did not explain why the deaths occurred during sleep nor why the victims were nearly all males.

Discussion

In the summer of 1984, the SUNDS Planning Project arranged for a group of eight epidemiologists knowledgeable about SUNDS to meet informally on two occasions in Minneapolis to discuss SUNDS epidemiology. The group was asked to identify techniques and directions for studying SUNDS and to formulate recommendations about the syndrome for use by public health officials in responding to SUNDS.

In its first meeting, the group noted difficulty with agreeing on a case definition of SUNDS. Other discussion topics were: identification of subjects at risk, communication among researchers, and methods for community intervention.

At its second meeting, the group of epidemiologists made the following observations and set of recommendations:

1. Case Definition

The present case definition of SUNDS may not be adequate to define the spectrum of the syndrome.

Two levels of case definition may be appropriate, analogous to culture-proven and presumptive diagnoses in infectious disease epidemiology. A case which meets clinical and demographic criteria but not confirmed by autopsy could be considered presumptive.

The issue of SUNDS-like or SUNDS-related events needs further consideration:

"Survivors" or "near-misses", persons fitting demographic and clinical criteria for SUNDS who suffered a cardiac or respiratory arrest, were resuscitated or recovered spontaneously, and were later found to have no explainable reason for the arrest on clinical evaluation.

Persons who fit the demographic characteristics for SUNDS cases and who are observed by others to have the following transient nocturnal signs:

1) breathing pauses in sleep
2) seizures or muscle spasms during sleep
3) loud snoring, gasping or choking sounds during sleep
4) cyanosis during sleep
5) unarousability from sleep

Persons who fit the demographic characteristics of SUNDS and who have transient nocturnal events with the following symptoms:

1) a sense of panic or extreme fear
2) paralysis (partial or complete)
3) a sense of pressure on the chest
4) a sense that there is an alien being (animal, human, or spirit) in the room
5) a disturbance in sensation (auditory, visual, or tactile)

Recommendations

A. A relatively young, healthy person, usually male and Asian, who dies suddenly while sleeping, with no known factors precipitating cardiac arrest and without any cause explainable with post-mortem studies is defined as a case of SUNDS.

B. A sudden fatality during sleep in a previously healthy member of a group demographically similar to past SUNDS cases but whose death is not investigated with an autopsy is defined as presumptive SUNDS.

C. Non-fatal cardiac or respiratory arrest in a subject demographically similar to the case definition of SUNDS is defined as a SUNDS-like episode, unless other medical explanation is found for the arrest.

D. A subject demographically similar to the past cases of SUNDS who has 3 of the 5 symptoms or one of the signs listed above is defined as being at high risk for SUNDS.

2. Surveillance and Casefinding

Surveillance and casefinding for SUNDS and for SUNDS-like episodes can be organized through medical examiners' offices, refugee organizations, vital statistics, or ambulance and paramedic records. Surveillance through medical examiners' offices is the most reliable method to conduct surveillance for SUNDS cases. SUNDS-like episodes might be identified through refugee leaders or through the study of emergency records. The use of vital statistics in the various states to find cases of SUNDS is fraught with problems including the lack of a uniform code for SUNDS and the known use of several different death codes for SUNDS in the past. Another problem is the lag time for completion of vital statistic computer tapes. A third problem with vital statistics surveillance is the inability to sort out the mortality data for Southeast Asians from other Asian-Americans including large numbers of Vietnamese refugees who have an apparently low rate of SUNDS.

Recommendations

A. The appropriate federal agency ought to develop a surveillance system for SUNDS.

B. The surveillance system should concentrate on medical examiners' offices, using periodic telephone calls.

C. Refugee organizations should be consulted in planning a surveillance system and an active reporting scheme should be developed for those organizations.

D. Pilot studies of the patterns of emergency telephone calls, ambulance rides, and emergency room visits by Southeast Asians in selected locations should be done to determine the need for surveillance for SUNDS-like episodes.

3. Case Registry

The case registry should contain all known and available cases of SUNDS, past and current, presumptive cases, and SUNDS-like episodes.

Recommendations

A. The appropriate federal agency should develop and maintain a SUNDS case registry.

B. The case registry data should be available to non-federal researchers under existing rules and regulations.

4. Investigation Protocols

The SUNDS Planning Project provided the discussion group with examples of

two questionnaires, one for SUNDS cases and the other for subjects of SUNDS-like episodes. (See Appendix) The questionnaires were produced as a stop-gap measure for capturing information until a definitive registry and subsequent studies are devised. Several members of the group made suggestions about improving the protocols.

The group discussed the idea of a new case control study. Problems which might have prevented the first case control study from showing results were mentioned, including small numbers, possible lack of cooperation among the interviewees, and cultural differences which may have interfered with reliable answers.

Recommendations

A. Given an active surveillance and case registry system in place, a new case control study ought to be designed and conducted by the appropriate federal agency and/or its designate(s).

B. Existing questionnaires should be used only until more refined instruments are designed in the context of a case control study.

C. New questionnaires and other research instruments should be written with the utmost sensitivity to cultural differences between the interviewer and the interviewee, and the interviewer should be fluent in the native language of the interviewee.

5. Identifying Subjects at Risk for SUNDS

Review of the literature of unexplained cardiovascular sudden death and of sleep apnea suggests no reliable way to screen subjects for SUNDS risk. There is no basis to believe that the electrocardiogram, the 24-hour ambulatory heart monitor, or the exercise stress test are appropriate screening tools to identify high risk individuals. There is evidence that sleep apnea occurs in relatives of SUNDS victims and in asymptomatic Hmong individuals. In a study of pokkuri, a SUNDS-like syndrome in Japan, fourteen victims had an average hemoglobin of 17.1 Gm/dl while controls who died of acute poisoning had a hemoglobin of 14.7 Gm/dl on the average. (Sugai, 1959) Hematocrits were 50.3 and 43.5% respectively. This observation raises the possibility of screening Indochinese refugees for erythrocytosis or elevated hemoglobins as a possible marker of sleep apnea, high risk for SUNDS, or both.

Following up on the suggestion that certain types of dreams or events during sleep might be associated with SUNDS, Project staff questioned several Hmong community groups (a support group for elderly females, two student groups, a group of Hmong war veterans, the leadership of Lao Family Community. and the Association for the Advancement of Hmong Women in Minnesota). It seemed to be the general consensus that the quality and quantity of dreams are not a reliable marker for potential victims of SUNDS. Hmong individuals point out that persons are often reluctant to talk about their dreams. Those who retain the traditional religion are more apt to place credence on the possibility of dreams or spirits playing a role in SUNDS. The elderly are more likely to believe in the traditional religion. No one offered any suggestions as to how the traditional

religion or the dreams could be used in identifying persons at risk for dying.

Also at these meetings, two persons with SUNDS-like episodes, both close male relatives of a victim, and three persons related to young men who had had SUNDS-like episodes described these experiences. In general, they stated that outside of a brief visit to the doctor, no clinical evaluation was conducted.

Recommendations

A. The feasibility of using the hemoglobin or hematocrit to screen Southeast Asians for risk for SUNDS or sleep apnea ought to be studied.

B. Refugee leaders and community organizations ought to be extensively involved in any attempt to screen subjects for risk for SUNDS.

C. As they obtain medical screening and ongoing medical care, patients and their spouses in demographic groups similar to past cases of SUNDS ought to be questioned about the signs and symptoms of SUNDS-like episodes and about possible SUNDS-related events during sleep.

6. Communication with Research Subjects and Community Leaders

The two research groups in the Twin Cities who have completed or contemplated sleep studies for Southeast Asians described severe communication difficulties with research subjects. Potential Hmong research subjects and their relatives expressed misgivings about high technology studies. The Hmong women in particular described their efforts to convince particular male individuals to have tests but were met with the argument that the tests would be dangerous and probably would not help that individual.

Recommendations

A. Sleep studies and other research activities might concentrate on Lao and Khmer rather than Hmong subjects.

B. Research or clinical study of two or more refugees ought to be organized with the help of the appropriate refugee leaders.

C. Research projects should have a bilingual coordinator on staff.

7. Communication Among Researchers

After talking with several researchers in the Twin Cities, Project staff concluded that communication among them about SUNDS and about research strategies with refugees is limited. Their findings are shared mainly through publications in medical journals.

Recommendations

A. The appropriate federal agency should organize a regional or national research conference on the subject of SUNDS.

B. A central place for information and referral for researchers and for their contacts with the refugee communities needs to exist.

8. Methods of Intervention for Individuals and Communities at High Risk

Efforts by public health nurses and others to emphasize the use of the 911 emergency telephone number to refugees were discussed. Problems in the system are said to occur because of the language barrier.

Cardiopulmonary resuscitation (CPR) training has been taught to Hmong and other Southeast Asians in several locations in the United States, but written information is not available on the outcome of the training programs. Many refugees express a strong interest in receiving CPR training. It was suggested that CPR training be targeted to teenagers in high schools because of their better facility with the English language. It was also suggested that women be a high priority group to receive CPR training.

At the present time in the Twin Cities there is no component of medical screening for incoming Southeast Asian refugees which deals directly with SUNDS.

Based on descriptions from refugees who have had SUNDS-like experiences, health care providers may be unaware of the high incidence and the high risk of SUNDS in the Southeast Asian population. A SUNDS death has occurred in a transport vehicle not equipped with a defibrillator.

Staff members of the SUNDS Planning Project have queried large numbers of Hmong refugees about whether or not discussing SUNDS with new refugees or with established refugees could constitute a danger, unnecessarily alarming them because there are few actions which an individual refugee can take. The staff was unable to find any Hmong who felt that discussion could be harmful in any way. On the contrary, they felt that incoming refugees already know about SUNDS and would benefit psychologically from knowing that American medical personnel are also aware and concerned. The project's Advisory Board concurred.

Recommendations

A. Public health nurses and public health nursing services need to emphasize training in use of the 911 emergency number with refugee clients. They also ought to refer clients to CPR training programs and organize such programs if none are available.

B. 911 emergency lines should periodically evaluate response and response time to callers who cannot speak English.

C. Sites where Southeast Asian refugees are screened soon after arrival should incorporate questions about SUNDS and education about emergency responses into their routine screening protocols.

Where is this done??

D. The appropriate state and federal agencies should create criteria to identify persons at high risk for SUNDS and guidelines for the clinical

evaluation of persons at high risk.

E. The appropriate state and federal agencies should produce educational materials and advisories for health professionals, including paramedics, about SUNDS.

F. Physicians, in particular, should be made aware of the need for full evaluation and treatment of persons who have suffered SUNDS-like episodes and persons who are at high risk for SUNDS.

2. References

Baron, R.C., Thacker, S.B., Gorelkin, L., Vernon, A.A., Taylor, W.R., Choi, R.: Sudden Death Among Southeast Asian Refugees: An Unexplained Nocturnal Phenomenon. The Journal of the American Medical Association December 2, 1983; 250:2947-2951.

This case-control study of 26 deaths failed to establish causal factors, but the article suggests that some of the deaths may be associated with abnormalities in the conduction system pathways of the heart. Includes epidemiologic description of 51 cases reported through March 1982, details of case-control study, and preliminary findings of cardiac studies. Concludes that emotional stress cannot be ruled out as a contributing factor.

The Centers for Disease Control: Sudden Unexpected, Nocturnal Deaths among Southeast Refugees. Morbidity and Mortality Weekly Report December 4, 1981; 30:581-589.

Initial report from Centers for Disease Control describes the circumstances of 38 cases of sudden death among Southeast Asian refugees occurring between July 1977 and October 1981, and suggests the possibility of a "distinct syndrome". From interviews with families and review of medical examiners' and coroners' reports, article presents symptoms, estimated rates, and avenues for investigation. Notes that it is relatively uncommon for sudden deaths to remain unexplained after thorough postmortem examinations.

Kasl. S.V.; Berkman, L.: Health Consequences of the Experience of Migration. American Review of Public Health 1983; 4:69-90.

A review of the literature of health changes in migrating populations. Detailed discussions of the studies of Jews migrating to Israel and of Japanese migrating to the United States. The logic of health studies of immigrants and methodologic limitations are considered. 101 references.

Kuller, L.; Lilienfeld, A.; Fisher, R.: An Epidemiologic Study of Sudden and Unexpected Deaths in Adults. Medica 1967; 46:341-361.

A review of the literature of sudden death is provided. Death records for one period, June 1964-July 1965, were analyzed in the city of Baltimore. Thirty-two percent of the 3326 deaths reported in the 40-64 age range were sudden and unexpected. A higher percentage of male deaths were sudden but no racial differences were noted in sudden vs. not-sudden. Because of a large number of unwitnessed but sudden (less than 24 hours) deaths, time of day for the deaths was not analyzed. Atherosclerotic heart disease accounted for 61.4% and cerebrovascular disease for 9.2% of the sudden deaths. An "all other" category includes several different diseases such as acute or chronic infections, diseases associated with massive sudden hemorrhage, 4 deaths due to pulmonary emboli and several due to cardiomyopathies.

Moritz, A.R.; Zamcheck, N.: Sudden and Unexpected Deaths of Young Soldiers. Archives of Pathology November 1946; 42:459-494.

Healthy young adults, mostly men, who died suddenly and unexpectedly were studied from the records of the Army Institute of Pathology. Body weight of those who died unexpectedly was decidedly greater than that of average soldier. Death rates by cause were not determined due to the large number of records (over 40,000). Representative samples were taken from major categories known to cause sudden death and characteristics described. A group of "miscellaneous" causes of death is discussed, and 15 causes, mainly infectious, are listed. Of interest is a group of 140 carefully investigated cases in which the postmortem findings were essentially normal. The group was older than the distribution of the entire army. The race ratio was the same. There was no relationship between physical activity and onset of the collapse. Ninety-three percent died within a few minutes after onset of fatal seizure. In 100 cases, state of health was normal or not stated in the record. Ten cases were described as "not feeling well", 9 with substernal or epigastric discomfort, 8 with acute agitated psychotic episode, 7 with headaches, 3 with upper respiratory infection and 3 with vomiting. The characteristics of the fatal event was simple syncope 68, convulsion 17, chest pain 9, headache 2, not known 44. Past medical history was negative except in 10 cases who had had previous convulsive seizures. Postmortem findings in the 140 cases showed no pathologic change in 33, obesity in 23, cardiac hypertrophy in 18, small occasional atheroma 16, focal myocarditis in 3, fat infiltration of right ventricle 2, craniocerebral adhesions 2, purulent bronchitis 1, chronic catarrhal bronchitis 1, mild interstitial pneumonitis 1, and generalized arteriolar sclerosis 1.

Munger, R.G.: Sudden Adult Death in Asian Populations: The Case of the Hmong. In The Hmong in the West, edited by B. Downing, D. Olney, pp.307-319. Minneapolis: University of Minnesota, Center for Urban and Regional Affairs, 1982.

Points out similarities in time of death (mean: 2-3 a.m.) and age distribution (range: 20-60; peak: 25-35) between Hmong sudden deaths and "bangungut", a phenomenon first reported in 1948 among Filipino men. Also notes that similar deaths have been reported in Japanese populations. All these possibly-related incidents differ from cardiac deaths in industrialized regions, which increase in rate dramatically with age. Article examines three popular hypotheses concerning sudden death: nightmare fright, chemical exposure, and congenital effects due to inbreeding. States that there is no evidence to support any of these hypotheses. Suggests sleep apnea syndromes as "most promising area of research".

Sugai, Masayoshi: A Pathological Study on Sudden and Unexpected Death, Especially on the Cardiac Death Autopsied by Medical Examiners in Tokyo. Acta Pathologica Japonica 1959; Supplement 9:723-752.

An analysis of 18,515 consecutive autopsies in Japan. The author further describes 270 cases of heart diseases which he himself examined. Cardiac death

of unknown etiology occurred in 76 of these and almost all were young men who had been considered to be in good health. They died "suddenly during sleep with a groan as if having a dreadful dream and agonal deep respiration with stretching of limbs". This syndrome has been called "pokkuri disease", meaning sudden unexpected phenomenon. Autopsies were negative. The heart was slightly hypertrophic in the majority but less than 400 G. Another set of 39 similar cases was added and the whole case group compared with controls who died violent deaths. Ages of the pokkuri deaths were 18-48 years, body weights 44.0-70.5 Kg., heart weights 270-580 G. In each decade, either the average body weight or the average heart weight was greater for cases than controls. Occupation did not differ for cases and controls. Time of death for cases was midnight to 4:00 a.m. About a third of these cases had been drinking alcohol according to family members. However, none were found to have ethyl alcohol blood levels above 0.1%. A subset of cases had an average specific gravity of blood higher than controls (1.064.3 vs. 1.057) but the same specific gravity of plasma. Cases had an average higher total protein of plasma (9.1g/dl vs. 8.3). Average hemoglobin was 17.1 (Hct. 50.3%) in cases, 14.7 (Hct. 43.5%) in controls. In a subset of each, the cases had more right coronary artery preponderance than the controls. The nervous system of the cases were also examined. As opposed to the controls, hypoplasia with cellular regression of the sympathetic nervous tissue including the superior and inferior cervical ganglia existed in cases.

3. INTERNATIONAL AND ANTHROPOLOGICAL STUDIES OF SUDDEN DEATH

Sudden death in healthy individuals is a phenomenon that has occurred throughout history and in many cultures. Because of their sudden and unexpected nature, many of these deaths have been attributed to supernatural and psychological, as well as, physiological causes. There has been speculation that the Sudden Unexpected Nocturnal Death Syndrome (SUNDS) in Southeast Asian Refugees in the United States may be triggered by such factors as stress, night terror, evil spirits, or culture shock. The deaths need to be put into a worldwide context by reviewing studies conducted in countries outside of the United States. These reports take primarily an anthropological point of view of sudden death.

Sudden Death in Southeast Asia

Very few studies have been published about the occurrence of SUNDS in Southeast Asia. A recent field investigation conducted in the Ban Vinai Refugee Camp in Loei Province of northeastern Thailand is the only study by an American to look specifically for SUNDS in Southeast Asia. (Munger, 1983) One goal was to "document whether or not sudden unexpected deaths during sleep occurred in Hmong refugees in Thailand. The next step was to study the characteristics of sudden death victims (cases) as compared to randomly selected individuals in Ban Vinai of the same ethnicity, age and sex (controls)." A surveillance network was organized using the existing social structure in Ban Vinai to locate cases.

> Twenty-seven formal interviews were conducted in Ban Vinai with relatives of sudden death victims. Sixteen of these were cases of sudden unexpected death during sleep in which the victim was not previously ill....Four case reports were collected in which victims of sudden death in sleep had experienced previous non-fatal sleep disturbances, including abnormal respiratory sounds, breathing difficulties, or transient loss of consciousness. None of the controls experienced such sleep disturbances....Six Hmong refugees in Ban Vinai, all alive at the time of the study, also reported episodes of seizure-like activity and unresponsiveness in sleep. Such cases of non-fatal sleep disturbances are consistent with the hypothesis that disorders of the control of respiration during sleep - the sleep apnea syndrome - may be related to the Southeast Asian sudden deaths in sleep. (Munger, 1983.)

Sudden Death in the Philippines

A number of older studies have identified a Filipino sudden nocturnal death known in Tagalog as bangungut. "In the Filipino cases, previously healthy males died during the night making moaning, snoring or choking noises. Bangungut means nightmare in Filipino and reflects theories that the mysterious deaths were caused by terror during a nightmare." (Bliatout, 1982) In the majority of cases the victims were in their 30's and 40's. "The disorder was officially recognized as an entity in Manila in 1915, and was described in a medical publication of that city two years later. About 20-30 cases are seen

in Manila yearly. Bangungut has also been seen among Filipinos living in the Hawaiian Islands." (Aponte, 1960)

No consistent cause has been found for the acute cardiorespiratory failure preceeding death in these cases. A number of hypotheses have been tested but all were found lacking by their investigators. According to some, death may be caused by the consumption of a large Filipino meal followed by a violent dream. It was thought that overdistention of the stomach by the recently ingested food interfered with cardiac and pulmonary function. (Manalang, 1948)

Dr. Nils P. Larsen, a Honolulu pathologist who examined Filipino victims of bangungut in Hawaii in 1955, proposed excessive fear during sleep due to a nightmare as the cause of death. He found no consistent post-mortem findings to otherwise explain the deaths and was intrigued by the possibility that the Hawaiian counterpart of voodoo - being "kahunaed" - could be the cause. (Bliatout, 1982) Dr. J.G. Nolasco of the University of Manila wondered whether the Filipino sudden nocturnal deaths were due to consumption of toxic material in fish products commonly consumed in that country. Potent vasodepressors capable of causing death have been found in some preserved fish products eaten in the Philippines, but victims of bangungut had not all eaten fish or fish products the day they died. The sudden death selectively affected males in a limited age group but did not occur among family members who had eaten the same food at the same time.

A study in Guam of 11 cases of bangungut affirmed that the food poisoning theory was implausible. Witnesses of some of the deaths described the victim as thrashing and groaning in his sleep as if in a dream. Extensive post-mortem study again showed no consistent cause for the acute cardiorespiratory failure and sudden death. (Aponte, 1960)

The author of a study investigating 81 sudden deaths in young Filipino men in Hawaii between 1937 and 1948 concluded that, "The chief post-mortem finding in most of these cases had been an acute hemorrhagic pancreatitis but it is not known whether this finding is cause or effect." (Majoska, 1948)

Based on experience as director of the Emergency Department at Philippine General Hospital in Manila, Dr. Ricardo Uy has seen numerous cases similar to SUNDS. He states that "the usual profile of a SUNDS victim is a young male adult, a stocky build construction worker who migrated from the Visayan Islands to work in Manila and who had either a drinking spree shortly before sleeping or had just had a fatty meal prior to retiring for the night. More often than not, they are brought to the emergency room by fellow workers who are unable to wake him after being alerted by the patient's moaning and groaning in his sleep." (R. Uy, personal communication, 1984)

Sudden Death in Japan

A Japanese sudden nocturnal death known in Japanese as pokkuri disease has been investigated by Japanese cardiologists, pathologists, and endocrinologists. The circumstances of death in pokkuri disease are very similar to those described for Southeast Asian and Filipino sudden nocturnal deaths. A study of 18,515 consecutive autopsies in Japan found cardiac death of unknown etiology in 76 cases. Almost all of these deaths occurred in young

men who had been considered to be good health. They died "suddenly during sleep with a groan as if having a dreadful dream and agonal deep respiration with stretching of the limbs". (Sugai, 1959)

Several Japanese teachers studying in the United States have mentioned "pokkuri temples" in Japan. "They are not widely distributed in Japan" one Japanese women said, "but most people have heard of them." Another young woman explained that these temples were places where older men will go to pray that they die quickly and quietly in their sleep, rather than die painful, prolonged deaths. Pokkuri is seen as something positive. A teacher of Japanese living in the United States further explained that as far as she knew, pokkuri did not occur often in young men and she was not aware that pokkuri was a major health concern in Japan today.

Psychological and Supernatural Beliefs about Sudden Death

> "Few folklore notions have enjoyed as widespread and persistent popularity as those that ascribe sudden death to emotional shock. As far back as written records exist, people are described as dying suddenly while in the throes of fear, rage, grief, humiliation, or joy; a fate often believed by the devote to be sanctioned by devine edict." (Engel, 1971)

Emotional trauma, voodoo, spirits, and magic have all been suggested as important factors for sudden unexpected death in folk cultures. Examples such as voodoo are well recognized, even by Western cultures. Modern biomedical beliefs prescribe that these "psychological" factors cannot cause deaths but may trigger a fatal event.

One hundred-seventy cases of sudden unexpected death culled from newspapers in the United States over a six year period were analyzed. The victims experienced overwhelming excitation, loss of control, and giving up. The setting was often one where fight or flight was impossible. In one ironic example, "a patient died while celebrating the doctor's verdict that his heart was sound." (Engel, 1971)

A different emphasis occurs in reports of sudden death among persons living in cultures where the concept of psychological sudden death has greater currency than in the United States. One review article cites observations made as far back as 1587 by anthropologists and others, attributing death to voodoo, sorcery, or witchcraft. For example, in Australia in 1941 there was a belief among the northern Aborigines that a person who has been pointed at with a bone ("boned") will die as a result. "Unless help is forthcoming in the shape of a countercharm administered by the hand of the Nangarri, or medicine man, his death is only a matter of a comparatively short time." (Cannon, 1957) Dr. Roth, a government surgeon among the people of north central Queensland in 1897 wrote, "So rooted sometimes is this belief on the part of the patient that some enemy has pointed the bone at him, that he will actually lie down to die and succeed in the attempt, even at the expense of refusing food and succour within his reach: I have myself witnessed three or four such cases." (Cannon, 1957)

There is one report of 200 instances of sudden death in Transvaal, South Africa. Autopsies performed on some of the victims were completely negative. Curses, voodoo and magic were considered as precipitating factors. (Burch,

1965)

Another description cited "certain peculiarities of rural Bantu" noted by a physician in South Africa who observed "the puzzling phenomenon of wishful dying....men aged 50 years or more and in apparent good health can die deliberately within a few hours. At autopsy no obvious cause of death can be found." Suicide by poisoning was ruled out. (Burrell, 1957) The doctor also described the experience of having several of his aged male patients with good prognosis suddenly demand discharge from the hospital and were taken home by relatives to die. When these cases were followed up, they indeed had died within hours of reaching home.

As Engel has concluded, the dramatic circumstances preceeding these deaths cannot be construed as evidence for a cause and effect relationship. But examples of belief in witchcraft or voodoo as a cause of death and examples of a wish to die followed by death certainly point to phenomena that have not been fully explained by Western biomedical understanding of death. Potent psychological factors may be involved as triggers of death.

Several studies of the Hmong, the group hardest hit by the Sudden Unexpected Nocturnal Death Syndrome in the United States, have proposed psychological triggers for their deaths. An extensive cultural study of SUNDS focused on Hmong religion and its relationship to health concepts. (Bliatout, 1982) It described results in testing five hypotheses for the sudden deaths. The first hypothesis was that "Hmong traditional beliefs have a role in SUNDS."

> Hmong elders cite many examples of mysterious deaths which they believe were caused by ogres or evil spirits. Although Western medical practitioners may ridicule these concepts, generations of belief in supernatural powers can cause ill health and death. Many Hmong elders have stated that they believe the Hmong's sudden nocturnal deaths were caused by people not continuing their traditional religious practices and rituals to worship their ancestors. They feel that in anger over not being worshipped properly, ancestors' spirits may withhold their protection and this allows ogres and evil spirits to kill their descendants. (Bliatout, 1982)

The remaining four hypotheses included the inability to utilize traditional healing practices, genetics, past geographic locations, and other aspects of Hmong culture. The study was performed in a case-control fashion using sociological interviews.

In his discussion of his results, Bliatout concludes that, "it did not seem that religious preference was an indicator of sudden nocturnal death. Sudden nocturnal death struck both Christians and ancestor worshipers alike." He further explained that whether a person is a Christian or a believer in traditional religion, anxiety over religious questions exists. In his conclusion he proposed that one possible triggering mechanism for Sudden Unexpected Nocturnal Death may be stress.

> The stress to certain individuals caused by the inability to continue traditional religious practices in Western countries or other religious difficulties or stress caused by other reasons such as the inability to find traditional healing practices or the

> difficulty in adapting to a new lifestyle can cause a variety of health problems including eventual sudden nocturnal death. (Bliatout, 1982)

Another study conducted in the US by two anthropologists also considered stress as a potential trigger in SUNDS. (Lemoine and Mougne, 1983) The authors interviewed relatives of 28 victims of SUNDS. They concluded that night terror might have contributed to the deaths. They speculated that such terrors were brought on by exhaustion, culture shock, family quarrels, or even the violent images found on television.

Recommendations

1. Develop a cross-cultural guide which can be utilized by the Southeast Asian community and the American service provider community for the following:

   A. understanding the medical beliefs of each group

   B. discussing how stress may be managed in each cultural tradition

   C. exploring religious beliefs as they relate to medical beliefs in each culture

   D. discussing communication systems within each of the two cultures in order that important information is shared.

2. Pursue research in countries where SUNDS or SUNDS-like syndromes are occurring such as Japan, Philippines, Thailand, Laos and Cambodia.

3. References

Aponte, G.E.: The Enigma of Bangungut. Annals of Internal Medicine June 1960; 52:1258-1263.

Bangungut refers to the rapid and unexpected death during sleep of previously healthy Filipino men. Data from 11 cases seen in Guam during a four-year period are described in this article from the U.S. Naval Hospital in Guam. The study focused on: the heart, lungs, pancreas, brain, gastrointestinal tract, and bacteriologic and chemical analysis.

Bliatout, B.: Hmong Sudden Unexpected Nocturnal Death Syndrome: A Cultural Study: Portland, Oregon: Sparkle Publishing Enterprises, Inc. 1982.

This cultural study of sudden death focuses on Hmong religion and its relationship to health concepts, and also discusses five hypotheses which have emerged from research on the cause of sudden death. It promotes the idea that "cross-cultural considerations must be given " when studying sudden death. One hypothesis is that Hmong traditional beliefs about illness and death are contributing factors to sudden death.

Burch, G.E., DePasquale,N.P.: Sudden Unexpected Natural Death. American Journal of Medical Science January 1965; 249:112-123.

An older but wide ranging discussion of sudden death written before the modern epidemiologic studies of the subject. There are anecdotes cited from the medical literature (some very remote in time) and the authors' own experience. One section of the paper, "Interesting aspects of the problem of sudden death" focuses on cases in which coronary artery disease was not found to be the cause of death. Emotion (stress) and its possible connection with sudden death is discussed by presenting four cases of fear, joy or excitement which seemed to precipitate death. A verbal report of 200 instances of sudden death in Transvaal, South Africa with negative autopsy findings is cited. Curses, voodoo, and magic are considered. The mechanism for these events are thought to be increased sympathetic activity to the heart and vasoconstriction. In total, the metabolic and functional work of the myocardium is increased through several secondary mechanisms. It is postulated that underlying disease or lesions may make the myocardium more sensitive to catecholamines and produce a fatal arrhythmia. Aggravating these events would be a concomitant reduction in venous capacity which would suddenly increase return to the heart by 10% and result in acute left ventricular failure.

Burrell, R.J.W.: Chapter 6 - The Possible Bearing of Curse Death and Other Factors in the Bantu Culture on the Etiology of Myocardial Infarction, in The Etiology of Myocardial Infarction. N.T. James, J.W. Keyes, eds., Boston: Little, Brown and Company, pp. 95-110, 1963.

Sudden death among the Bantu of South Africa is described. Death of this kind

is attributed to either a curse or belief that it is time to die. "Men aged 50 years or more and in apparent good health can die deliberately within a few hours. At autopsy no obvious cause of death can be found."

Cannon, W.B.: "Voodoo" Death. Psychosomatic Medicine 1957; 19:182-190.

Cited are numerous instances from around the world of how spells, sorcery, "black magic" or voodoo has brought a person to death. Records dating as far back as 1587 of anthropologists and others are utilized. As an example, among Aborigines of northern Australia it was believed (in 1941) that having a bone pointed at you meant imminent death. From then on "the group acts with all the outreachings and complexities of its organization and with countless stimuli to suggest death positively to the victim." The social environment is then seen as having a strong enough influence to convince a victim of bone pointing that he is to die. Cannon also draws on examples from North American culture in which cases of shock incurred during war, even when wounds were "trivial", brought on death. Cannon suggest that in all of these cases death may be explained as "due to shocking emotional stress - to obvious or repressed terror". He suggests that simple testing of pulse, coolness, moistness of the skin and a red blood count can determine shock.

Eckert, W.: Unexplained Deaths in Refugees Newly Arriving in America. The American Journal of Forensic Medicine and Pathology June 1981; 2:185-186.

Notes the need for sensitivity by medical professionals when working with newly arrived refugees who may not be familiar with American culture. Misunderstandings and misuses of American products, for example, could prove fatal.

Engel, G.L.: Sudden and Rapid Death During Psychological Stress: Folklore or Folk Wisdom? Annals of Internal Medicine May 1971; 74:771-782.

Folk stories from Western religion and history and folk wisdom from Western art and literature are described as an introduction. The demise of such concepts in the late 19th Century coincided with the advent of scientific medicine. Recent rekindling of interest in the idea of emotion as a "cause of death", especially in a multifactorial explanation is described. One hundred and seventy cases of sudden death following negative life events were collected from news sources by the author. The negative events included: 1) death of a close person, 2) acute grief, 3) threat of loss of a close person, 4) mourning or anniversary, 5) loss of status or self esteem, 6) personal danger or threat of injury, 7) after dangerous situation, 8) reunion, triumph or "happy ending". Numerous case descriptions are given in each category. Some of the deceased were elderly or had pre-existing disease but others were healthy teenagers or young adults. The author notes the similarity in causal distribution of "emotion-related" deaths to those in the medical literature. Deaths ascribed to rage, fright, deep conviction of death's inevitability, voodoo, and loss of will to live are cited. The press reports and medical reports can be summarized as having the following characteristics: overwhelming excitation, loss of control, and giving up. The setting often is one where neither fight nor flight is possible. Parallels in the animal world are described. The

author speculates that neurogenic cardiovascular influences exist and may cause these deaths. Rather than invoking only the excitatory phenomena, he points out that inhibatory (giving up) phenomena are also important. Perhaps rapid shifts between sympathetic and parasympathetic effects are more important than the effects of either one alone.

Hufford, D.J.: The Terror That Comes in the Night: An Experience-Centered Study of Supernatural Assault Traditions. Philadelphia: University of Pennsylvania Press, 1982.

Hufford, a folklorist, first became aware of the experience that is the subject of this book during work in Newfoundland on a folk tradition called "The Old Hag". According to popular belief in Newfoundland, a person who experiences the Old Hag awakes to a frightening sensation of being pressed down upon the bed or strangled, often accompanied by feeling a "presence" in the room. Hufford found that many of his Newfoundland informants had first-hand experience of the Old Hag, but what struck him as extraordinary was that American students who had never heard of the tradition described exactly the same experience.

Hurlich. M.G., Holtan, N.R., Munger, R.G.: Attitudes of Hmong Toward a Medical Research Project. In press - presented at the Second Hmong Research Conference, University of Minnesota, Minnesota, November 17-19, 1983.

Reactions of Hmong in Thailand and in the U.S. to scientific research studies about SUNDS are discussed. Effects of previous research experience as perceived by the Hmong are described as they affected a study which was attempted in Thailand. Causes for misunderstandings by the Hmong of researchers' efforts are outlined and recommendations are offered to future researchers.

Larsen, N.P.: The Men with Deadly Dreams. Saturday Evening Post December 3, 1955; 228:20.

Lemoine, J., Mougne, C.: Why Has Death Stalked The Refugees? Natural History November 1983:6-19.

Twenty-nine families of Hmong, Lao, and Mien-Yao sudden death victims were interviewed in the United States. The authors speculate that night terror may lead to sudden death. The cases were divided into two groups, those who died soon after arriving in the U.S. and whose death may be attributed to culture shock. While a second group was identified as having died after a longer period of time in the U.S. and whose death could be attributed to exhaustion, quarrels or provoked by the violent images of television. The final answer, they conclude, will involved psychological, cultural and physical factors.

Majoska, A.C.: Sudden Death in Filipino Men: An Unexplained Syndrome. Hawaii Medical Journal July-August 1948; 7:469-473.

A report of the incidence and investigation of sudden death occurring in 81 young Filipino men. Findings from this report are taken from autopsy protocols filed in Honolulu from January 1, 1937 to April 30, 1948. "The chief post-mortem finding in most of these cases has been an acute hemorrhagic pancreatitis, but it is not known whether this finding is cause or effect."

Manalang, C.: The "Mystery Death" of Filipinos in Hawaii. Journal of the Philippine Medical Association 1948; 24:627.

Marshall, E.: The Hmong: Dying of Culture Shock? Science May 1981; 212:1008.

Brief history of the Hmong - U.S. connections in the Vietnam war, and of the Hmong experience after the war. Possible causes of SUNDS include: stress, nightmares, a weakness from chemical warfare, congenital susceptibility to cardiac arrhythmia, sleep apnea or subtle infections that damage the heart.

Monagan,D.: Curse of the Sleeping Death. Science Digest April 1982; 36-38.

Various theories as to the cause of SUNDS are discussed: nightmares, weakness of the heart, weakness caused by an elusive virus, yellow rain or genetic predisposition to sleep apnea. The question of whether there is an age-old genetic predisposition to SUNDS, or are these deaths a reflection upon the recent trauma of this entire culture, is asked.

Munger, R.G.: Sleep Disturbances and Sudden Death of Hmong Refugees: A Report on Fieldwork Conducted in the Ban Vinai Refugee Camp. In press - Presented at the Second Hmong Research Conference, University of Minnesota, Minnesota, November 17-19, 1983.

This report is part of a larger study on sudden nighttime death of Hmong refugees conducted in the Ban Vinai refugee camp (Thailand) between October 1982 and June 1983. "The purpose of this report is to describe cases of sleep disorders which may be related to the sudden deaths in sleep." Case reports of four sudden death victims with a history of previous non-fatal sleep disturbances and reports of similar non-fatal sleep disturbances occurring in individuals who are still living at the time of this writing are presented. The sleep apnea hypothesis is discussed.

Nolasco, J.B.: An Inquiry into Bangungut. Archives of Internal Medicine 1957; 99:905.

Romanucci-Ross, L., Moerman, D.E., Tancredis, L.R.: The Anthropology of Medicine: From Culture to Method, New York: Praeger Publishers, 1983.

Santa Cruz, J.S.: The Pathology of Bangungut. Journal of Philippine Medical Association 1951; 27:476.

Wood, C.S.: Human Sickness and Health: A Biocultural View. Palo Alto: Mayfield Publishing Co., 1979.

4. RELIGION AND TRADITIONAL HEALING PRACTICES

Three experts have recently, in various presentations, discussed the religious and health beliefs and traditional health practices of Hmong - Dr. Bruce Bliatout, Mr. Ronald Munger, and Dr. Joseph Westermeyer. An understanding of the cultural beliefs of Hmong and of the other ethnic groups affected by the Unexpected Sudden Nocturnal Death Syndrome (SUNDS) is of importance to anyone who wishes to study SUNDS or to plan programs for its prevention.

Bruce Bliatout, Ph.D., a Hmong himself, has worked since 1977 in cross-cultural and social services in several public health agencies serving refugees located in Honolulu, Hawaii, and Portland, Oregon. Excerpts from a paper, used by Dr. Bliatout in training bilingual health workers, are quoted with his permission.

Mr. Munger conducted a field investigation of SUNDS from October 1982 to June 1983 in the Ban Vinai refugee camp in Loei Province of northeastern Thailand. This investigation was part of Mr. Munger's Ph.D. thesis in anthropology at the University of Washington in Seattle. Notes from a presentation given by Mr. Munger to the East Metro Refugee Mental Health/Social Adjustment Coordination Committee of the Amherst H. Wilder Foundation Refugee Projects in St. Paul on May 30, 1984, were prepared by Project staff and approved by Mr. Munger.

Joseph Westermeyer, M.D., psychiatrist at the University of Minnesota, has lived in Laos studying mental health concepts of Southeast Asians. He spoke at the June 1, 1984 conference entitled "Cross-Cultural Medicine: An Exploration of the Hmong People's Mental and Physical Health", sponsored by the Bethesda Lutheran Medical Center in St. Paul, Minnesota. In his talk, "Cross-Cultural Health Care: The Hmong Case", Dr. Westermeyer explored cultural differences as they affect health, behavior and acceptance of medical practices. A synopsis of this talk was prepared by Project staff.

Basic Health Concepts and Hmong Health by Bruce Bliatout

> Due to the beliefs that illness spreads through close contact to sick persons, most Americans prefer to isolate ill persons. Persons who are sick are usually refrained from cooking for the family or handling children, as it is feared that these activities would encourage the illness to spread. This concept is sometimes very hard for Hmong and other Asian cultures to accept or understand as Hmong persons who are ill expect family members to visit them and stay near until health is regained.
>
> Americans also acknowledge that there are many other causes of illness. There are some types of nutritionally related diseases such as obesity, gout, kidney stones, and goiter. These four are mentioned because the American method of treating these problems are radically different from Hmong treatments.

Obesity is considered a contributing factor towards heart disease in American society. American doctors encourage obese patients to limit their caloric intake and obtain their ideal weight. In contrast, Hmong think of obesity as a desirable quality. The Hmong sense of an optimum figure is somewhat more heavy than the American idea. Although Hmong frown upon extreme obesity, most Hmong prefer to be heavier than what Western medicine dictates is healthiest for them.

Gout is treated in American society by special diet in addition to taking pills. In Hmong society, this gout is often thought to be caused by a type of evil spirit, and thus, treatment for this problem is very different from dietary control.

Kidney stones, common among Southeast Asians, are sometimes treated in America by surgical intervention. Most American health practitioners are surprised and frustrated to find that their Hmong clients strongly resist any type of surgery, even after the low risk of surgery and the many advantages are explained. This is because many Hmong feel that they are no longer "whole" if they have been cut open, or if something is removed. Hmong society treats someone who has had surgery as an invalid for the rest of that person's life, and single persons have little change of obtaining a spouse. Everyone regards the post-surgical patient as someone who may die any day, and as a person whose body no longer retains its full strength.

Goiter, a condition which can be caused by lack of iodine in the diet, is treated by surgery or adding iodine to the diet. However, some Hmong feel that having a goiter is a sign of good luck and will refuse to have it removed.

There are many diseases that Americans have isolated for which the Hmong have no comparable state. Examples are cancer, hypertension, heart disease, and diabetes. Hmong patients or families faced with these terms are often unable to understand what type of disease they have, the prognosis, or its treatment.

Hmong Concepts of Causes of Diseases. Many Hmong concepts about what causes diseases can sound strange to an American health practitioner. Great care must be given to discussing traditional Hmong health concepts with American doctors and misdiagnosis may occur. It is important that American health personnel dealing with Hmong clients are aware of cross-cultural differences in health concepts and health care expectations. In this portion of the paper, some common Hmong diseases which may be unfamiliar to Western health practitioners are presented.

Diet. The Hmong believe that eating or drinking the wrong thing can cause temporary, and/or long-term discomfort. Temporary discomfort is usually treated in the home by

massagers who massage the stomach and "push" the pain out to the arms, then to the fingertips. The fingertips are then pricked and the blood allowed to drop in a pan of water. If the blood sinks, it is thought that food caused the discomfort; and if it floats, it is thought that liquid caused the discomfort. It is believed that the pain is pushed out of the body through the prick in the fingertips.

Long-term stomach or intestinal discomfort is thought to be caused by ingesting something wrong. Many Hmong believe that the food hardens and becomes a "lump" in their digestive tract. Many will tell their American doctor that upon pushing their stomach, they feel discernable lumps. Of course the American physician can feel no such lumps and often forms the opinion that the patient is suffering from delusions.

Change of Weather. Many elderly Hmong who suffer from a variety of ailments such as muscle, joint, head or eye aches, often blame the climate for their pain. Some get sicker in the harsher winter climates found in the United States, while others have more discomfort in the much higher summer temperatures. Others complain that changes from rainy to sunny weather or vice versa causes their aches and pains.

Loss of Soul. The Hmong believe that illness can be caused when a person loses one or more of his or her souls. Souls can be lost in a variety of ways. It can be scared away because the patient suffers from a trauma, it can be lost during travels, it can be enticed away under certain circumstances, or it can run away because it is angry over something. The longer the soul is gone, the sicker the person becomes. Symptoms range from behavioral changes to acute physical and/or mental illness.

Spirits. (Ancestor, Nature, Evil). Hmong who follow their traditional religious beliefs of ancestor worship and animism, often believe that sudden illnesses are caused by spirits. Ancestor spirits cause illness in order to communicate their needs to their descendants. They are not malicious in intent, and upon satisfying their requests, will return health to their victims. Nature spirits are normally thought to be neutral towards humans. They cause illness only when offended. Offense may be taken over something as small as hitting a wind spirit with one's arrow when shooting at a bird, or urinating on a spirit's abode when hunting in the forest. Evil spirits are thought to roam the world and attack humans for no apparent reason. Any of the mentioned spirits are thought to be able to also cause a wide range of symptoms from behavioral changes to acute physical or mental illness.

Curses. Hmong have traditionally believed in the power of curses, provided that the cursing person is morally right. If a person commits a wrong against someone, the victim can curse the perpetrator. The curse can range from something mild

such as, "since you stole my bananas, your banana crop will rot", or it can cause economic disaster, illness or death. It is believed that the only way to recover from an illness caused by a curse is to convince the cursing person to take back the curse. If the cursing person is already dead, his or her spirit must be contacted and amends made.

License Expiration. Many Hmong elderly who suffer from a variety of illnesses feel that their problems may be caused by their "license" expiration date. Those following traditional religious beliefs believe that when they are born, their souls are issued a "license" which specifies the amount of time they are allowed to live. As the time comes nearer to when their licenses are due to expire, many Hmong persons become more and more ill. Traditional ceremonies to "extend their licenses" must be performed to ease these situations.

Physical, Emotional, and Spiritual Health and Well-Being
A Holistic View. The Mind-Body Link.

Americans and Hmong both believe that to a certain extent, in order to live a happy life, one must be emotionally, spiritually as well as physically well. However, there are some differences in Hmong and American beliefs about what contributes toward emotional and spiritual well-being. There are also differences in beliefs about how the mind and body are linked together as well as differences in beliefs about life priorities - what is important to make a person happy.

American View on Holistic Health

Americans stress that in order to be in good health, one must not only have good physical health, but be emotionally stable. In order to achieve this state, Americans believe in "preventive medicine". Patients are encouraged to find and maintain a lifestyle that is not only healthy, but is pleasing to the individual.

American society is one of many choices. There are countless lifestyles to choose from, different types of jobs, living arrangements, spouse agreements, and choice of family size. Each person is encouraged to find the right mixture to please him or herself. Those who find the right mixture usually find emotional and spiritual well-being, and this engenders physical well-being. In this sense, Americans believe that a happy mind brings about a well and happy body.

In general, Americans feels that priorities in life are to have a happy family life, a good social life, a work environment that is pleasing, adequate recreational time, and sensible exercise. These things are thought to contribute to a happy frame of mind, emotional stability and overall well-being.

Hmong View on Holistic Health

Hmong culture stresses that in order to be in good health, one must have all one's souls intact in the body, and be at peace with the spirit world. Hmong believe that each person has twelve souls. Three are major souls, each of which has three shadows. This makes three major souls plus nine shadow souls which total twelve in all. Upon death, one major soul is thought to remain at the grave site, one major soul to remain with the descendants, and one major soul returns to heaven where it is reassigned to another life, depending on past actions and luck. All of these twelve souls must be with the body in order to be in good health. The more souls missing, the more ill the person is.

Hmong Healers and Their Roles

Since the 1930's, Hmong have been introduced to Western medicine. The Western medicine available to the Hmong in Laos was limited and much less sophisticated than that available in America. Still, doctors and nurses were considered among the top levels in society. Western trained medical personnel were accorded almost the highest of professional status in Hmong society.

Traditional Hmong health practitioners were, and still are, also highly respected in the Hmong society. There are several different types of Hmong health practitioners, which perhaps corresponds to the American idea of specialists. However, the Hmong think of traditional healers as not only having different areas of expertise, but also having different levels of power. Some healers are elders in the family who have learned some minor healing arts through experience.

Other persons spend considerable effort to learn from skilled healers the arts they need to start their own practices; while others still inherit their healing arts. A brief itemization of these different types of healers follows.

Miscellaneous Referrals and Diagnosticians. Many Hmong elders or heads of household have learned through experience how to find the right health practitioner for a certain ill person, or how to diagnose certain problems. These functions take the form of performing one of several ceremonies.

One of the most common methods of obtaining a referral to an appropriate health practitioner is to perform a ceremony using a freshly laid chicken egg. After saying the appropriate ceremonial words to the spirits, the person performing the ceremony asks the spirits to talk to him/her through the egg. Usually he/she asks a question similar to, "Is Mr. X the health practitioner who can help our sick relative? If so, please stand up". If the egg stands, then the answer is affirmative. If not, questioning continues.

Three grains of rice or three beans can also be used to obtain a referral. After performing the right rituals, and asking a question similar to the one above, the grains of rice or beans are tossed into a bowel of water. If they land in a certain configuration, the health practitioner mentioned will be sought for assistance.

Eggs can also be used to diagnose illnesses. After again performing the correct ceremonies, skilled egg readers crack the egg into a bowl of water and "read" the cause of illness in the floating egg pattern.

Another type of diagnostician is someone who "reads" a patient's ear. Usually these are cases of "lost soul(s)". The patient is taken out into the direct sunlight. The diagnostician examines the ear with sunlight shining through it. The lines of the ear tell the experienced person what has happened to the patient's soul(s).

Lastly, there are diagnosticians who have studied the Chinese art of fortune telling. These persons can tell by one's date of birth and certain omens what is happening to the patient.

Soul Callers. Most heads of households and Hmong elders have learned the ceremony for calling souls back. This is done by sacrificing at least two chickens and an egg while performing the appropriate ritual. In more complicated cases, however, more skilled soul callers are asked in and they are able to conduct more intricate ceremonies.

Herbalists. There are many different levels of skills for herbalists. Almost every Hmong family raises at least a small selection of herbs in their gardens. Elders in the family use these herbs to help family members who incur minor ailments. However, there are others who go through extensive study under the supervision of skilled herbalists to learn advanced arts of healing with herbs. Some herbs can be cultivated, while others must be found in forests. The Hmong rely heavily on fresh herbs and less so on dried preparations. Therefore, this art is fast being lost in America because the climate is not conducive to growing traditional Hmong herbs.

Massagers. Massagers are healers who help a variety of health problems. They ease many muscular, body and headaches, and also deal with stomach aches. They are also thought to be able to "reposition" babies in utero to give comfort to the mother.

Acupuncturists. Hmong acupuncturists apply needles to help persons with "pressure" problems. Some Hmong believe that in some cases there is too much blood or too much air in a sick person's system. This can build up pressure and cause a variety of ailments such as fever, rash, or various aches. Needles are applied to certain points in order to "release the pressure". Thus, Chinese and Hmong acupuncture differ in

scope.

"Kawv Koob". The "kawv koob" is a person who can perform a variety of healing arts. Some "kawv koob" are thought to be good persons, others to be evil. Some are thought to own tame evil spirits who can mysteriously plant foreign objects in persons' bodies which causes extreme pain and possible death, or mysteriously suck the blood and life away from victims. Other "kawv koob" can help people in distress. Some examples of their healing skills are that they can stop the blood flow from cuts and deep wounds. They can also heal bruises and cuts, and take away mysterious acute pains or cause broken bones to heal in a shorter period of time.

Hmong Shaman. The Hmong shaman is the most famous and reknowned of traditional Hmong healers. The Hmong shaman can be either male or female. Hmong shamanism is the only healing art that cannot be learned, it must be inherited. the Hmong say that shamans are chosen by "nengs" or healing spirits, to become healers in their society. The "neng" teaches its host how to send the "neng" out to the spirit world and find information about sick persons and help negotiate cures for that person. The "nengs" are thought to select only men and women of good moral character so that society does not have to fear from these healers. Shamans are approached by family members to help sick patients. The shaman enters a trance and through his "neng" talks to the spirit world. He may find out that the patient has lost a soul, or has an ancestor spirit who needs something, or has a problem with a nature or evil spirit. The shaman can then entice the soul back or negotiate with the appropriate spirit for the health of the patient. Usually, chickens or a pig must be sacrificed in exchange for the health of the patient. However, the health of the patient must be obtained first, before the sacrifice is made.

Shamans are very respected in Hmong society. They rank almost, or as high, as clan and village leaders. Since shamans are also religious leaders, their advice is always sought by village members before a major decision is made. They help decide when and if a village should move, and influence clan and village politics. Much respect is still accorded to Hmong shamans in America because of their healing abilities.

"Natural Helpers"/"Self-Care"

The Hmong society has historically been one that helps its own members. It is not a society based on individuality. Rather, it is a society based on the well-being of the family, clan, and race. Thus, family members almost always help other family members who are in need, whether the problem be physical, financial, or illness.

Americans have termed this willingness to help themselves as "self-care" or "natural helpers". When they refer to these

terms, they are referring to the concept of sick Hmong persons finding assistance from "natural helpers" such as family members, elders, and clan leaders, and this indicates that the society cares for itself, or "self-care".

In examining how the Hmong society cares for itself, especially in terms of health, we must first look at the Hmong family. When someone in a family gets sick, the adults automatically seek what is considered appropriate food for the ill one. Whatever herbal knowledge the family household or an elderly person has will be called on to perhaps perform a "soul-calling" ceremony.

It is important for both Americans and Hmong who deal with Hmong clients to remember that in the Hmong culture, it is not always the sick person who seeks help for him or herself. It is usually the family members who arrange for all medical assistance. So it must be remembered that while Hmong society cares for itself, some individuals may not seek medical care for themselves as aggressively as their American peers may feel they should.

Traditional Hmong Health Practices

Comments by Ronald Munger to the Wilder Foundation Refugee Projects in June 1984 describing observations in Thailand were provided to aid American health providers in cross-cultural mental health care. The following synopsis of his talk, prepared by Project staff, is used with his permission.

The striking issue in regard to traditional Hmong health practices is how visible these practices are in Ban Vinai Refugee camp in Thailand and how hidden they are in the United States. The Hmong people get a strong message in Ban Vinai that traditional health practices are unacceptable to most Western health practitioners.

The Hmong nurses encountered by Westerners at the Ban Vinai camp hospital provided a view of Hmong culture and illness beliefs. Unfortunately, the picture which resulted, even for the more culturally sensitive Westerners, was not necessarily valid or accurate, because the young male nurses were not representative of the Hmong population in general. The impression of a culture in transition, its members eager to embrace new ideas, was often conveyed to the Western relief workers; however, traditional beliefs were more widely held by large numbers of Hmong.

The Hmong embraced some Western medical practices enthusiastically. Intravenous lines which Hmong had seen to work miraculously well in many instances were popular and sought after. Other practices, such as blood drawing, had fewer tangible positive results; in fact, such practices conflicted with religious beliefs and were not accepted easily.

In using various health practices, Hmong people often combined several techniques - "whatever works". Creating bruises on the skin by vigorous massage and pinching or applying a goat horn to the forehead to create a vacuum were common. Another group of practices involved the use of a wide variety of pharmaceuticals and herbal medicines easily available in the camp's market. Chinese traders brought herbal preparations and stone powders, which had also been available in Laos, and sold them to eager customers in the refugee camps.

Shamanism was widely practiced. In one example, an eggshell was placed in water in a split gourd to reveal the source of an illness by the pattern of the settling fragments. In this ceremony a "diagnosis" such as "malevolent spirit lodged in spleen" could be reached. Another ceremoney, during which an entranced shaman went to the spirit world to look for the cause of a problem, also corresponded to the Western concept of diagnosis. Other shamanistic ceremonies were curative and involved the shaman taking the spirits of sacrificed animals into the spirit world to battle and negotiate with the spirits responsible for a problem.

The religious aspects of the Hmong New Year celebration were often not visible to Westerners. Using an altar set up on the first day of the New Year in a home, the family called back from the spirit world the ancestral spirits and the spirits of animals sacrificed during that year. Incense and spirit money (silver paper representing money) were placed on the altar. The whole house was arranged to look as new and rich as possible to please the spirits.

There were other more common everyday rituals which reflected the pervading belief in the spirits in every aspect of life. Ritual figures or heads of sacrificed animals set on poles were common. Wooden boards on the floor at the doorway of a home were intended to confuse unwanted spirits and prevent them from entering the house. The central spirit post of the house contained the main ancestral spirits. It was also the place where the placenta from male babies - the "shirt of the baby" - were buried. The placenta of female babies were buried near the bed and not near the spirit post.

Three days after the birth of a baby, a pig or other animal was sacrificed, and kind words were offered by the shaman to entice the spirit of the child out from the spirit world, into the house, and finally into the child. Strings were then tied around the child's wrists accompanied by words of well wishing. Chicken and eggs, symbolizing fertility and health, were offered. The elders examined the tongues and feet of the chickens to predict the future of the child.

From these examples, it can be seen that the manipulation of the spirits and the spirit world are central to the Hmong animist religious beliefs as they were practiced in 1982 in a refugee camp. The spirits of the ancestors were primary among

all the spirits. Pleasing the spirits was a primary goal. For example, bracelets, necklaces and other devices were often placed on babies and small children to contain the spirit of that person and avoid its loss. The loss of a person's spirit could result in severe illness and possibly even death. For older people there was a belief that a contract had been made with the great gods and that when the contract is up, the spirit is lost and the person dies. Older persons attempted to postpone the end of the contract by placing patterns on the back of his or her clothing.

Many Hmong homes where there was a strong belief in the animist religion contained small altars with the items needed to interact with the spirits. There were buffalo horns which could be thrown on the floor and whose position told if a spirit is present. There were rings and rattles used during rituals. The shaman rode a bench "spirit horse" during the trance or journey into the spirit world to intercede with or battle the spirits.

Funeral rituals were very important in the Hmong culture. A musical pipe was used to call the spirits and to instruct the spirit of the person who had died. The deceased's spirit was instructed to go back to the place of birth to find the spirit post where his placenta had been buried to put it on again. Special rituals were related to the funeral ceremony included proper shoes, clothing, and other items as well as the sacrifice of animals.

Cross-Cultural Health Care: The Hmong Case

Comments given by Joseph Westermeyer, M.D., at the Bethesda Conference on Cross-Cultural Medicine. (Synopsis by Project staff, limited to concepts not covered by previous two experts.)

Traditional Hmong beliefs on the causes of illness differ from American beliefs. Spirits, ancestors, problematic relationships and nature itself may precipitate illness.

Hmong, also, believe there are good and bad places to die. The souls do not all leave immediately after death, either. Tissues and organs have souls, it is believed. In some cases, Hmong have refused permission for treatment and have let a relative die with two eyes, rather than allowing one eye to be taken out. If the eye were taken out, some Hmong believe that the patient would be without it, and its soul, for eternity.

Effects of Migration on Religion and Traditional Healing Practices

Traditional religions of many Southeast Asians are Buddhism and Buddhism combined with aspects of ancestor worship and animism. Hmong religion, in particular, combines animism and shamanism with elements of Buddhism. (Desan, 1983) A primary animistic belief is that humanity can live happily only by dwelling harmoniously with its surroundings and animism provides guidelines for safe behavior among the many spirits and forces in the universe.

Many Hmong believe that the spirits in the United States are foreign to them, and, therefore, cannot harm them. They also fear that Americans would regard them as crazy for allowing shamans to perform ceremonies. Most Hmong, as a result, have suspended animist and shamanist practices. Shamans may be practicing, however, in the larger Hmong communities.

Some Hmong have achieved what they believe to be harmony with their surroundings by assuming the beliefs of Americans around them - either religiously ambivalent or Christian. Thirty to fifty percent of the Hmong in Philadelphia, Pennsylvania, now associate with the Christian church. Some Hmong have accepted the denomination of their sponsoring hosts or churches, but accept only part of the proceedings. Ministers suggest that some refugees attend religious services because of a desire for community, not doctrine, and may be attracted to the rituals.

Dr. Bliatout summarizes the problems that the transition poses for health care:

> Most Hmong have little background in pathophysiology, and so rely on cosmological theories. Americans depend upon certification of health providers to gain trust in them. The Hmong, on the other hand, develop ties of personal loyality; they seek services from a health care provider that they know. Difficulties in health care develop concerning what Hmong expect from their treatment. From their experience with immunizations and treatment of severely ill patients in Asia, many Hmong expect rapid recovery from every ailment. Some Hmong are unfamiliar with side effects and treatment risks. Many Hmong feel that their recovery from illness is guaranteed in this country.

Relevance for SUNDS

Loss of traditional religion and healing practices of refugees in the United States has left them with large amounts of anxiety and no way of relieving it. This situation may be directly relevant to SUNDS. Stress and its implications will be discussed in more detail in the next section of this report.

One specific herbal medicine used by Hmong, India rubber vine, has raised interest in relation to SUNDS because it is known to contain organic substances that affect the heart. According to Xang Vang, Administrative Intern at the University of Minnesota, the Hmong feel that this vine ameliorates stomach ache and fever. He states that small amounts can be beneficial, but more can be poisonous. India rubber vine, or *Cryptostagia grandiflora*, contains cardiac glycosides, and its use has been known to cause human fatalities in India. Cardiac glycosides primarily affect conduction, rhythm, and vasodepressor reflexes of the heart. The extent of its use in the United States and any possible connection to SUNDS are not known.

Recommendations

1. Further study is needed of refugee religions and traditional healing practices, so that cross-cultural understanding and improved quality and appropriateness of refugee health care can be achieved.

2. Traditional rituals should be considered therapeutic. Shamans should be befriended to gain their assistance in reducing refugee stress.

3. Compromises can be found so that refugees interested in animal sacrifice can be accomplished while abiding by legal restrictions. Animals may be killed outside of the city limits for ceremonial purposes and afterward brought into the city.

4. Because the content and purity of herbal and inorganic medicines vary widely, they should be studied for efficacy and toxicity.

5. The possible role played by organic substances such as cardiac glycosides in traditional medicines for increasing risk of SUNDS should be considered.

4. References

Desan, C. : A Change in Faith for Hmong Refugees. Cultural Survival Quarterly. Cambridge, MA, Cultural Survival International, Fall 1983.

Looks at the religious adaptation that has occurred in three generations of Hmong women from a shamaness grandmother in Laos to a granddaughter practicing Presbyterianism in the United States. Explores the reasons Hmong have chosen to convert to Christianity.

Lemoine, J.: Shamanism in the Context of Hmong Resettlement. In press - Presented at the Second Hmong Research Conference, University of Minnesota, Minneapolis, Minnesota, November 19, 1983.

Anthropological discussion of Hmong shamanism as "a positive therapy to counteract anxiety and other psychic and psychosomatic disorders". The author puts shamanism in the context of both Laos and the U.S. He describes in detail the practices and beliefs that surround shamanism, stating that shamanism is central to traditional Hmong culture. Reference is made to the hypothesis of stress in combination with a predisposition to cardiac arrest as a cause of sudden death sleep among Southeast Asian refugees.

Muecke, M.: In Search of Healers - Southeast Asian Refugees in the American Health Care System. The Western Journal of Medicine December 1983; 139:835-840.

Explains how the shift from primarily public health concerns to more personal health concerns has occurred among Southeast Asian refugees. This has created a need for culturally appropriate medical healers who can deal with the somatic responses to refugee trauma as well as to mental health needs. Notes that because psychiatric services are uncommon in many areas of Southeast Asia, they are not a well utilized service in the United States.

Thao, X.: Hmong Perception of Illness and Traditional Ways of Healing. In press - Presented at the Second Hmong Research Conference, University of Minnesota, Minneapolis, Minnesota, November 19, 1983.

The author provides an introduction to traditional Hmong perceptions of illness, which he has broken down into approximately 5 causes of illness--loss of soul, natural, organic, magical, supernatural--and how each of these kinds of illnesses can be treated by shamans and herbalists.

Tobin, J., Friedman, J.: Spirits, Shamans and Nightmare Death: Survivor Stress in a Hmong Refugee. American Journal of Orthopsychiatry July 1983; 53:439-448.

Examines a case study of a Hmong man experiencing survivor stress and his need to call in a shaman. A possible link is suggested between the circumstances of the case study and sudden death syndrome.

5. MENTAL HEALTH ISSUES FOR SOUTHEAST ASIANS IN THE UNITED STATES

Mental health issues play a large role in the problems facing Southeast Asians in the United States. As refugees from the events surrounding the Vietnam War, these people, especially the men, are experiencing survivor stress. Coming from a slow paced and rural lifestyle in Asia, refugees have been thrust into a clock-driven, achievement-oriented lifestyle of the United States resulting in culture shock and depression. Cultural differences require attention to proper methods in diagnosing and treating such problems by Americans.

Survivor Stress

Observations of Jewish holocaust survivors in World War II revealed that victims were suffering from guilt and self-loathing. Many felt subconsciously that they had no right to live while so many died in their places. Similar stress is also confronting Southeast Asians today. (Tobin, 1983) In helping the United States in its fight against communists in Laos, it is estimated that 100,000 Hmong died. Later combatants and their families had to flee to refugee camps in Thailand to save their lives against persucution in Laos. The effects were devastating. Many friends and loved ones did not survive. Refugees lost their homes, their friends and families, their possessions, their way of life, and their status.

Culture Shock

Culture shock is another form of psychological trauma for refugees coming from Southeast Asia to the United States. (Tobin, 1983) For example, prior to becoming refugees, the Hmong had lived in rural mountainous areas. They traditionally grew gardens, raised farm animals and hunted. (Westermeyer, 1983) Technology was not readily available to them. It is not difficult to realize why Hmong as well as other Southeast Asian refugees experience culture shock in a fast paced Western society. Besides the automobiles, appliances and mechanized conveniences in the United States, differences exist between Indochinese and American value systems. Most Southeast Asians are raised to have a great deal of respect for elders, family structures and education, whereas such respect may appear to be lacking in American society. The refugees may also sense rejection by Americans. They may be associated with a war that many in the United States seek to forget. New laws and customs must be learned. They are exposed to various religious groups, each with a different set of beliefs. Traditional family balance may be disturbed when American sex roles conflict with traditional Indochinese ones. (Lemoine, 1983)

Anxiety

The trauma of surviving great hardships, emigrating to a new country, and acculturating to a new society all increase the likelihood of specific emotional responses such as anxiety, depression, delayed grief and post traumatic stress disorder. A loss of self-worth may result from refugees becoming dependent on sponsors, social agencies and public aid. Male Hmong heads of household may experience an identity crisis because many of them had

positions and occupations of high status in their homelands but in the United States they must be content with whatever employment they can find.

Refugee stress and anxiety resembles the Twentieth Century stress described as "invisible entrapment" in which one is "boxed in a corner" with no way out and no acceptable mode of action. The resulting hopelessness and helplessness may lead to anxiety and depression. (Eliot and Forker, 1976)

As a consequence of high anxiety, Hmong and other Indochinese refugees frequently have nightmares. (Westermeyer, 1981) Some claim that spirits in these dreams cause breathing difficulties by sitting on the sleeper's chest. Such symptoms can be ascribed to anxiety and depression affecting persons under extreme stressful conditions. (Tobin, 1983)

A St. Paul dentist reported to the SUNDS Planning Project in September, 1984 that a forty year old man who had complained of sleeping difficulties was fitted with a dental orthotic device and is now able to relax and sleep. The device, installed in June 1984, was designed to prevent bruxing in which the person grinds his or her teeth and often sleeps with a clenched jaw. (Juhnke, personal communication)

Depression

Depression has been reported as the most common psychiatric problem among Southeast Asian refugees. (Muecke, 1983) At the University of Oregon Indochinese Psychiatric Clinic, 49% of patients had a depression disorder. (Kinzie, et al., 1980) Forty-three adult Hmong refugee patients of the internal medicine primary care clinic of St. Paul-Ramsey Medical Center were screened for depression. An interpreter helped to administer the translated format of the Zung Self Rating Depression Scale. The Zung scale, known to be cross-culturally effective, consists of 20 items suggestive of clinical depression. Over 60% of the subjects were experiencing some degree of depression and a third of those were diagnosed as clinically depressed. (Jacobson and Crowson, 1983) In another study in Minnesota, the translated Zung and the SCL-90 Self-Rating Scales were employed. The SCL-90 has several subscores and a general symptom index for many manifestations of psychiatric disorder. Compared with other males, persons who had been herbal healers in Laos had higher rates of somatization, depression and anxiety on the SCL-90 scale. More depressive symptoms were discovered in employed rather than unemployed refugees. Less phobic anxiety was seen in males who had maintained the hobby of fishing than in those who had not. In general, fewer emotional and mental problems correlated with maintenance of a single residence, continued contact with a sponsor, lack of access to someone with knowledge of both American and Hmong culture, and a distance from other Hmong of less than fifty miles. (Westermeyer, Vang, and Neider, 1983) Such seemingly incongruent results can be explained by the hypothesis that those with access to their countrymen who knew the reality of low class and limited status of refugees in the U.S. tended to develop more emotional disturbances. Those without such an orientation perhaps maintained their dependent non-directed existence which had helped them survive the refugee camps.

Cultural Considerations

Concepts of mental illness among Southeast Asians and Americans differ. The

mentally ill in Southeast Asia in fact bring shame upon a family because immorality is thought to underlie mental disorders. (Muecke, 1983) Other conceptual causes of mental illness includes spirits, breaking a taboo, excessive thinking, and bad blood. (Westermeyer, 1979)

Identification of mental illness by persons not trained in Western psychiatry has been successful in lags. Use of indigenous laymen to diagnose psychosis depends primarily on recognizing consistent socially dysfunctional behavior rather than thought disturbances. (Westermeyer, 1979)

"Ba" (crazy) is a social label in Hmong meaning that one is offensive to others, and has potential for hurting oneself, destroying property, or being socially disruptive. For prevention of mental disorder, Hmong recommend avoiding "excessive worry" and "breaking taboos". (Westermeyer, 1979)

Dr. Bruce Bliatout, a Hmong himself, is an expert on religious and health beliefs of the Hmong. Dr. Bliatout has worked since 1977 in cross-cultural social services in public health agencies in Honolulu, Hawaii and Portland, Oregon. The following extended quote about mental health concepts held by Hmong is from a paper used by Dr. Bliatout in treating bilingual health workers, and is used with his permission.

> "Liver"/"Emotional" Problems. The Hmong believe that everyone's emotions are governed by the liver. This is similar to Americans' belief that the emotions are governed by the mind. Whenever a Hmong persons suffers from stress, he or she is subject to succumbing to a "liver" symptom. This does not imply in any way that something is physically wrong with the liver, but rather that the person is having emotional problems. Often having a "liver" symptom will cause the patient to lose one or more souls. Some common "liver" symptom terms are:
>
> 1. "Siab Phem" or "Ugly Liver" - a term which refers to persons who become destructive, and use verbal abuse.
>
> 2. "Nyuab Siab" or "Difficult Liver" - a condition in which patients have excessive worry.
>
> 3. "Tu Siab" or "Broken Liver" - a term referring to patients suffering from excessive grief.
>
> 4. "Siab Luv" or "Short Liver" - when persons develop short tempers.
>
> 5. "Kho Siab" or "Murmuring Liver" - the development of nervous habits.
>
> 6. "Lwj Siab" or "Rotten Liver" - patients suffering from loss of memory and/or delusions.
>
> "Loss of Soul" Problems. Persons who are thought to have lost their soul often exhibit changes in behavior. They may develop nervous habits, suffer from nightmares, loss of appetite, and many other mental health related symptoms. Often, when family members note a mildly depressed person, they will arrange for a soul calling ceremony whether the person has really lost his or her soul or not. Perhaps it is the attention the depressed one receives, or perhaps it is the return of the soul, but these persons often

benefit from such ceremonies.

"Spiritual" Problems. Persons who suddenly go from good health to acute symptoms of health and mental health problems are often thought to be victims of "spiritual" problems. It is thought that ancestor, nature and evil spirits can cause temporary insanity. The Hmong believe that normal diseases progress at a slower rate. "Spiritual" problems take a person from seeming healthy to extreme sickness in a very short time - perhaps only a day or two.

The Hmong treat the above mentioned types of patients with traditional healing arts. Usually, the family will either perform a soul-calling ceremony or a diagnostic procedure. Depending on the illness, it is usual for the next step to be calling in a shaman. The shaman will either solve the case or refer the patient to another health practitioner.

It is important to emphasize that the Hmong do not classify "liver", "loss of soul", or "spiritual" problems as mental health problems. These health problems are normally considered to be either spiritual or physical health problems and are treated by Hmong health practitioners as such.

Impact on SUNDS

Anxiety reactions are known to occur in epidemic fashion. Epidemic hysteria has been described on the West Bank, Israel and in the United States. (CDC, 1983; Robinson, 1984) In the West Bank example, Arab schoolgirls experienced acute non-fatal illness with symptoms of headache, dizziness, blurred vision, abdominal pain, weakness and difficult breathing. Clinical epidemiologic and toxicologic investigations were all negative. The condition was assumed to be due to stress instigated by the smell of hydrogen sulfide gas near the site of one outbreak. Cardiac difficulties were observed in early stages of the illnesses but later testing showed no abnormalities.

Though evidence in man remains incomplete and circumstantial, data from animal studies is direct and pursuasive in showing that traumatic life events may predispose to greater susceptibility to cardiac death. Higher nervous system activity, triggered by psychologic factors, can significantly affect cardiac irritability resulting in premature ventricular beats and lowering of the ventricular fibrillation thresholds. (Lown, 1980)

Tobin and Freidman (1983) suggest that SUNDS deaths may be a form of unconscious suicide, with nightmares functioning either as the cause of death or as a side effect of the causative factor. The unconscious suicide may be motivated by loss of self-respect, loss of feeling of control over one's life, and loss of will to live in anxious circumstances. Men may be more susceptible because the male's role has changed more dramatically than the female's.

Recommendations

The following recommendations were formulated from ideas offered by the following writers: Eliot and Forker, 1976; Westermeyer, Vang, and Neider, 1983; Muecke, 1983; Tobin, 1983; and Lown, 1980.

1. To minimize mental stress, refugees should take any of the following

measures:

a. decrease the frequency of life altering events
b. set up realistic priorities and establish practical life objectives
c. pursue education
d. continue any past relaxing activities such as fishing and gardening
e. attend group therapy, naturally in clans or families, or artificially through contacts with Western therapists
f. practice behavior modification
g. exercise aerobically
h. gain knowledge and skills in any of the following daily relaxation techniques:
    1) yoga
    2) meditation
    3) biofeedback
    4) martial arts
    5) breathing exercises

2. Western or American mental health providers should:

a. maintain cross-cultural sensitivity to the refugee patient's viewpoint
b. keep invasive diagnostic procedures to a minimum
c. use the least dangerous medications whenever possible
d. employ trained bilingual interpreters
e. not discourage use of folk medicines as long as they do not contain toxic substances

3. Shamans and other ethnic healers may be helpful in maintaining mental health of some Southeast Asian refugees.

4. Collaboration among psychiatrists, neurologists and cardiologists concerning psychological factors in SUNDS.

5. References

Brower, I.: Counseling Vietnamese. Personnel and Guidance Journal June 1980:646-652.

Eliot, R.S., Forker, A.D.: Emotional Stress and Cardiac Disease. The Journal of the American Medical Association November 15, 1976; 236:2325-2326.

Emotional stress as a risk factor in atherosclerotic heart disease is considered. The modern social impropriety of the ancient "fight or flight" response is discussed. Twentieth century stress is characterized by the phrase "invisible entrapment" in which an individual is boxed into a corner with no options. The result is hopelessness and helplessness. Sustained emotional stress has been shown to increase circulating catecholamines and their urinary excretion. Hypothalamic stimulation provokes ventricular fibrillation in experimental animals. The work of Rahe on the concept of life change events is cited. Rahe's data suggest that an excessive number of adverse events in a short period of time is associated with acute severe illness. Methods of managing excessive prolonged stress are listed as:

1. establish priorities
2. identify realistic obtainable goals
3. attempt behavioral modification
4. reduce frequency of stressful events
5. teach daily relaxation response
6. engage in aerobic exercise
7. participate in group therapy
8. attain beta-adrenergic blockade with medication such as propranolol.

Details are offered concerning these eight items.

Centers for Disease Control: Epidemic of Acute Illness -- West Bank. Morbidity and Mortality Weekly Report April 29, 1983; 32:205-208.

Presents findings from investigation of a non-fatal illness characterized by headache, dizziness, and abdominal pains. Cases clustered among adolescent women, some of whom reported the odor of hydrogen sulfide. Propagation occurred against a background of anxiety facilitated by media reports that described the symptoms and suggested that a toxic gas was the cause. Article presents negative evidence (from physical examinations, laboratory studies, and toxicologic analysis) in support of the diagnosis of stress-induced illness.

Jacobson, M.L., Crowson, T.W.: Screening for Depression in Hmong Refugees. Minnesota Medicine September 1983:573-574.

Forty-three adult Hmong refugee patients were screened for depression in a primary care clinic using the Zung Self-Rating Depression Scale. Results show 65.1% of patients having scores suggestive of depression.

Jenkins, C.D.: Recent Evidence Supporting Psychologic and Social Risk Factors for Coronary Disease. The New England Journal of Medicine April 29, 1976; 294:987-994.

A review of studies which identify cultural and behavioral variables in the cause of coronary disease. Considers occupation, socio-economic status, religious affiliation, cultural mobility, anxiety, and dissatisfaction as factors which "offer the possibility of accounting for at least part of the cause of coronary disease still remaining unexplained".

Kinzie, J.D., Tran, R.A., Breckenridge, A., Bloom, S.D.: An Indochinese Refugee Psychiatric Clinic: Culturally Accepted Treatment Approaches. American Journal of Psychiatry November 1980; 137:1429-1432.

Reviews explanations for the large number of psychoses among Southeast Asian refugees. Included are: a dangerous escape from their homeland, a stressful transition period in large refugee camps, a move to a strange land in which a similar indigenous minority group does not exist, and not being accepted readily in that country because of association with a war now considered embarrassing. The authors suggest that psychiatric services are needed for refugees coming from Southeast Asian countries, in which the attitude toward the mentally ill is fear, rejection and ridicule, and in which a mentally ill relative affects one's social and economic status.

Levine, R.: Mass Hysteria - Diagnosis and Treatment in the Emergency Room. Archives of Internal Medicine October 1984; 144:1945-1946.

Closely associating groups of women or girls, typically, and more often than men, will manifest mass hysteria when experiencing stress. The disease spreads from one person to another after unaffected individuals observe symptoms of those affected, including nausea and abdominal tenderness. Hysteria outbreaks within a group of susceptible individuals, can reach explosive proportions within a few minutes. Treatment of outbreaks in the emergency room includes separation, reassurance and observation of affected individuals, and, in most cases, the disease lasts a maximum of two hours.

Lin, K.M., Masuda, M., Tazuma, L.: Adaptational Problems of Vietnamese Refugees: Part III. Case studies in Clinic and Field: Adaptive and Maladaptive. Psychiatric Journal of the University of Ottawa 1982; 7:173-183.

Lown, B., Tempte, J.V., Reich, P., Gaughan, C., Regestein, Q., Hai, H: Basis for Recurring Ventricuilar Fibrillation in the Absence of Coronary Heart Disease and Its Management. The New England Journal of Medicine 1976; 294:623-629.

Muecke, M.: In Search of Healers-Southeast Asian Refugees in the American Health Care System. The Western Journal of Medicine December 1983; 139:835-840.

Nguyen, S.D.: Psychiatric and Psychosomatic Problems Among Southeast Asian Refugees. Psychiatric Journal of the University of Ottawa 1982; 7:163-172.

Clinical observations of a group of 56 Southeast Asian refugee patients in Canada. Depression and anxiety with a high prevalence of somatization were the most common problems. Cultural aspects of somatization are discussed.

Robinson, P., Szewczyk, M., Haddy, L., Janes, P, Harvey, W.: Outbreak of Itching and Rash - Epidemic Hysteria in an Elementary School. Archives of Internal Medicine October 1984; 144:1959-1962.

Tobin, J., Friedman, J.: Spirits, Shamans and Nightmare Death: Survivor Stress in a Hmong Refugee. American Journal of Orthopsychiatry July 1983; 53:439-448.

Westermeyer, J.: Hmong Deaths (letter to editor). Science August 28, 1981; 213:952.

Offers dream interpretations as another related issue in the matter of Hmong sudden deaths, and notes higher self-report of depression and other symptoms among men at Hmong psychiatric clinic.

Westermeyer, J.: Mortality and Psychosis in a Peasant Society. The Journal of Nervous and Mental Disease 1978; 166:769-774.

Westermeyer, J.: Folk concepts of Mental Disorder Among the Lao: Continuities with Similar Concepts in Other Cultures and in Psychiatry. Cultural, Medicine and Psychiatry 1979; 3:301-313.

Westermeyer, J., Vang, T.F., Lyfong, G.: Hmong Refugees in Minnesota: Characteristics and Self Perceptions. Minnesota Medicine July 1983; 431-439.

Provides results of a survey among 97 Hmong persons in Minnesota, designed to be useful to clinicians who encounter Hmong as patients. Questions pertained to the subject's life in Laos, migration to the U.S., and current conditions and attitudes toward life here. Findings indicate a greater prevalence of psychological symptoms among adult refugees than in the non-refugee population. The age of this sample resembled that of Hmong people in Laos. While 60% stated that they felt happy here, only one-fourth gave positive responses regarding their outlook on the future.

Westermeyer, J., Vang, T.F., Neider, J.: A Compairson of Refugees Using and Not Using a Psychiatric Service: An Analysis of DSM-III Criteria and Self-Rating Scales in Cross-Cultural Context. Journal of Operational Psciatry 1983; 14:36-41.

Surveyed sample of Hmong subjects using the Zung scale for depression and the Symptom Checklist, and observed subjects for psychiatric disorder during a subsequent one-year period. After classifying patient visits using DSM-III criteria, found higher-than-expected incident of psychiatric disorder, severity of depressive syndrome greater than anticipated, and major differences in self-rating scales between patients and others in the population.

Westermeyer, J., Vang, T.F., Neider, J.: Migration and Mental Health Among Hmong Refugees: Association of Pre- and Postmigration Factors with Self-Rating Scales. The Journal of Nervous and Mental Disease 1983; 171:92-96.

Correlates self-reported symptoms with several variables to determine if these characteristics are associated with increased emotional distress. Demographic variables: older Hmong scored higher on scales for depression, but men and women did not differ. Premigration variables: these factors (education, occupation, residence, etc.) showed little influence on current self-rating. The exception was former avocations: Hmong who formerly were herbal healers but abandoned the practice in the U.S. reported greater depression and anxiety than those who had fished in Laos and found fishing to be popular and readily accessible in the U.S. Postmigration variables: four factors were linked to fewer problems on self-report 1-no secondary migration, 2-maintained contact with sponsor, 3-no access to a "bi-cultural" person, and 4-greater distance from other Hmong. Article discusses how some findings were oppposite researchers' anticipation, and suggests implications for policy planning. That is, access to someone who oriented the refugees to their low class and limited opportunity status seemed to precipitate more emotional disturbances.

Westermeyer, J., Vang, T.F., Neider, J.: Refugees Who Do and Do Not Seek Psychiatric Care: An Analysis of Premigratory and Postmigratory Characteristics. The Journal of Nervous and Mental Disease 1983; 171:86-91.

A study of the social genesis of psychiatric disorder. Analysis of differences between those who sought psychiatric care (17 out of a sample of 97 Hmong refugees in Minnesota) and those who did not. Examines 60 factors, including social and occupational status, expectations in the U.S., and strategies employed by sponsoring individuals or agencies, for their relation to frequency of patient visits.

Westermeyer, J., Wintrob, R.: "Folk" Criteria for the Diagnosis of Mental Illness in Rural Laos: On Being Insane in Sane Places. American Journal of Psychiatry June 1979; 136:755-761.

Westermeyer, J., Zimmerman, R.: Lao Folk Diagnosis for Mental Disorder: Comparing with Psychiatric Diagnosis and Assessment with Psychiatric Rating Scales. Medical Anthropology 1981;425-443.

The purpose of this investigation was to see whether there were any gaps between the investigators' and Lao villagers' diagnosis of people as insane or having a nervous problem. A survey of 28 Laotian villages was undertaken by

an ethnic Laotian known to the villages. Chronic psychosis had most frequent occurrence. Thirty-six were diagnosed as insane by Laotian villagers: two-thirds of which had evidence of psychosis but few physical findings, one-fourth had psychosis and physical findings supporting an organic impairment, and 3 of the villagers diagnosed indicated no current psychosis, as determined by the investigators. Case reports included demographic information, past and current history of of condition, social history, mental status, examination and photograph. Five tables list results. Conclusion was that illiterate Lao villagers can recognize psychosis with a high degree of reliability as compared to experienced clinicians.

Williams, C.L., Westermeyer, J.: Psychiatric Problems Among Adolescent Southeast Asian Refugees: A Descriptive Study. The Journal of Nervous and Mental Diseases 1983; 171:79-85.

Reviews 28 cases of adolescents encountered in a psychiatric setting and describes their presenting complaints and problems (functional psychosis, mental retardation, and other psychiatric diagnoses, as well as family problems precipitated by adolescent behaviors appropriate to the new majority society but not to the parents). Discusses impairments prior to migration, intergenerational conflicts, additional difficulties faced by unaccompanied adolescents, and the exacerbating factors in psychiatric facilities and resources.

6. SUNDS AND NUTRITION

There have been no studies linking dietary factors to the Sudden Unexpected Nocturnal Death Syndrome (SUNDS). Conversations with Hmong and other Southeast Asian refugees about SUNDS, however, rarely fail to include comments about nutrition. In particular, the refugees are keenly interested in how dietary changes due to migration might be playing a role in SUNDS. The refugees see the diet as one area on which they are able to exert control as individuals.

The nutritional status of newly arriving Southeast Asian refugees is fairly well known. The Saint Paul-Ramsey Nutrition Program screened 3782 refugees between 1980 and 1983, including a population of 61% Hmong, 15% Vietnamese, 13% Cambodian, 8% Laotian, and 3% other nationalities (P. Henry, K. Cairns, personal communication, 1984). A high prevalence of nutritional problems was found: stunted growth (71%); diets inadequate in two or more nutrients (53%); underweight (14%); anemia (12%); and overweight (7%). These findings are consistent with similar assessments and are not surprising considering that many of the refugees had been consuming diets of unenriched rice supplemented with small amounts of fish, meat and vegetables in the refugee camps.

Assessment has revealed that the nutrients most likely to be missing in the diets of newly-arriving refugees are calcium and Vitamin A and C. (P. Henry, personal communication, 1984). Whether these deficiencies continue to be present as refugees adjust to living in the United States is not known.

A study of Hmong in the State of Washington revealed important changes in the types of foods eaten by the refugees after arrival in the United States. (Hurlich, 1982) Men consumed more meat than the average woman, but women ate more eggs, peanut butter, nuts, fruit, and sweets. Both men and women ate substantially more meat than they ever had in Laos. One-fifth of the foods eaten by the refugees were new to them, for example, apples, strawberries, and fruit juices, and "junk food." The data suggested that older men might have diets deficient in magnesium, iron, and Vitamin A.

Recommendations

1. Health care personnel should advise Southeast Asian refugees to consume well-rounded diets with sufficient calcium, Vitamin A, and Vitamin C, magnesium, and iron.

2. Studies should be carried out with Southeast Asian refugees to determine effects of acculturation on dietary patterns and to evaluate possible deficiencies in persons at risk for SUNDS, namely, young adult males.

6. References

Centers for Disease Control: Nutritional Status of Southeast Asian Refugee Children. Morbidity and Mortality Weekly Report October 3, 1980; 29:477-479.

Describes results of a CDC case control study on the nutritional status of Southeast Asian refugee children (in California and Washington). Results indicate that anemia and stunting were more common in the case group.

Guthrie, H.A., Scheer, J.C.: Validity of a Dietary Score for Assessing Nutrient Adequacy. Journal of the American Dietetic Association March 1981; 78:240-245.

Hurlich, M.: Rural Hmong Populations in Western Washington State: The Consequences of Migration for Nutritional Status and Growth. In The Hmong in the West, edited by B. Downing and D. Olney, pp.320-351. Minneapolis, Minnesota: Center for Urban and Regional Affairs, 1982.

Description of the Hmong diet in Laos and in the U.S. Dietary data collected in a survey included food preferences, frequency of consumption, and daily patterns, as well as socioeconomic data and statistics on age and length of stay in the U.S. The test sample of Hmong fell below two-thirds of the Recommended Daily Amounts of Mg, Fe, and vitamin A, for older men.

Marks, J.S.: Unexplained Sudden Deaths Among East Asian Immigrants. The Journal of the American Medical Association September 7, 1984; 252:1193.

In answer to a question about the possible role of dietary carnitine deficiency in these unexplained sudden deaths, the author concludes that "although carnitine deficiency was not examined directly, (by the Centers for Disease Control) it seems unlikely that this would provide the explanation for the sudden deaths that have occurred among this group."

Wurtman, R.J., Fernstrom, J.D.: Effects of the Diet on Brain Neurotransmitters. Nutritional Reviews 1974; 32:193-200.

Serotonin normally increases in the brain after a protein meal. Strategies for examining the effects of diet on the brain are described. Acute effects of protein-free or protein containing meals on brain serotonin in rats is found to be reflective of plasma tryptophan, a precursor of serotonin. Based upon indirect observations, human beings are found to have a similar pattern. In a reversal of the usual concept of brain biochemistry controlling behavior, behavior (food choice, eating habits) can potentially control or influence brain biochemistry (serotonin). The ability of brain serotonin levels to be influenced by diet-induced changes in plasma amino acids such as tryptophan could be a mechanism by which the brain decides when it is hungry, time to sleep, etc. Therefore, the serotonin-releasing brain neurons function as a

kind of humoral-neural transducer, converting information about the peripheral metabolism (amino acid pattern) to neural signals (the release of a greater or less quantity of serotonin). Serotonin in turn affects behavior and basic life functions.

7. SUNDS AND TOXICOLOGY

Among the various explanations proposed for the Sudden Unexpected Nocturnal Death Syndrome (SUNDS), the possibility of a toxin or poison has been raised repeatedly by reseachers and by the populations at risk for SUNDS. Present evidence to support the toxin theory is circumstantial at best.

The usual and customary toxicologic screens which accompany an autopsy were performed on all the cases of SUNDS in the United States and the findings were negative. These toxicologic screens will identify hundreds of common toxic substances including medications, drugs, or alcohol, if any of them are present.

The first of two unusual examples of heavy metal poisoning occurred in the Hmong community of St. Paul, Minnesota in 1982. (CDC, 1982) Thirty-five children, twenty-four of them Hmong refugees, were identified through routine screening to have lead intoxication. Investigation showed no environmental sources of lead in some of the cases. The lead poisoning was thought to be due to the use of folk remedies in some of the children who had probably been given a red powder called "pay-loo-ah" for fever. Six samples of folk medicine from Hmong homes in St. Paul were analyzed and two contained lead, three contained arsenic.

In 1984, physicians in St. Paul became aware of three cases of arsenic poisoning in Hmong adults. (CDC, 1984) All three patients initially denied using folk remedies but one patient's wife later provided a sample of medicine to her husband's physicians.

The issue of arsenic poisoning became of special interest in regard to SUNDS because of the circumstances of one of three cases described in St. Paul. A thirty-nine year old man, chronically using traditional medicine for anxiety and depression, ingested a triple dose of the medication because he was unable to sleep. Moments later, his wife discovered him on the kitchen floor, not breathing and apparently dying. Paramedics called to the scene found him to be cyanotic and in ventricular fibrillation. They successfully resuscitated him and brought him to an intensive care unit. Physicians began to suspect an intoxication because of persistent agitation lasting for three days. Urine and blood collected soon after his admission to the hospital were found to have impressively high levels of arsenic. The exact nature of the substances he had ingested is not known. The subject's wife did produce a small portion of a root which was not positively identified due to its small size. It could not be analyzed for arsenic. A plant toxicologist suggested that it could be the root of Cryptostagia grandiflora, or India rubber vine. The root of this vine has been described as containing cardiac glycosides related to digitalis. Cardiac glycoside overdose is a well known cause of cardiac arrhythmias.

Arsenic intoxication is known to cause ventricular irritability and fibrillation. (Goldsmith and Fram, 1980) It has also caused respiratory failure. (Greenberg et al. 1979) The medical examiner of Ramsey County, Minnesota (St. Paul), had preserved samples of blood, urine and tissue from three of the early cases of SUNDS. After he learned of the cases of arsenic poisoning, he arranged to have

these samples analyzed for arsenic. None was found. (M. McGee, personal communication, 1984)

A discussion of toxicology and SUNDS would not be complete without mention of chemical warfare agents. Although absolute proof is lacking, some Hmong were probably the victims of chemical warfare agents in Laos. The best characterization of the nature of these agents is that they were mycotoxins, products of fungi. A study of SUNDS failed to show any differences in history of being a victim of chemical warfare between cases and controls. (Baron, et al. 1983) Furthermore, some of the SUNDS victims had left Laos before the commonly-accepted 1979 date when use of chemical warfare agents began in Laos. On the other hand, some observers, including the Special Advisor on Highland Lao Affairs of the Office of the US Coordinator for Refugee Affairs in the Department of State, Dr. Jane Hamilton-Merritt, believe that such agents were tested in Laos long before awareness of them became common in 1979. It should be emphasized that one of the most common beliefs about SUNDS among Hmong is that it is caused by previous exposure to chemical warfare agents.

That SUNDS is caused by a toxin is one of the few theories which could explain the nearly total male makeup of the victims. Use of virility enhancing, aphrodisiac, or potency preparations by young males could explain the preponderance of male cases in the United States. But, the likelihood that one particular preparation is used by all four of the Southeast Asian ethnic groups, as well as other Asian immigrants, seems remote.

Studies of the extent and nature of folk medicine use in the Hmong community in the United States are presently in progress at several sites, including Seattle, Atlanta, St. Paul, and Missoula. Planning for many of these studies has been the work of Dr. Mark Eberhardt at the Centers for Disease Control.

Recommendations

1. Lead and arsenic intoxication from folk remedies ought to be considered in the clinical evaluation of persons with SUNDS-like episodes or signs and symptoms of sleep disorders.

2. Cardiac glycoside poisoning due to organic folk remedies ought to be considered in the clinical evaluation of persons with SUNDS-like episodes.

3. Hmong and other refugee community leaders ought to be supportive of surveys and studies of traditional medicines conducted by local, state, and federal officials.

4. Health officials studying the issue of folk remedies or traditional medicines need to maintain constant awareness of the cultural sensitivity of their efforts.

7. References

Baron, R.C., Thacker, S.B., Gorekin, L., Vernon, A.A., Taylor, W.R., Choi, K.: Suddent Death Among Southeast Asian Refugees. The Journal of the American Medical Association 1983; 250:2947-2957.

Centers for Disease Control: Folk Remedy - Associated Lead Poisoning in Hmong Children - Minnesota. Morbidity and Mortality Weekly Report 1983; 32:555-556.

Lead and arsenic found in samples of folk remedy powders obtained in Twin Cities.

Centers for Disease Control: Nonfatal Arsenic Poisoning in Three Hmong Patients- Minnesota. Morbidity and Mortality Weekly Report 1984; 33:347-349.

Cases described. Editorial notes possible arsenic source as folk medicines and comments on potential relationship to SUNDS.

Chun, K., Deinard, A.: Undue Lead Absorption in Hmong Children in Minneapolis. (In Press) University of Minnesota, Department of Pediatrics.

Description of data collected since 1978 on the absorption of low levels of lead by Hmong children in Minneapolis. This study, conducted in 1983, indicates absorption rates have been changing over the years showing a peak in 1981 and an incidence similar to the general American population in 1983. The questions of how or why Hmong children were experiencing higher incidence rates of lead absorption were not answered. Nutritional factors were mentioned as a possible determining factor.

Ember, L.R.: Yellow Rain: The Strange Case of the Hmong. Chemical and Engineering News January 9, 1984:8-34.

Perhaps the best review to date of the evidence and counter-evidence related to the U.S. State Department's allegations that the Soviet Union and its allies have used and are using chemical warfare (specifically "Yellow Rain") in Laos, Cambodia, and Afghanistan. It concludes "the U.S. simply has to concede that it has badly botched the science needed to prove its cause for toxin warfare, and that it has to start over".

Gerhardt, R.E., Crecelius, E.A., Hudson, J.B.: Moonshine-Related Arsenic Poisoning. Archives of Internal Medicine February 1980; 140:211-213.

Twelve cases of arsenic poisoning reviewed.

Goldsmith, S., From, A.: Arsenic-Induced Atypical Ventricular Tachycardia. New England Journal of Medicine 1980;303:1096-1098.

Case presentation of torsade de pointes-type ventricular tachycardia after prolongation of the Q-T interval in arsenic intoxication. Treatment with isoproterenol is recommended and need for cardiac monitoring of cases is stressed.

Greenberg, C., Davies, S., McGowan, T., Schorer, A., Drage, C.: Acute Respiratory Failure Following Severe Arsenic Poisoning. Chest November 1979; 76:5-7.

Severe case of arsenic poisoning in a farmer, course complicated by paralysis and respiratory failure.

Haruff, R.C.: Chemical-Biological Warfare in Asia. The Journal of the American Medical Association July 22, 1983; 250:497-498.

Commentary on the alleged use of chemical-biological weapons in Asia by the Soviet backed Vietnamese causing death and pulmonary complaints. The author cites as evidence accounts by the Hmong he treated as a physician in the Ban Vinai refugee camp (Thailand, 1980); a State Department study; and several other studies conducted in the U.S. and Canada. Critics claim that the mycotoxins allegedly used as a chemical-biological weapon in Asia could have been produced naturally. He ends by noting the importance of this situation, especially in light of its precedence as a breech of existing treaties. Author laments the lack of interest on this issue.

Keogh, J.: Recognizing Lead Poisoning in Adults. Archives of Internal Medicine October 1984; 144:1944-1945.

Parsons, J.S.: Contaminated Herbal Tea as a Potential Source of Chronic Arsenic Poisoning. North Carolina Medical Journal 1981; 2:38-39.

Herbal tea made of Xanthorrhiza simplicissima (yellow root) or Hydrastis canadensis (golden seat) grown in contaminated soil.

Petery, J.S., Gross, C., Victoria, B.E.: Ventricular Fibrillation Caused by Arsenic Poisoning. American Journal of Diseases in Children 1970; 120:367-371.

Presentation of a case of arsenic poisoning in a 3 year-old; clinical manifestations and treatment, including cardiovascular complications.

Smith, W.M., Gallagher, J.J.: Les Tordes de Pointes: An Unusual Ventricular Arrhythmia. Annals of Internal Medicine 1980;93:579-584.

A discussion of an unusual electrocardiographic manifestation of arsenic

poisoning. Treatment is described.

Tay, C. H.: Cultaneous Manifestations of Arsenic Poisoning Due to Certain Chinese Herbal Medicines. Journal of Dermatology in Australia 1974; 15:121-131.

Details of dermatologic condition of patients later described by Tay and Seah.

Tay, C.H., Seah, C.S.: Arsenic Poisoning from Anti-Asthmatic Herbal Preparations. Medical Journal of Australia 1975; 2:424-428.

Description of 74 cases of arsenic poisoning in Singapore due to ingestion of Chinese "herbal" medicine containing inorganic arsenic sulfide. Detailed discussion of signs and symptoms, and laboratory evaluation of the cases and the nature of the traditional medicines which have been consumed.

Wade, N.: Yellow Rain and the Cloud of Chemical War. Science November 27, 1981; 214:1008-1009.

Refutes the findings used in the State Department's 1981 case alleging the Soviet Union's use of chemical warfare in Laos and Cambodia since 1976. States that the evidence used is sketchy. Does not directly refer to SUNDS.

8. SUNDS AND THE HEART

Cardiac arrest, the acute stoppage of the heart causing sudden death, has long been recognized as the final event in the course of fatal illness. In that sense, all death is sudden. On the other hand, cardiologists and cardiovascular epidemiologists have come to use the term sudden death in a more restricted sense to mean death occurring in an individual who was considered to be in good health as recently as twenty-four hours prior to death. Sudden death is also unexpected death.

Because sudden death is a major phenomenon in the United States and other industrialized countries, it has been studied intensively. There is a large body of medical literature describing its epidemiologic patterns. Primary among the diseases associated with sudden death is atherosclerotic heart disease.

Due to diet, genetics, environment, activity, and other factors, persons in an affluent industrial society progressively develop blockages in the arteries. This process is called atherosclerosis. When cholesterol plaques or blood clots occlude the coronary arteries which supply the heart muscle, the event is called myocardial infarction, or a "heart attack". Sudden death may result from such damage, either because so much of the heart muscle has been infarcted that it can no longer effectively pump blood or because the injured tissue causes disruption of the heart rhythm.

Following myocardial infarction, an arrhythmia (abnormal heart rhythm) called ventricular fibrillation (VF) commonly causes sudden death. VF is an overload of electrical activity which causes the heart muscle to quiver ineffectively and not to contract. Loss of consciousness (syncope) follows VF immediately because blood is no longer being pumped into the brain. Death occurs within minutes if VF is not reversed. Cardiologists are all too familiar with this series of events because atherosclerotic coronary artery disease with myocardial infarction and ventricular fibrillation is the most common cause of death in the industrial countries of the world.

The Sudden Unexpected Nocturnal Death Syndrome (SUNDS), is by definition sudden and unexpected. More importantly, it is also unexplained. The autopsy or post-mortem examinations of the victims do not show changes in the coronary arteries typical of atherosclerotic disease. There are no areas of infarction in the myocardial tissue. There is, in fact, no cause of death found at all.

An autopsy is necessary to assign a person to the category of SUNDS because other causes of death, including atherosclerotic heart disease, must be excluded. Diseased hearts, chronic illnesses, and explained deaths are therefore removed from consideration in trying to understand SUNDS. Consequently, the body of medical knowledge about sudden death in general becomes irrelevant for SUNDS because the studies for the most part describe atherosclerotic heart disease.

In the normal heart, there is a small bit of tissue, the sinoatrial node (S-A node) which is the pacemaker of the heart. Roughly speaking, the S-A node is

analogous to the spark plugs in a car motor. About eighty times a minute, from birth to death, a small electrical spark is discharged from the node, is carried down a conduction pathway of special cells, and causes the ventricles to contract. Unlike the spark plug wires in a car engine, the conduction system in the heart cannot be taken off and examined for problems. In the live person, the node and conduction system can be tested by measuring electrical conduction times over the pathways, a process called electrophysiologic testing or cardiac pacing. (Green, et al., 1978) After death, the conduction system can be examined by slicing thin sections of its course and viewing the cells microscopically.

The S-A node is not autonomous but has connections to the central nervous system. Through nerves and hormones, the brain has a profound effect on the function of the S-A node and the heartbeat. Everyone knows what it is like to have a surge of adrenalin causing the heart to race. Adrenalin is simply a hormonal boost to the nerve connections that are functioning all the time.

The autonomic nervous system (ANS), the involuntary or automatic portion of the nervous system, controls the basic functions of life and the vital organs. It has two opposing halves. One half, the sympathetic, functions in the same way as adrenalin, revving up the body and the heart to deal with danger, excitement or stress. Sympathetic fibers from the brain to the heart connect with the S-A node and increase heart rate. The opposite half of the ANS is the parasympathetic; its nerve fibers have the opposite effect; they slow down the heart rate for such activities as rest and digestion. These two sets of nerve fibers constantly have electrical activity or traffic, referred to as tone. The balance between them is important in regulating heart rate.

Pattern of Cardiovascular Disease in Southeast Asians

Heart disease mortality has been studied in migrants moving from one part of the world to another. (Kasl, 1983) In general, the mortality from atherosclerotic heart disease in migrants from a country with a low prevalence rate to a country with a high prevalence rate is half-way between the rates for the country of origin and the new country. Similar intermediate rates have been documented for the risk factors in atherosclerotic heart disease--hypertension and hypercholesterolemia. The best known set of studies of heart disease in migrants were obtained in persons moving from Japan, with a very low rate of atherosclerotic heart disease, to the United States with a high rate. The degree of acculturation to the new country correlated with increasing rates of coronary artery disease. The degree of acculturation to the new country correlated with increasing rates of coronary artery disease. Those who retained the highest level of the traditional Japanese way of life in the United States had the lowest prevalence of coronary artery disease in the new country.

The effects of migration and the degree of acculturation among Southeast Asians coming to the United States on SUNDS is not known. In the Japanese immigrants, the development of coronary artery disease involved a complex set of risk factors, many of which (diet, level of exercise, cigarette smoking, and stress) have behavioral or cultural components. Contrary to the Japanese immigrants who increased their risk of coronary artery disease with increasing time in the new culture and increasing acculturation, the Southeast Asian

victims of SUNDS in the United States have for the most part been recent arrivals. In addition, there is no reason to believe that the risk factors associated with atherosclerotic heart disease, coronary artery disease, and sudden death are pertinent to SUNDS. (Baron, et al. 1983)

There is preliminary data about the prevalence rate of hypertension among incoming Southeast Asian refugees to the United States. As her master's thesis for a degree in public health, University of Minnesota medical student Heidi Nelson completed a survey of blood pressure readings of Southeast Asians during their intake medical screening examinations at the Saint Paul Division of Public Health for the years 1980, 1981 and 1982. The prevalence of hypertension among incoming Southeast Asian adults (over 14) was less than 1% for all ethnic groups and ages. Of 102 Hmong adults, none was found to have hypertension. This low prevalence rate for hypertension in Hmong contrasts sharply with the high rate for Americans. (Nelson, unpublished data, 1984)

Studies Performed on Victims of SUNDS

A case control study of SUNDS conducted by the Centers for Disease Control in 1982 revealed no differences between cases and controls on such characteristics as history of cardiac disease, history of symptoms compatible with cardiovascular disease, or diet. (Baron et al., 1983) In fact, the case control study failed to establish any causal factors for those who had died. For factors conceivably associated with other varieties of sudden death, only one, a difference in the amount of external stress for the cases, was detected. Many of the cases of SUNDS were recent arrivals, had large families, experienced job and school problems, and had financial difficulties. Cases were also more likely to have had recent loss of weight.

The hearts of six of the SUNDS victims were analyzed post-mortem by serial sectioning of the conduction pathway between the S-A node and the ventricle. (Eckner, et al., 1983) Three of the SUNDS victims' hearts had malformations in the structure of the conduction pathways. One of these also had significant thickening of the heart muscle and coronary artery atherosclerosis. The study suffers from the lack of a control group which might or might not be found to have similar abnormalities.

Of special importance for SUNDS is a paper describing studies of the heart of seven fatal cases of pokkuri disease in Japan, a syndrome with the same definition as SUNDS. (Gotoh, 1976) Victims were relatively young, healthy men who were later found to be without factors for cardiac arrest or a cause of death explainable by autopsy. Increased fibrous tissue (fibrosis) in the S-A node and in the junction between the node and the atrial muscle fibers was found in six of the seven cases. There was an abnormal course of the sinus node artery in six cases, with three of the subjects' arteries having no penetration into the node itself. Pathological lesions were found in the conduction system between the S-A node and the ventricles in four cases, two with fibrotic lesions in the midportion (distal bundle of His and proximal left and right bundle branches) and two with lipomatous partial interruption in the same area. One man had had an electrocardiogram two and a half months before his death. The tracing showed axis deviation and complete right bundle branch block, findings consistent with the abnormalities later found in his conduction pathway.

Recently, Japanese pathologists have described abnormalities in heart tissues from victims of pokkuri in Tokyo. (Ishiyama, et al., 1982) Referring to the syndrome as acute cardiac failure, the investigators noted a deletion of myoglobin from heart muscle fibers in numerous foci in the hearts of five victims. The intramural and the epicardial regions of the muscle were especially affected. The fibers themselves were normal in structure and did not show any alterations typical of myocardial infarction. Loss of myoglobin has been associated in other studies with acute ischemia (lack of adequate blood supply). The authors speculate that the most plausible explanation for the loss of myoglobin in the five cases would be "functional spasms of the main branches of coronary artery in a state of vagotonia, especially during sleep." The resulting ischemia could rob the fibers of the myoglobin necessary to contract.

Parasympathetic effects on the heart include: decreasing heart rate by means of the S-A node; decreasing contractility of the atria; and decreasing conduction velocity in the atrio-ventricular (AV) node. There are said to be few parasympathetic effects on the conduction system (His-Purkinje system), the ventricles, or the coronary arteries. (Koelle, 1975)

Studies Performed on SUNDS Survivors

Important studies were performed in Seattle, WA, on three survivors of SUNDS. (Otto, et al., 1984) The cases, young men from Laos (1 Lao, 1 Hmong) and the Philippines, were resuscitated by paramedics called to the scene. Paramedics documented ventricular fibrillation on the electrocardiographic tracings. Clinical evaluation later revealed no coronary artherosclerosis or structural cardiac lesions of the heart. One of the men, well two years after his cardiac arrest, was studied with cardiac catheterization. The coronary arteries were normal. He refused electrophysiological studies of the conduction pathway during the procedure. A second patient agreed to have electrophysiologic studies during cardiac catheterization three months after his cardiac arrest. He had normal coronary arteries. Electrophysiologically, he had normal S-A node function, A-V conduction times, and refractoriness. He did, however, produce a rapid ventricular tachycardia with programmed right ventricular extrastimulation. After the study, he took an antiarrhythmic medication, quinidine gluconate, and did well.

Stress and Sudden Cardiac Death

The earthquake in Athens, Greece, in 1981 afforded the opportunity to study cardiovascular disease death rates during a period of high stress. (Trichopoulos, et al., 1981) An excess of deaths from atherosclerotic coronary artery disease followed the earthquake. Emotional stress secondary to the disaster might have increased sympathetic tone and activity in those who suffered fatal arrhythmias. Five persons known to have coronary artery disease were having ambulatory cardiac monitoring during the earthquake. (Vordis, 1983) They were found to have more rhythm disturbances after the earthquake.

There have been investigations of neural influences on arrhythmias and sudden death. (Lown, 1982; Burch and DePasquale, 1965; Verrier and Lown, 1978, 1982)

Electrical stability of the myocardium is favored by decreasing sympathetic tone to the heart and increasing parasympathetic. In experiments on dogs who were given precursors of serotonin, a substance in the brain which increases sympathetic tone, the hearts were more excitable and more subject to serious arrhythmias. (Robinowitz and Lown, 1978; Scott, et al., 1981)

Clonidine, an antihypertensive drug which decreases sympathetic discharges to the heart, could conceivably be used to treat a person at risk for arrhythmias incited by or aggravated by increased sympathetic tone to the heart. Clinical studies using clonidine for this purpose have not been carried out.

Treatment of Ventricular Arrhythmias and Sudden Death

The treatment of ventricular fibrillation, ventricular tachycardia, and sudden death are left to the physician. (Mayer, 1984; Castle, 1984) Brief descriptions of these treatments are necessary, though, for those who wish to consider emergency response to SUNDS and to design preventive measures for persons at risk for SUNDS.

Cardiopulmonary resuscitation (CPR) is a community-based technique of basic life support well-known to many persons in any community of the United States. After CPR has been applied by citizens or paramedics on the scene, advanced cardiac life support (ACLS) can be administered in the ambulance or in the hospital. Treatment for ventricular arrhythmias is cardioversion, a burst of electricity delivered to the heart through the chest wall which shocks the heart into a normal life-sustaining rhythm. Attention is given to promote cardiac electrical stability by correcting hypoxia, acidosis, and electrolyte disturbances. A third component of ACLS is the use of drugs known to stabilize the heart rhythm. Two of the three main drugs used for this purpose, bretylium and lidocaine, are available only in intravenous form. The third, procainamide, is available in oral form but is not as effective as the other two and has other major disadvantages.

Methods Available to Assess the Risk for Sudden Death

Assessment of risk for sudden death in patients with coronary artery disease is a common clinical procedure. (Weissler and Boudoulas, 1981) Methods are either invasive or non-invasive. Invasive techniques involve procedures in which instruments and catheters are inserted into the cardiovascular system. These procedures generally carry a small but significant risk, are costly, and are unsuitable for use in screening large numbers of persons. They are generally reserved for patients who have already suffered a cardiac arrest.

Non-invasive methods are safer, less costly, and less reliable. Three non-invasive techniques have been shown useful in studying patients with coronary artery disease to predict the likelihood of ventricular arrhythmia and sudden death. The resting electrocardiogram is a relatively simple procedure free of risk and familiar to most people. Its use in detecting risk for sudden death is limited to finding gross abnormalities in patients with severe end-stage atherosclerotic heart disease. It is probably not suitable for screening large numbers of people for risk of SUNDS because it is neither sensitive nor specific but large numbers of Southeast Asians have yet to be

tested.

The ambulatory monitoring of cardiac rhythm is a more sensitive procedure to detect arrhythmias and to assess for sudden death in atherosclerotic heart disease. Over a twenty-four hour period of time, and at no risk to the subject, the heart rhythm is recorded on a device worn on the chest. Patients with groups of certain abnormal beats have been found to be at a higher risk for sudden death. Ambulatory monitoring is more expensive than a resting electrocardiogram. It too lacks sensitivity and specificity and its relevance for screening for SUNDS is unknown.

The third non-invasive method to screen for risk for sudden death is exercise stress testing. Certain stress test findings are well correlated with subsequent clinical course for patients with severe atherosclerotic heart disease. The exercise stress test is a relatively costly procedure whose use in screening even for the relatively common atherosclerotic heart disease is controversial. Its use to screen for SUNDS has not been studied.

Recommendations

I. Clinical Evaluation and Treatment

A. For persons resuscitated from SUNDS-like episode(s) and documented cardiac arrest:

1. Evaluation
   a. complete medical history and physical examination
   b. psychosocial evaluation
   c. serum electrolytes, glucose, and blood urea nitrogen
   d. 24 hour urine collection for sodium, potassium, magnesium, and phosphorus
   e. 24 hour urine collection for heavy metals
   f. complete sleep apnea studies
   g. cardiovascular studies
      (1) resting electrocardiogram
      (2) 24 hour ambulatory electrocardiogram
      (3) exercise stress test (Bruce)
      (4) left-sided cardiac catheterization with coronary angiography
      (5) electrophysiologic conduction times, pacing, and fibrillation threshold
      (6) selection of anti-arrhythmic agent with drug trials during the electrophysiologic testing (including induction of ventricuilar arrhythmias)
      (7) endomyocardial biopsy at discretion of cardiologist

2. Treatment
   a. anti-arrhythmic drug at discretion of physician (e.g. quinidine, procainamide)
   b. stress reduction
   c. treatment of any abnormalities found during evaluation

B. For persons with non-fatal SUNDS-like episodes not resulting in documented cardiac arrest:

1. Evaluation
   a. complete medical history and physical examination
   b. psychosocial evaluation
   c. serum electrolytes, glucose, and blood urea nitrogen
   d. 24 hour urine collection for sodium, potassium, magnesium, and phosphorus
   e. 24 hour urine collection for heavy metals
   f. complete sleep apnea studies
   g. cardiovascular evaluation
      (1) resting electrocardiogram
      (2) 24 hour ambulatory electrocardiogram
      (3) exercise stress test (Bruce)
      (4) left-sided cardiac catheterization with coronary angiography

(5) electrophysiologic conduction times, pacing, and fibrillation threshold
(6) if needed selection of anti-arrhythmic agent with drug trials during the electrophysiologic testing (including induction of ventricular arrhythmias)

2. Treatment
   a. stress reduction
   b. treatment of any abnormalities found during evaluation

C. For asymptomatic adult male first-degree relatives of someone who has died of SUNDS:

1. Evaluation
   a. complete medical history and physical examination
   b. psychosocial evaluation
   c. serum electrolytes, glucose, and blood urea nitrogen
   d. 24 hour urine collection for sodium, potassium, magnesium, and phosphorus
   e. 24 hour urine collection for heavy metals if history of use of any folk medicines
   f. exercise stress test (Bruce)
   g. 24 hour ambulatory electrocardiogram
   h. ambulatory (home) sleep monitor

2. Treatment
   a. stress reduction
   b. treatment of any abnormalities found during evaluation

D. For males who have excessive nightmares, dreams of dying, death anxiety, or who are relatives greater than first-degree relation to victims of SUNDS:

1. Evaluation
   a. complete medical history and physical examination
   b. psychosocial evaluation
   c. 24 hour urine collection for heavy metals if history of use of any folk medicines
   d. ambulatory (home) sleep monitor
   e. 24 hour ambulatory electrocardiogram

2. Treatment
   a. stress reduction
   b. treatment of any abnormalities found during evaluation

II. Research

A. Use of electrocardiogram, Holter monitor, and/or exercise stress test as screening measures for SUNDS ought to be studied.
B. Conduction systems in the hearts of all SUNDS victims should be studied histopathologically.
C. Survivors of SUNDS-like events need to have complete cardiac evaluations, (including electrical pacing studies under the influence of various anti-arrhythmic agents) until enough cases have been studied

to make recommendations about therapy.

D. The issue of manipulating sympathetic or parasympathetic tone pharmacologically in persons at high risk for SUNDS needs further study.

8. References

Barodi, G., Falzi, G., Mariani, R.: Significance of Morphological Changes in Sudden Coronary Death. Advanced Cardiology 1978; 25:82-95.

Baron, R.C., et. al: Sudden Death Among Southeast Asian Refugees: An Unexplained Nocturnal Phenomenon. Journal of the American Medical Association December 2, 1983; 250:2947-2951.

This case control study of 26 deaths failed to establish causal factors, but the article suggests that some of the deaths may be associated with abnormalities in the conduction system pathways. Includes epidemiologic description of 51 cases reported through March 1982, details of case control study, and preliminary findings of cardiac studies. Concludes that emotional stress cannot be ruled out as a contributing factor.

Castle, L.: Therapy of Ventricular Tachycardia. American Journal of Cardiology 1984; 54:261-33A.

Reviews the therapeutic modalities for ventricular tachycardia (VT) - drugs, cardioversion, electrical pacing, and surgery. For the drugs, procainamide is available as an oral preparation, but lidocaine and bretylium are not. Quinidine, phenytoin, propranolol, verapamil and several investigational agents are mentioned. Cardioverson, pacemakers, and surgery are considered.

Davidson, S., Suvawicz, B.: Incidence of Supraventricular and Ventricular Ectopic Beats and Rhythms and of Atrioventricular Conduction Disturbances in Patients with Hypopotassemia. Circulation (Supple III) 1966; 33(34):III-85.

Arrhythmias occurred in 50% of 107 patients with serum K levels 3.2 mEg./L. or less. Eighteen percent of hospitalized controls (N=1879) had comparable arrhythmias. In patients with hypopotassemia, arrhythmias occurred more often in presence of EKG changes characteristic of the condition. Incidence of arrhythmias in patients with hypopotassemia and not on digitalis was 3 times higher than in controls. AV conduction disturbances were 2.5 times higher. In patients with hypopotassemia and no heart disease, arrhythmias occurred about twice as frequently as in controls.

Davies, M.J., Thomas, A.: Thrombosis and Acute Coronary-Artery Lesions in Sudden Cardiac Ischemic Death. New England Journal of Medicine May 3, 1984; 310:1137-1140.

Acute intra-arterial lesions (thrombus or plaque fissure) was found among all but 5 of 100 subjects who died of ischemic atherosclerotic heart disease. Most of the thrombi were found at points of stenotic lesions.

Dyckner, T., Wester, P.: Magnesium in Cardiology. Acta Medica Scandinavica (Supple)1982; 661:27-31.

Eckner, F., Kirschner, R.H., Baron, R.: Sudden Nocturnal Death in Southeast Asian Refugees: A Progress Report. Proceedings of the 1983 Meeting of the American Academy of Forensic Science, Abstract G-32.

Abstract appears as follows: "In the past 2 years, CDC has investigated more than 50 cases of nocturnal sudden death occurring among Southeast Asian refugees. All except one of the victims have been males, and all died in their sleep. The finding of significant cardiac conduction system anomalies in one victim led to a cooperative pilot study to determine whether similar abnormalities might be associated with sudden death in other victims. We have examined the hearts in six additional cases; in one of these, extensive previous dissection precluded further evaluation. In three hearts, malformations of the conduction system were the major significant abnormalities; in one heart, significant ventricular hypertrophy and coronary atherosclerosis were also present. Unusual abnormalities of the aortic root, involving the central fibrous body, were present in 2 hearts. One heart showed no significant abnormalities. Interestingly, this victim did not fit the usual sudden death pattern, but collapsed while awake. He was also suffering from a possible allergic reaction to a drug at the time of his death. These results should be interpreted with caution, but suggest that cardiac conduction system abnormalities may be an important factor in sudden death in Southeast Asian refugees."

Eliot, R.S., Forker, A.D.: Emotional Stress and Cardiac Disease. The Journal of the American Medical Association 1976; 236:2325-2326.

Gotoh, K.: HistopathologicalStudy on the Conduction System of the So-Called "Pokkuri Disease" (sudden unexpected cardiac death of unknown origin in Japan). Japanese Circulation Journal 1976; 40:753-768.

Conduction systems in the hearts of seven fatalities were studied histologically with serial sectioning method. Fibrosis with a significant reduction of conduction fibers in the SA node and its junction with the atrial fibers was found in six cases. Four cases had pathological lesions in the AV conduction system: two with fibrotic lesions in the distal bundle of His and two with lipomatous partical interruption in the mid and distal bundle of His. One case had an abnormal EKG (left axis deviation and right bundle branch block). Description and definition of pokkuri disease: 1) relatively young healthy male, 2) dies suddenly with a groan, 3) while sleeping at night, 4) with no known factors precipitating cardiac arrest and 5) without any causes explainable in terms of autopsy findings. Considerable clinical detail, manner of death, clinical studies, and post-mortem data are presented about the seven cases.

Greene, H.L., Reid, P.R., Schaeffer, A.H.: The Repetitive Ventricular Response in Man: A Predictor of Sudden Death. The New England Journal of Medicine 1978; 299:729-734.

This study describes cardiac pacing (programmed stimulation of the ventricle) to assess a group of fifty patients with coronary artery disease and 12 controls in regard to repetitive ventricular responses (arrhythmias).

Ishiyama, I., Kamiya, M., Rose, M., Komuro, E., Takatsu, A.: Fluminant Deletion of Myoglobin from Myocardial Fibres in State of Acute Cardiac Failure Inducing Sudden Cardiac Death. Lancet 1982; 2:1468-1469.

Jenkins, C.D.: Recent Evidence Supporting Psychologic and Social Risk Factors for Coronary Disease. The New England Journal of Medicine 1976; 294:987-994.

A review of studies which identify cultural and behavioral variables in the cause of coronary disease. Considers occupation, socio-economic status, religious affiliation, cultural mobility, anxiety, and dissatisfaction as factors which "offer the possibility of accounting for at least part of th cause of coronary disease still remaining unexplained."

Koelle, G.B.: Neurohumeral Transmission and the Autonomic Nervous System. Ch. 21, in Goodman, L.S. and Gilman, A. eds. The Pharmacological Basis of Therapeutics, New York: Macmillan, 1975, pp. 404-444.

Lown, B.: Mental Stress, Arrhythmias and Sudden Death. American Journal of Medicine 1982; 72:177-180.

An editorial discussion of the relationship between stress and sudden cardiac death due to coronary artery disease. Experience from animal studies is reviewed. Animals in a stressful situation had reduced thresholds for ventricular fibrillation, all else being equal. This response becomes conditioned in the stressful environment, even without the agent of stress. A review listing 88 studies of psychosocial precursors of human coronary morbidity and mortality is mentioned. The best documentation of the biobehavioral factors in coronary artery disease relates to bereavement. Migrant studies of Japanese in Asia and North America are discussed. The prevalence gradient is not explained by differences in usual risk factors for coronary artery disease. The existence of premature ventricular beats and the randomness with which they occur in some patients is discussed. There is decreased prevalence of the beats and reduced grade of beat when the patient is largely physically passive. Emotionally stressful events increase PVC's in some patients. Input from the higher neural centers may be the element that provides neural stimulation to disorganize the heart rhythm. Reduction in psychological arousal, sleep and relaxation lessen the frequency of PVC's, but REM sleep provoke them. The genesis of malignant ventricular arrhythmias involved three factors: 1) presence of myocardial electrical instability; 2) intense psychologic state burdening daily life; 3) a proximate psychologically charged event. Among 117 patients, the psychological state was either an affective depression or sense of emotional entrapment without seeming exit. 21% of patients had a psychological trigger for arrhythmias, usually preceeding it by less than 1 hour. Future directions for intervention are mentioned such as the use of preventive dietary changes, namely amino acides tyrosine and

L-tryptophan.

Lown, B., Temte, J.V., Reich, P., Gaughan, C., Regestein, Q., Hai, H.: Basis for Recurring Ventricular Fibrillation in the Absence of Coronary Heart Disease and Its Management. The New England Journal of Medicine 1976; 294:623-629.

The case of a 39 year old man who had ventricular fibrillation is discussed. The subject underwent extensive testing including catheterization of the heart. No coronary artery disease was found. Premature ventricular beats were noted at 2-4 per minute. He was tested on a variety of medications. Psychiatric and psychophysiological studies were made awake and sleeping. Findings are described in detail. The patient was placed on digoxin, phenytoin, and propranolol. He was taught meditation. The premature beats were abolished in time. It is of special interest that the sleep study showed increased ventricular premature beats during early morning hours at the time of REM sleep. The authors emphasize that it is not sufficient to select only one seemingly effective drug. Acute testing of drugs under controlled conditions is advisable. In this case, the two drugs suppressed the arrhythmias but they re-emerged during emotional stress. A beta-blocking agent was added with good result.

Lown, B., DeSilva, R.A., Reich, P., Murawski, B.J.: Psychophysiologic Factors in Sudden Cardiac Death. American Journal of Psychiatry 1980; 137:1325-1335.

Describes the use of animal models to determine the repetitive extrasystole threshold (more than one ventricular extrasystole but less than ventricular fibrillation) after electrical stimulation of the heart. The threshold is consistently 65% of the fibrillation threshold. Dogs who are placed under psychologic stress showed decreased levels in the repetitive extrasystole threshold and even may be conditioned in a Pavlovian fashion. Neural mechanisms, the autonomic nervous system connections, are discussed. Observations in humans regarding stress, arrhythmias, and sudden death are also summarized. Of special interest for SUNDS is that patients while asleep showed a striking decrease in the number of premature ventricular beats. Studies of persons engaged in meditation also suggested a decrease in extrasystoles.

Mayer, N.M.: Management of Ventricular Dysrhythmias in the Pre-Hospital and Emergency Department Setting. American Journal of Cardiology 1984; 54:34A-36A.

Treatment of out-of-hospital ventricular fibrillation is discussed. Anti-arrhythmic drugs: bretylium, lidocaine, and procainamide are described. Current AHA guidelines for advanced Cardiac Life Siupport now recommend bretylium after unsuccessful cardioversion in the field.

Otto, C.M., Tauxe, R.V., Cobb, L.A.: Ventricular Fibrillation Causes Sudden Death in Southeast Asian Immigrants. Annals of Internal Medicine 1984; 100:45-47.

Researchers in Seattle studied four SUNDS survivors who were resuscitated by emergency paramedics. They included a 30 year old ethnic Lao, a 33 year old Hmong, a 37 year old Filipino, and a 40 year old Cambodian. All were men in excellent health, all were found unresponsive, gurgling or grunting in their sleep, and all were in documented ventricular fibrillation, a lethal cardiac arrhythmia, when exmained by emergency medical personel who reached the scene within 10 minutes of the beginning of the event. Each of them had a normal cardiac rhythm restored by electrical defibrillation in the field, and each of them had a second episode of ventricular fibrillation within the first half hour, from which they were also resuscitated.

The person in which the longest time elapsed before paramedics were summoned was severely brain damaged after resuscitation, an died several days later. The other three made complete recoveries, and underwent extensive cardiologis testing, all of which was normal, with one important exception. Electrophysiologic testing, performed on one individual 6 months after the event, showed that his heart had a remarkable tendency to start fibrillating with small electric stimuli applied directly to the heart. This tendency ws eliminated with an anti-arrhythmic medication.

Of the three who left the hospital, one took no medications and died suddenly 4 months later. The other two, on medication, were alive and well 1 and 3 years later. The studies that were done produced important information. The authors conclude: 1) that part of the underlying pathophysiology of the syndrome is an abnormal tendency to develop lethal cardiac arrhythmias, 2) that the tendency may be treatable if the person is known to be at risk, and 3) that prompt emergency cardiac care - including CPR and emergency paramedical teams equipped with defibrillators - can help people survive.

Rahe, R., Romo, M., Bennett, L., Siltanen: Recent Life Changes, Myocardial Infarction, and Abrupt Coronary Death. Archives of Internal Medicine February 1974; 133:221-228.

Investigation showed sudden death victims and survivors of myocardial infarction had marked elevations in magnitude of life changes during the eix months immediately prior to infarction or death.

Rabinowitz, S.H., Lown., B.: Central Neurochemical Factors Related to Serotonin Metabolism and Cardiac Ventricular Vulnerability for Repetitive Electrical Activity. American Journal of Cardiology 1978; 41:516-522.

Experiments with dogs are described. Sympathetic neural activity modifies cardiac excitability and lowers the threshold of the vulnerable period for ventricular fibrillation. Sympathetic tone or traffic of impulses to the heart can be decreased by giving serotonin precursors that localize in the central nervous system.

Rowland, E., Krikler, D.M.: Potassium Supplementation in the Treatment of Ventricular Arrhythmias. Acta Medica Scandinavica (Supple) 1981; 647:95-100.

The effects of potassium on the cardiac action potential is detailed. Metabolic disorders with chronic hypokalemia complicated by ventricular arrhythmias are described. Authors state that hypokalemia seems to be only one possible causal factor in various arrhythmias (including ventricular fibrillation and torsades de pointes). It is not known whether sustained hypokalemia can cause mycardial degeneration similar to the well-known tubular damage in the kidney.

Sasyniuk, B.I.: Concept of Re-Entry Verses Automaticity. American Journal of Cardiology 1984; 54:1A-6A.

A technical description of the underlying mechanisms in ventricular arrhythmias. The point is made that these mechanisms respond differently to the different anti-arrhythmic drugs.

Scott, N.A., DeSilva, R.A., Lown, B., Wurtman, R.: Tyrosine Administration Decreases Vulnerability to Ventricular Fibrillation in the Normal Canine Heart. Science 1981; 211:727-729.

IV administration of the amino acid tyrosine, a precursor of serotonin, caused dose-dependent increases in the ventricular fibrillation threshold in normal dogs. Therefore, tyrosine, presumably acting in the central nervous system, through serotonin and finally the parasympathetic nervous system protected against certain ventricular arrhythmias.

Sugai, Masayoshi: A Pathological Study on Sudden and Unexpected Death, Especially on the Cardiac Death Autopsied by Medical Examiners in Tokyo. Acta Pathologica Japonica 1959; Supplement 9:723-752.

An analysis of 18,515 consecutive autopsies in Japan. The author further describes 270 cases of heart diseases which he himself examined. Cardiac death of unknown etiology occurred in 76 of these and almost all were young men who had been considered to be in good health. They died "suddenly during sleep with a groan as if having a dreadful dream and agonal deep respiration with stretching of limbs". This syndrome has been called "pokkuri disease", meaning sudden unexpected phenomenon. Autopsies were negative. The heart was slightly hypertrophic in the majority but less than 400 G. Another set of 39 similar cases was added and the whole case group compared with controls who died violent deaths. Ages of the pokkuri deaths was 18-48 years, body weights 44.0-70.5 Kg., heart weights 270-580 G. In each decade, either the average body weight or the average heart weight was greater for cases than controls. Occupation did not differ for cases and controls. Time of death for cases was midnight to 4:00 a.m. About a third of these cases had been drinking alcohol according to family members. However, none were found to have ethyl alcohol blood levels above 0.1%. A subset of cases had an average specific gravity of blood higher than controls (1.064.3 vs. 1.057) but the same specific gravity of plasma. Cases had an average higher total protein of plasma (9.1g/dl vs. 8.3). Average hemoglobin was 17.1 (Hct. 50.3%) in cases, 14.7 (Hct. 43.5%) in controls. In a subset of each, the cases had more right coronary artery preponderance than the controls. The nervous system of the cases were also examined. As opposed to the controls, hypoplasia with cellular regression of

the sympathetic nervous tissue including the superior and inferior cervical ganglia existed in cases.

Thompson, R.G., Cobb, L.A.: Hypokalemia After Resuscitation From Out-of Hospital Ventricular Fibrillation. The Journal of The American Medical Association 1982; 248:2860-2863.

Compared with a group of patients admitted for acute myocardial infarction without cardiac arrest, the subjects who had experienced cardiac arrest had lower serum potassium values (49% vs. 19%). The cause of the hypokalemia in those who had arrested remained unknown. Whether it had existed before the arrest is also unknown. Explanations have been offered that potassium shifts from extracellular to intracellular spaces during cardiac arrest. The mechanisms are discussed.

Trichopoulos, D., Katsouyanni, K., Zavitsanos, X., et. al: Psychological Stress and Fatal Heart Attack - The Athens (1981) Earthquake Natural Experiment. Lancet 1983; 1:441-443.

An excess of deaths from atherosclerotic heart disease and related cardiac events was noted during the days following the earthquake of 1981. The increase was significant on the third day after the earthquake and appeared primarily among people with coronary artery disease. The authors speculate that stress due to earthquakes might lead to the development of disturbances associated with intense vagal activity or increased sympathetic drive.

Verrier, R.L., Lown, B.: Experimental Studies of Psychophysiological Factors in Sudden Cardiac Death. Acta Medica Scandinavica (Supple) 1982; 660:57-68.

Examines the processes underlying cardiac vulnerability to arrhythmia and the influence of psychological stress on these processes. The sympathetic and parasympathetic influences on myocardial irritability are discussed. Neurochemical agents are proposed to achieve a decrease in sympathetic tone or an increase in parasympathetic tone in the setting of high risk for lethal ventricular arrhythmia. Future studies are suggested.

Verrier, R.L., Lown, B.: Neural Influences and Sudden Cardiac Death. Advanced Cardiology 1978; 25:155-168.

Electrical instability of the heart, central neural effects, the autonomic nervous system and ventricular fibrillation are discussed in normal and diseased hearts. Parasympathetic activity of the vagus nerve is considered in relation to concurrent sympathetic discharge. The issue of psychological stress and ventricular fibrillation is examined. Evidence from cited studies indicates that stability of the ventricles can be maximized by decreasing cardiac sympathetic activity and increasing parasympathetic tone. Neurochemical agents which promote such a pattern might decrease myocardial susceptibility to ventricular fibrillation. Increasing CNS serotonin concentration in the brain has been shown to decrease sympathetic neural input to the heart. Precursors of serotonin (tryptophan) given to dogs increased the threshold for

repetitive extrasystoles by 50% when given with phenelzine (MAO inhibitor) for carbidopa. Clonidine, an antihypertensive agent which decreases adrenergic input to the heart by a central mechanism, has also been shown to decrease cardiac vulnerability to fibrillation. Increasing vagal tone with morphine has also been shown to decrease myocardial vulnerability to arrhythmia.

Voridis, E.M., Mallios, K.D., Papantonis, T.M.: Holter Monitoring During 1981 Athens Earthquake. Lancet 1983; 1:1281-1282.

Rhythm strips on five patients who experienced the 1981 earthquake in Athens were analyzed before and after the quake. Results suggest that cardiac rhythm disturbances occur due to the stress in some people with ischemic heart disease or pre-existing rhythm disturbances.

Weissler, A.M., Boudoulas, H.: Sudden Death: Detecting the Vulnerable Ventricle by Non-Invasive Methods. Journal of Laboratory and Clinical Medicine 1981; 98:654-659.

An editorial which reviews the subject of sudden death due to coronary arterioscerlotic disease and the factors which precipitate sudden death in that disease. The two approaches to clinical management of sudden death are discussed: first, community-wide cardiopulmonary resuscitation programs; second, intervening with those at highest risk for sudden death. In patients with established coronary artery disease, non-invasive procedures have been used to uncover the portion of patients with highest risk. One of these methods described, ambulatory monitoring of cardiac rhythm, has been shown to be effective in detecting patients at high risk for sudden death in those with a history of prior myocardial infarction. Other non-invasive techniques, such as determination of the PEP/LVET, use of exercise stress testing, and analysis of the QT interval have also been employed. An invasive technique, programmed stimulation of the ventricle, appears to offer promise in detecting those at high risk but has obvious safety and cost limitations.

Wurtman, R.J., Fernstrom, J.D.: Effects of the Diet on Brain Neurotransmitters. Nutrition Review 1974; 32:193-200.

Serotonin normally increases in the brian after a protein meal. Strategies for examining the effects of diet on the brain are described. Acute effects of protein-free or protein containing meals on brain serotonin in rats is found to be reflective of plasma tryptophan, a precursor of serotonin. Based on indirect observations, human beings are found to have a similar pattern. In a reversal of the usual concept of brain biochemistry controlling behavior, behavior (food choice, eating habits) can potentially control or influence brain biochemistry (serotonin). The ability of brain serotonin levels to be influenced by diet-induced changes in plasma amino acids such as tryptophan could be a mechanism by which the brain decides when it is hungry, time to sleep, etc. Therefore, the serotonin-releasing brain neurons function as a kind of humeral-neural transducer, converting information about the peripheral metabolism (amino acid pattern) to neural signals (the release of a greater or less quantity of serotonin). Serotonin in turn affects behavior and basic life functions.

9. SUNDS and Sleep

One of the perplexing characteristics of the Sudden Unexpected Nocturnal Death Syndrome (SUNDS) is the time of death. Unlike other varieties of sudden death, the SUNDS victim usually dies during sleep between midnight and 6 A.M. These observations lead to the consideration of sleep abnormalities as a possible cause of SUNDS.

In recent years sleep has come under extensive study by neurologists and pulmonary medicine specialists. Technology to study sleep and respirations during sleep has developed rapidly. A system of regional sleep disorder study centers exists in the United States, and there are also academic centers and private hospitals with sleep laboratories. Patients may be referred to such laboratories for sleep testing, just as they are referred for other medical tests, and reports are returned to the patient's physician describing the results of the studies. The regional centers are currently evaluating methods of home monitoring which can be performed more cheaply and conveniently. Home monitoring may eventually serve as a way to screen subjects who need further sleep studies.

Sleep investigators have long recognized the group of disorders known as sleep apnea. The word, apnea, (a = absence, pnea = breathing) refers to respiratory pauses of at least 10 seconds during sleep. Such apnic pauses, the cessation of air flow, are detected by probes measuring the air flow at the nose and mouth. Hypopnea, a reduction in breathing effort but not actual breathing pauses, is defined as a decrease in air exchange to less than 1/3 of the normal rate for a period of at least 10 seconds. Hypopnea must also be accompanied by at least a 4 percent reduction in arterial oxygen saturation. Air flow probes and rib and abdominal expansion belts are used to monitor the respiratory effort. Hypoxia, which means decreased oxygen saturation in the blood, is the result of apnea, hypopnea, and other conditions. Continuous monitoring of the oxygen saturation can be accomplished over a period of time by using a device called an oximeter. The oximeter, attached to the ear lobe, uses a spectrophotometric technique to determine oxygen saturation in the blood flowing through the ear.

During sleep studies, then, hypopnea and apnea are detected by oral and nasal airflow probes clipped to the lip and the nostril and by rib and abdominal belts. Hypoxia is detected continuously by an air oximeter. Other parameters are also measured routinely--the electrocardiogram for the heart beat, the electroencephalogram for the brain wave patterns, and electrodes for muscle activity and eye movement. Through such monitoring, the sleep pattern of an individual can be divided into three categories: wakefulness, slow-wave or deep sleep, and rapid-eye movement (REM) sleep. REM sleep, a lighter or higher level of sleep, is associated with dreaming and muscular activity. Apneic spells during REM sleep or at the onset of sleep are not considered abnormal. (Guilleminault, et al., 1976)

It is said that the ability of the subject to sleep while hooked up to the monitors in a sleep laboratory may in itself be indicative of the presence of sleep apnea syndrome. There are several types of sleep apnea, generally

categorized as obstructive, central, and mixed. Obstructive sleep apnea tends to occur in obese individuals whose air passageways are anatomically obstructed during sleep. Sleep studies can differentiate them from subjects with central apneic spells which involve the sleep control centers in the brain stem. In obstructive apnea, the subject has reduced air flow, but normal or increased respiratory effort. With central apnea there is a decrease in air flow and effort.

The control of breathing during sleep is certainly beyond the scope of this discussion. During normal sleep there are ventilatory responses to a wide range of stimuli in the chest wall, the upper air way, the lumps, the great vessels, and the nervus system. Respiratory changes also accompanying the REM and the non-REM sleep stages. Feedback mechanisms involving the respiratory organs, airways, blood, and the central sleep control centers in the brain stem are responsible for control of breathing. (Phillipson, 1978)

During non-REM sleep, breathing control depends heavily upon metabolic stimuli such as the level of carbon dioxide in the blood to stimulate the brain stem breathing centers. Abnormalities in this metabolic control system have been identified in a variety of diseases affecting the brain stem and spinal cord. The cause of the Sudden Infant Death Syndrome (SIDS) has been postulated to be a disorder of metabolic respiratory control. (Phillipson, 1978)

The prevalence of sleep apnea is not well known because of the complexity and cost of sleep studies. One report described 20 of 38 symptomatic normal men to have nocturnal hypoxia during one night of testing. (Block, et al., 1979) None of the 19 women tested had any abnormalities. Whether or not this surprisingly high prevalence rate of sleep apnea and hypoxia can be generalized to other groups of subjects is unknown. Progesterone, a female hormone and a respiratory stimulant may be a factor in protecting women from sleep apnea and hypoxia. Substances which stimulate respirations, aminophylline for example, have been used to treat sleep apnea patients. Other patients have received acetazolamide to acidify the blood in order to stimulate respiration. (White, et al., 1982)

Hypoxia causes erythrocytosis, a compensatory increase in the number of red blood cells. Low levels of oxygen saturation in the blood stimulate the production of the hormone erythropoeitin which causes the marrow to increase production of more red blood cells. Common examples of hypoxia-induced erythrocytosis are seen in persons with chronic lung diseases, smokers, and those living at very high altitudes. The number of erythrocytes could conceivably be used to screen subjects for the presence of sleep apnea syndrome associated with significant hypoxia, but this idea has not been studied.

In an extensive study of 131 cases of pokkuri, a SUNDS-like syndrome in Japan, a group of 14 cases were compared with 48 matched controls who had died of violence. Cases had higher mean hemoglobin (17.1 grams/% dl versus 14.7 grams/ dl) and hematocrit levels (50% versus 43.5%). (Sugai, 1959) Could erythrocytosis serve as a marker for potential SUNDS victims in the United States? The answer is not known considering that sleep disorders have not been directly associated with SUNDS and few Southeast Asian subjects have received sleep studies. Furthermore, erythrocytosis has not been used as a screening test for sleep apnea itself.

Ronald G. Munger, an anthropologist, has described observations of sleep abnormalities in Hmong refugees in the Ban Vinai Camp in Loei Providence of northeastern Thailand. Among the 40,000 Hmong inhabitants of the camp, Munger identified the relatives of 16 individuals who had died of sudden unexpected death. Four of them had a history of nonfatal sleep disturbances preceding the death, including abnormal respiratory sounds, breathing difficulties, movements, seizure-like activity or death dreams. In addition, he found six living subjects who had had similar sleep disturbances. The live subjects were more apt to have been described as having seizure-like activity in sleep than the deceased subjects. (Munger, in press)

Researchers from the Centers for Disease Control in Atlanta have discounted the possibility that sleep apnea is a factor in SUNDS. They found that victims' families never described symptoms typical of sleep apnea syndrome, i.e., "obesity, snoring, frequent nocturnal awakening or hypersomnolence." (CDC, 1981; Baron, et al., 1983)

Fourteen healthy and asymptomatic Hmong subjects, some of them relatives of SUNDS victims received sleep studies at the University of Minnesota. Three of them had abnormal results. One man whose wife reported him snoring at night was found to have obstructive apnea with breathing pauses as long as 46 seconds accompanied by significant oxygen desaturation (hypoxia). A second subject, a 22-year-old nephew of a SUNDS victim had 75 hypopneic episodes lasting 15 to 30 seconds during the night he was monitored. Oxygen saturation of 88 percent of normal was associated with the episodes. Another subject, a 22-year-old brother of a SUNDS victim had an unsatisfactory study (no REM sleep) but did exhibit 15 episodes of hypopnea and central sleep apnea (10 to 20 seconds). Oxygen saturation decreased only slightly from 97 to 94 percent. Heart rate decreased from 60 to 50 per minute during the episodes. (Hedemark, personal communication, 1984)

Cardiac pauses rather than respiratory pauses during sleep have been recently described in four white American adults who had sinus arrest (no heart beat) for periods up to nine seconds during REM sleep. (Guilleminault, et al., 1984) after extensive evaluation, the patients were found to have normal cardiac anatomy and function. Three of the four patients were treated with pacemakers set at a lower limit of 40 per minute and have been asymptomatic. The authors propose that the underlying defect in these patients lies in the autonomic nervous system, specifically, an over activity of the parasympathetic tone via the vagal nerve.

An editorial discussing the implications of sinus arrest during sleep points out the apparent dissimilarity between it and four survivors of SUNDS. (Cobb, 1984; Otto, et al, 1984). The SUNDS survivors were all found in ventricular fibrillation, and on later testing, had a lower than normal threshold for ventricular arrythmias. Such irritability seems to indicate overactivity of a sympathetic rather than a parasympathetic portion of the autonomic nervous system. On the other hand, bradycardia (slow heart rate) in patients with pre-existing myocardial lesions can trigger ventricular arrhythmias.

The implications of these two studies for SUNDS is as yet unclear. Until it is appreciated whether SUNDS is promoted by sympathetic overactivity or parasympathetic overactivity, preventive medication cannot be selected for high risk subjects. Sleep studies conducted with sizable numbers of Southeast Asian

refugees, especially Hmong, could provide additional information. Those interested in contacting the nearest sleep disorder laboratory can get more information from the Association of Sleep Disorders Centers, Post Office Box 2604, Delmar, California 92014. The Association has also produced a newsletter supplement entitled, "Insurance Reimbursement for Sleep Disorders Patients: An ASDC Survey" which discusses the important question of payment for evaluations at sleep disorder centers.

Recommendations for Research:

1. Findings from sleep studies performed on at least 50 Southeast Asian subjects should be obtained and reported.

2. The possibility of using the hemoglobin or hematocrit to screen Southeast Asians for hypoxia occurring during sleep apnea needs to be evaluated.

3. The feasibility of using home sleep monitors to screen selected Southeast Asians who are at high risk for SUNDS needs to be pursued.

4. The possible role of the parasympathetic and sympathetic nervous systems on sleep disorders in Southeast Asian subjects needs to be evaluated.

5. For clinical evaluation of persons at risk for SUNDS; please see Section 8 of this report.

9. References

Baron, R.C., Thacker, S.B., Gorelkin, L., Vernon, A.A., Taylor, W.R., Choi, R.: Sudden Death Among Southeast Asian Refugees: An Unexplained Nocturnal Phenomenon. The Journal of the American Medical Association December 2, 1983; 250:2947-2951.

Block, A.J., Boysen, P.G., Wynne, J.W., Hunt, L.A.: Sleep Apnea, Hypopnea and Oxygen Desaturation in Normal Subjects. The New England Journal of Medicine 1979; 300:513-517.

Asymptomatic normal men (N=30) and women (N=19) were monitored overnight to look for breathing abnormalities and oxygen desaturation. A sex difference for abnormalities was highly significant. None of the women had desaturation. Twenty of the 30 men had a total of 264 episodes of nocturnal oxygen desaturation. Increasing age and obesity correlated in a positive way with these abnormalities. Four obese male subjects dropped their oxygen saturation to low levels (less than 72%) even though they were asymptomatic. In explaining why women seemed to be protected from oxygen desaturation during sleep, the authors cite the presence of progesterone, a respiratory stimulant.

Centers for Disease Control: Sudden Unexpected, Nocturnal Deaths among Southeast Refugees. Morbidity and Mortality Weekly Report December 4, 1981; 30:581-589.

Cobb, L.A.: Cardiac Arrest During Sleep. The New England Journal of Medicine 1984; 311:1044-1045.

An editorial which discusses the findings of Guilleminault, et al. Compares the findings with those of Otto, et al. in survivors of SUNDS-like episodes. In the former, there were cardiac sinus pauses; in the latter there was ventricular fibrillation. Spontaneous ventricular fibrillation would be difficult to ascribe to increased parasympathetic tone, the mechanism proposed for the sinus arrest cases. The possibility that bradycardia could trigger ventricular arrhythmias needs to be kept in mind as a cause of unexpected nocturnal death.

Guilleminault, C., Pool, P., Motta, J., Gillis, A.: Sinus Arrest During REM Sleep in Young Adults. The New England Journal of Medicine 1983; 311:1006-1010.

Due to vague chest symptoms, four apparently healthy young adults had sleep studies. Each had periods of asytole (no heart beat) for up to nine seconds during REM sleep. Extensive medical evaluations were otherwise normal, including the heart. Such observations could explain cases of sudden unexpected death during sleep. The findings of normal cardiac structure and function suggests that the cause of the asytolic episodes was in autonomic

function. The authors note that in sleep, the parasympathetic activity via the vagal nerve plays an imporant role in reducing heart rate during non-REM and tonic REM sleep. The vagi also cause changes in heart rate during REM sleep. Abnormal parasympathetic tone in these patients could have caused the asytoles. Treatment with atropine (anticholinergic) and similar drugs had to be discontinued because of side effects even though the sinus pauses were reduced in duration.

Guilleminault, C., Tilkian, A., Dement, W.C.,: The Sleep Apnea Syndromes. Annual Review of Medicine 1976; 27:465-484.

A thorough review of sleep apnea syndromes based upon the Stanford University Sleep Disorder Clinic case series. The majority of patients showed a predominance of upper airway sleep apnea associated with a complaint of excessive daytime hypersomnolence. Other symptoms can including snoring, abnormal behavior during sleep (i.e. arm flapping, tremors), nocturnal enuresis and morning headaches. Hemodynamic abnormalities can also be associated with sleep apnea syndromes.

Hedemark, L., McCoomb, R.C., Kronenberg, R.: Sleep Disordered Breathing in Hmong Refugees. Manuscript in Progress - Pulmonary Division, Department of Internal Medicine, University of Minnesota Hospital.

The authors conclude that sleep apnea, acting in association with cardiac dysrhythmia, is a possibility for the cause of SUNDS, and one that deserves further research. They come to this conclusion after finding that three of their overnight polysomnographic recording subjects had abnormal sleep patterns: sleep apnea and hypopnea. This study shows that sleep disordered breathing occurs in asymptomatic Hmong refugees.

Kryger, M.H., Mezon, B.J., Acres, J.C., West, O., Brownell, L.: Diagnosis of Sleep Breathing Disorders in a General Hospital: Experience and Recommendations. Archives of Internal Medicine 1982; 142:956-958.

Forty-eight patients in a general hospital were referred for sleep studies. Sleep apnea syndrome was found in nineteen of twenty-four patients with excessive daytime sleepiness. Ten of fifteen with unexplained polycythemia had severe hypoxemia during sleep.

Munger, R.G.: Sleep Disturbances and Sudden Death of Hmong Refugees: A Report on Fieldwork Conducted in the Ban Vinai Refugee Camp. In press - Presented at the Second Hmong Research Conference, University of Minnesota, Minneapolis, November 17-19, 1983.

This report is part of a larger study on sudden death in sleep of Hmong refugees conducted at the Ban Vinai refugee camp (Thailand) between October 1982 and June 1983. "The purpose of this report is to describe cases of sleep disorders which may be related to the sudden deaths in sleep. Case reports of 4 sudden death victims with a history of previous non-fatal sleep disturbances and reports of similar non-fatal sleep disturbances occurring in individuals

who are still living at the time of this writing are presented." The hypothesis "that disorders of the control of respiration during sleep - the sleep apnea syndrome - may be related to the Southeast Asian sudden deaths in sleep" is discussed.

Otto, C.M., Tauxe, R.V., Cobb, L.A.: Ventricular Fibrillation Causes Sudden Death in Southeast Asian Immigrants. Annals of Internal Medicine 1984; 100:45-47.

Phillipson, E.A.: Control of Breathing During Sleep. American Review of Respiratory Disease 1978; 118:909-939.

The purpose is to review recent advances in knowledge on disorders of breathing during sleep. (246 references given)

Weitzman, E.D.: The Syndrome of Hypersomnia and Sleep-Induced Apnea. Chest April 1979; 75(4):414-415.

Brief review of the state of knowledge on hypersomnia and sleep-induced apnea. Mention is made, for example, of the prevalence of this syndrome in obese patients, occurrence in families, risk for cardiovascular and cerebrovascular disease and the question of what causes excessive sleepiness in the daytime in only some sleep-induced apnea patients. Notes the need to explore many avenues of research before the many questions this syndrome raises are answered.

Westermeyer, J.: Hmong Deaths (letter to the editor). Science August 28, 1981; 213:952.

Offers dream interpretation as another related issue in the matter of Hmong sudden deaths, and notes higher self-report of depression and other symptoms among men at a Hmong psychiatric clinic.

White, D.P., Zwillich, C.W., Pickett, C.K., Douglas, N., Findley, L.J., Weil, J.V.: Central Sleep Apnea: Improvement with Acetazolamide Therapy. Archives of Internal Medicine 1982; 142:1816-1819.

Sleep breathing rhythm may depend on blood ph, with apnea during periods of alkalosis. Therefore, acidification might protect against central sleep apnea. Six patients were tested before and after acidification with acetazolamide. All six had significant improvement with 69% fewer apneas. Five reported more restful sleep and less daytime hypersomnolence.

10. SUNDS AND METABOLISM

Through various homeostatic mechanisms, the body keeps it chemical components within definite ranges of safety. Some of the components, for example, potassium, are important for the proper function of muscle, including the myocardium or heart muscle. Could derangements in the control of substances such as potassium be playing a role in promoting the Sudden Unexpected Nocturnal Death Syndrome (SUNDS)? The answer to that question is not answerable at this time but there are certain observations which are tantilizing to researchers interested in SUNDS.

Physicians in St. Paul, Minnesota, at St. Paul-Ramsey Medical Center and at Bethesda Lutheran Medical Center were surprised to learn that several of the staff members had observed cases of unexplained hypokalemia (low serum potassium) in hospitalized Hmong patients. At a conference about Hmong health care issues held June 1, 1984 at Bethesda, discussion revealed that St. Paul Ramsey physicians had identified at least eight Hmong patients with unexplained hypokalemia. The cause of the hypokalemia in these patients remained obscure even after a thorough clinical evaluation. (T. Davin, M.D., personal communication) Physicians at Bethesda responded that they had added a serum potassium determination to their standing orders for Hmong women admitted to labor and delivery. These preliminary observations have not been published or confirmed.

In 1982, a proposal to study the electrolyte and hormonal status in healthy Hmong adults was presented to the St. Paul-Ramsey Medical Education and Research Foundation and accepted for funding. The research design included the collection of blood and urine samples at four hour intervals from healthy Hmong subjects in Minnesota and the performance of a 24 hour ambulatory monitor of cardiac rate and rhythm (Holter Monitor). A second part of the research was to collect blood and urine samples in the Ban Vinai Refugee Camp in Thailand from Hmong subjects similar to those in Minnesota. Fewer samples were planned for each of the subjects in Thailand. It quickly became obvious to the researchers that such research was unacceptable to Hmong leaders in Ban Vinai and Minnesota. The reaction from Hmong leaders in Thailand centered around controversy about the amount of blood to be collected and its fate and about the effects the test would have on the research subjects. The Thai portion of the study was abandoned. Armed with the knowledge and experience in Thailand, the researchers tried to accomplish the study in St. Paul. Similar problems arose in obtaining full cooperation from established Hmong leaders and the problems could not be surmounted. The research funds were returned to a research foundation unused after eighteen months of discussion and meetings between the researchers and the Hmong.

The idea that idiopathic hypokalemia could be of importance to SUNDS is strengthened by observations made by the medical director of the emergency department at Philippine General Hospital in Manila. (R. Uy, M.D., personal communication) Patients with idiopathic hypokalemia are regularly observed in that hospital, and in fact, the medical director has received complaints from the laboratory about the number of serum potassium determinations being ordered by the doctors. The laboratory reaches its annual budget for serum

potassium tests before six months of the year has elapsed.

These unconfirmed observations would not assume much importance at all if it weren't for the well known fact that potassium is crucial in the function of the heart. Low potassium, especially combined with certain heart medications such as digoxin, can cause serious or fatal arrhythmias in patients with myocardial infarctions due to atherosclerotic heart disease. There are hundreds of papers in the medical literature addresssing this issue. They are beyond the scope of this discussion. (Thompson and Coff, 1982; Solomon and Cole, 1981; Dyckner and Wester, 1981)

An issue related to the control of serum electrolytes is circadian rhythm. Humans share with other animals the phenomenon of diurnal cycles in the levels of various hormones and electrolytes. The circadian peak usually occurs at 3:00 p.m. and the trough at 3:00 a.m. Jet lag is a familiar example of the circadian cycle becoming deranged. One circadian study performed on groups of subjects in Japan and Minnesota suggested that there may be racial variations in the amplitude of the circadian peak and trough. (Haus, et al., 1980)

There are also racial differences in activity of sodium-potassium-ATPase in red blood cell membranes. (Beutler, et al., 1983) The Na-K-ATPase is an enzyme responsible for the shift of electrolytes in and out of the cells of the body. The serum potassium is also affected by stress. (Brown, et al., 1983) Circulating epinephrine causes a lowering of serum potassium by affecting the $beta_2$ receptors.

It is interesting to speculate on a possible relationship between these observations and SUNDS but the data is totally lacking. Bangungut, the SUNDS-like syndrome seen in the Philippines, was observed in Hawaii among Filipino immigrants. (Aponte, 1955) One of the cases was different from the others in regard to time of death--he expired in mid-afternoon whereas the others died during the night. The daytime victim was employed as a night watchman.

Serum potassium is nearly impossible to determine post-mortem. Soon after death the cells of the body begin to break down and release the large amount of potassium contained within them during life. The level of serum potassium is even used as one measure of how long the subject has been dead. The one fluid which is partially protected from this process is the vitreous humor of the eye. In several SUNDS victims, the potassium level in the vitreous humor was normal. (M. McGee, M.D., personal communication)

That abnormalities in serum electrolytes could be caused by nutritional factors or changes in diet is very unlikely. The serum potassium is known to stay within the normal range even in cases of severe malnutrition. Only in terminal stages of starvation is there a drop in potassium due to deficient intake.

Recommendations

1. Studies are necessary to determine normal electrolyte and hormone status in healthy Hmong adults.

2. Research on unexplained hypokalemia in the Philippines needs to be pursued.

3. Southeast Asian refugees in the United States should be encouraged to consume a well-rounded, balanced diet containing adequate amounts of fresh fruits and vegetables.

10. References

Beutler, R., Kuhl, W., Sacks, P.: Sodium-Potassium ATPase Activity is Influenced by Ethnic Origin and Not by Obesity. The New England Journal of Medicine 1983; 309:756-760.

Na-K-ATPase activity as measured indirectly by red-cell ouabain binding activity differs in various racial and ethnic groups. Asian subjects had a lower enzyme activity level than many of the other groups.

Davidson, S., Surawicz, B.: Incidence of Supraventricular and Ventricular Ectopic Beats and Rhythms and of Atrioventricular Conduction Disturbances in Patients with Hypopotassemia. Circulation 1966; 34:85.

Dyckner, T., Wester, P.O.: Magnesium in Cardiology. Acta Medica Scandinavica (Suppl) 1982; 661:27-31.

Dyckner, T., Wester, P.O.: Relation Between Potassium, Magnesium, and Cardiac Arrhythmias. Acta Medica Scandinavica 1981; 647:163-169.

In magnesium deficiency, the cell may not be able to attract potassium against the cell membrane gradient because as a co-factor of ATPase the deficiency may interfere with the function of the enzyme.

Flink, E.: Magnesium Deficiency, Etiology and Clinical Spectrum. Acta Medica Scandinavica (Suppl) 1981; 647:125-137.

Acute hypomagnesemia can occur from a variety of reasons including epinephrine, cold stress, stress of serious injury, or extensive surgery. Clinical manifestations can be non-specific, neuromuscular irritability, psychiatric disturbances, and cardiac arrhythmias including ventricular fibrillation. Hypocalcemia and hypokalemia not easily corrected without concurrent magnesium therapy are also seen. Etiologies and clinical manifestations of hypomagnesemia are discussed in detail by the author. Magnesium deficiency induces myocardial lesions in several animal species. Cold stress accentuates progression of the lesions and can be prevented by magnesium supplements. Numerous references are cited which document life-threatening ventricular arrhythmias in hypomagnesemia.

Gullner, H.G., Gill, J., Bartter, F.C.: Correction of Hypokalemia Repletion in Familiar Hypokalemia Alakalosis with Tubulopathy. American Journal of Medicine 1981; 71:578-582.

Haus, E., Lakatua, D., Halberg, F., et al.: Chronobiological Studies of

Proclatin in Women in Kyushu, Japan, and Minnesota, USA. Journal of Clinical Endocrinology Metabolism 1980; 51:632-640.

Daily and monthly variations in plasma prolactin, a hormone involved in lactation, was measured in the two groups. Japanese women had a much larger circadian amplitude than Minnesota women in winter and spring largely as a result of higher concentrations at night during sleep.

Kawasaki, T., Ueno, M., Uezono, K., et al.: Differences and Similarities Among Circadian Characteristics of Plasma Renin Activity in Healthy, Young Women in Japan and the United States. American Journal of Medicine 1980; 68:91-96.

Circadian rhythms of plasma renin activity was studied. Mean amplitudes of the peak values for the two groups (Japan, Minnesota) were similar but significant difference was found in comparing mean amplitude expressed as percent of the rhythm adjusted average. A significant difference in dietary salt of the two groups probably accounted for the results.

Pick, A.: Arrhythmias and Potassium in Man. American Heart Journal 1966; 72:295-306.

Rowland, E., Krikler, D.M.: Potassium Supplementation in the Treatment of Ventricular Arrhythmias. Acta Medica Scandinavica (Suppl) 1981; 647:95-100.

The effects of potassium on the cardiac action potential is detailed. Metabolic disorders with chronic hypokalemia complicataed by ventricular arrhythmias are described. Authors state that hypokalemia seems to be only one possible causal factor in various arrhythmias including ventricualar fibrillation and torsades de pointes. It is not known whether sustained hypopotassium can cause myocardial degeneration similar to the well-known renal tubular damage.

Steen, B.: Hypokalemia - Clinical Spectrum and Etiology. Acta Medica Scandinavica 1981; 647:61-66.

A review of the cause and symptoms of potassium deficiency. Causes such as insufficient dietary intake, gastrointestinal losses, and renal potassium losses are considered. Symptoms are reviewed, many of which are nonspecific (fatigue, lack of appetite, anorexia, poor mental concentration, apathy). Symptoms related to specific organs are also discussed (palpitations, polyuria, muscle weakness).

Wester, P.O., Dyckner, T.: The Importance of the Magnesium Ion. Magnesium Deficiency - Symptomatology and Occurrence. Acta Medica Scandinavica (Suppl) 1982; 661:3-4.

Symptoms of magnesium deficiency are detailed and causes are listed. Metabolism of magnesium is discussed.

Whang, R., Oei, T.O., Aikawa, J.K.: Magnesium and Potassium Interrelationships Experimental and Clinical. Acta Medica Scandinavica 1981; 647:139-144.

Coexisting magnesium and potassium deficiencies may be more common than has been thought. Clinical aspects of identification and appreciation of the problems and treatment of the deficiencies occurring together are described.

11. SUNDS AND GENETICS

So far, there have been no investigations of possible genetic factors in the Sudden Unexpected Nocturnal Death Syndrome (SUNDS). Once the underlying mechanism of these sudden deaths is better known, genetic studies may play an important role in identifying individuals at risk.

The possibility of a genetic heart defect due to inbreeding has been proposed as the cause of SUNDS. (Marshall, 1981) The explanation was that victims suffer from congenital weakness of the autonomic system causing the heart to beat irregularly. In reply, two anthropologists noted that field work in Thailand in Laos provided no evidence of inbreeding among the Hmong. Marriage rules prohibit marriage within clans, and this modified incest taboo is observed strictly. (Munger and Hurlich, 1982)

The genetic hypothesis was one of three early, popular, sensationalized explanations for SUNDS (the other two: nightmare fright and chemical exposure). Inbreeding has not been invoked as an explanation for either of two related syndromes, bangungut or pokkuri disease, SUNDS-like deaths occurring in the Philippines and Japan. (Munger, 1982)

A crucial issue in the possible role of genetics in SUNDS is whether or not cases are clustered in families. Research to date does not confirm clustering, but there have been anecdotal reports of father-son and brother-brother victims. Because clan or family members live in similar conditions, environmental factors could also cause clustering.

In meetings sponsored by the SUNDS Planning Project, most experts have suggested that close male relatives of previous SUNDS victims (brothers, sons, uncles, nephews) should be considered at high-risk for SUNDS.

11. REFERENCES

Marshall, E.: The Hmong: Dying of Cultural Shock? Science, 1981;212:1008.

Munger, R.G., Hurlich, M.G. 1982. Hmong Deaths (letter to the editor). Science, 213:952.

Munger, R.G. Sudden Adult Death in Asian Populations: The Case of the Hmong. The Hmong in the West. B. Downing,; D. Onley, eds., Minnesota Center for Urban and Regional Affairs (publisher). Minneapolis.

12. COMMUNICATION PATTERNS

One of the most important tasks which faced the Sudden Unexpected Nocturnal Death Syndrome Planning Project was to improve communication between refugees and health care professionals. Information that had to be distributed to members of the affected communities included research findings, suggestions for preventing SUNDS, and announcements of new efforts in the field. In addition, the Project sought to improve relations between refugee groups and medical researchers, and promote SUNDS-related research by providing basic information about the syndrome and the research methods used to investigate its cause.

The Project depended heavily on the expert advice and assistance of its Advisory Board, whose members possessed skill and experience in communicating with Hmong and other Southeast Asians. The Advisory Board members who were leaders in the Hmong community offered insights into how the clan structure affects dissemination of information. Other board members who worked for health and social service agencies shared their experience from previous communication campaigns among refugee audiences.

Members of the Advisory Board expressed concern about the difficulty in measuring the effectiveness of health education among refugees. A public health nurse on the board said, "We can give tests or quizzes in a classroom setting, but there's no way to measure real attitude change." Another board member with several years of experience as a health educator in the United States and Southeast Asia said, "I don't know of any methods which exist to measure the effectiveness of materials we have produced."

On the advice of Hmong board members, the SUNDS Planning Project staff approached the problem of making individuals in the Hmong community aware of its work by preparing a brochure and other materials in the Hmong language. They were not distributed by mail because several board members said that some Hmong throw away such materials. Instead, we arranged for the leaders of refugee organizations to distribute the information from their offices. We also made presentations to refugee community groups, including student and religious organizations, and distributed the brochures personally. Working with recognized leaders through formal channels is essential to the task of information-distribution in the Hmong community.

Another communication strategy evolved from the staff's oral presentations to refugee groups. Many Hmong who came to hear a talk on SUNDS did not appear interested in statistics; Advisory Board members agreed that such an orientation is unfamiliar to some Hmong, especially older persons. A board member suggested that information about SUNDS (research findings, recommended steps for prevention, etc.) be put into the form of narratives or stories to be more appealing to the Hmong culture in which storytelling is a major social activity as well as a means of sharing knowledge.

Clearly, the task of distributing information--whether by printed material, personal interaction, or any other means--is vital to the success of health-promotion efforts. Therefore, we recommend that a carefully planned study of communication patterns in selected refugee populations be conducted.

The results from this study could have immediate application in bringing researchers, health care providers, and refugees closer together in the fight against SUNDS.

Recommendations:

1. Develop and test methods using storytelling to communicate health information.

2. Consult educational, anthropological, sociological and linguistic experts for perspectives on refugee culture and for methods of analyzing information flow.

3. Develop strategies for effective health communication among specific ethnic groups.

4. Produce and distribute a guidebook for health communicators, based on study of information flow in refugee communities.

13. COMMUNITY IMPACT OF SUNDS

There seems to be a consensus among refugee leaders and service providers working with Southeast Asian clients that the Sudden Unexpected Nocturnal Death Syndrome (SUNDS) has had a tremendous impact on their respective communities as well as on the general public through media coverage of the deaths. That impact is also reflected in the emergence of the SUNDS Planning Project which grew out of meetings of concerned members of the refugee community, public health and social workers, and others.

Impact of SUNDS on the Refugee Community

Of the 15 identified cases of SUNDS in the Twin Cities, one victim was a Lao man and the remaining 14 were Hmong men. The number of SUNDS deaths in the Hmong community has been inordinately high. Therefore, the SUNDS Planning Project chose to focus most of its attention on the Hmong as an example of an affected community.

The full impact of SUNDS on the Hmong community is not known. The pastor of a Hmong community church who was interviewed by Project staff noted that fears about SUNDS arise occasionally among his parishioners, but those are "superstitious." Other Hmong leaders told staff members that the contrary is true, a high-level of concern about SUNDS exists among Hmong in the Twin Cities. According to a young man interviewed about the recent sudden death of his father, SUNDS is an everyday concern for himself and his family. The president of Lao Family Community in St. Paul, a local mutual aid association, stated that SUNDS has a great effect on the Hmong community. "But," he said, "there are no ideas on how to resolve this problem. People don't know what to do. So there is an underlying fear, not an overt fea r."

Fear of SUNDS may be increased due to a lack of information about it. Fear is also compounded by difficulties in adapting to American life. Culture shock, depression, and cultural misunderstandings would have existed without the factor of SUNDS, but when they are combined with an overriding fear of dying, the effect is one in which mistrust occurs more readily. An excellent example of how these elements of fear and mistrust can manifest themselves was evident in a meeting between six Chicago Hmong leaders and a Project staff member in August of 1984. Fear, mistrust of doctors and of the government, hypotheses about causes, immense frustration, and religious differences were the topics of conversation.

Three potential causes of SUNDS were described by the leaders in Chicago. First, they believe that chemicals similar to Agent Orange were used in Laos and are now showing their effects; an overwhelming sense of loss, depression, and stress is causing deaths in those affected by the chemicals and in others who were not exposed. The leaders also presented the hypothesis that a change of sleeping habits, in particular the use of soft beds, poses new and fatal situations due to the tendency of men to sink into the bed and choke. As these possibilities were discussed and translated during the meeting, the feeling in the room became increasingly heavy. There was a feeling that sudden death was right there ready to pounce on one of the six men as soon as they fell asleep.

The meeting closed with a conclusion and recommendation for further action. "In conclusion, American doctors and the American government may know the cause of SUNDS, but they don't want Hmong people to know the cause because Hmong people will sue the government like the Agent Orange incident. And they also may know how to get the cure, but because they won't research nationally, they don't have it." The latter comment may refer to the feeling that local investigators do not communicate with investigators in other hospitals and cities and thus engage in information sharing. Their final statement was a recommendation that had been made at a previous meeting of 15 leaders representing the Chicago Hmong community. To summarize, they recommended a national study by the Centers for Disease Control and a broadcast on national news media of any new deaths that occur. They expressed a desire that a limited number of subsequent autopsies be completed in contrast to an autopsy for every death. They stated that they will fight the continued authorization of autopsies on religious grounds.

The sense of fear and frustration evident in the Hmong leaders in Chicago seem to be typical of what many Hmong refugess have expressed to Project staff about SUNDS. Frustration due to a feeling of helplessness seems to be prevalent. The continuing message that there are still no answers to what is causing SUNDS appears to result in a serious lack of confidence on the part of Hmong toward the medical establishment. The feelings have grown into a sense of persecution and mistrust.

Everything that is strange in this country or was disturbing about the refugee camp experience is also suspect as a cause of SUNDS. Some Hmong have blamed immunizations given in the camp, fear of poisons in foods in the refugee camps and lingering effects of chemical warfare agents. In this country, they suspect the food, the cold, radiators, lack of ventilation, pollution, crowded living conditions, and the soft beds.

Other Hmong refugees cite stress and depression as important factors in SUNDS. They wonder if there is a "spirit of the land" that is hostile to them or causing loss of their souls and resulting in death. Many Hmong wonder why American people are not more upset about the problem, and why it is not a national concern. The general feeling seems to be that if researchers studied the problem, they would find the answer.

An issue related to fear about SUNDS is mistrust of the American health care system itself. American beliefs, laws, policies, and regulations have come into direct conflict with Hmong religious beliefs about health and illness. The greatest topics of disagreement seems to be the issues of autopsies and American methods of diagnosis.

American health providers know that a level of trust is necessary in any health transaction between doctor and patient. Many doctors who serve Hmong and other refugee patients note that SUNDS is a disruptive factor in the background which limits the development of that trust. Mistrust of American medical practices might have arisen without the presence of SUNDS, but SUNDS has added an extra burden to the delicate balance of trust that needs to exist in the clinic or hospital.

The law in every state provides that in cases of unexpected and unexplained

deaths, autopsies must be performed. Consequently, tissue samples including in some cases the entire heart, were removed from a number of SUNDS victims under the direction of local medical examiners. Of great importance to the Hmong was that the victims' families did not understand the procedures and results. Families' permission was not routinely requested. The autopsy protocols were not uniformly described; and the need for tissue samples was not discussed. Some Hmong families upon getting back the corpse of their dead family member, noticing that the body had been cut open, proceeded to open the body and find to their horror that some organs had been removed and that sometimes the organs had not been properly repositioned in the body.

It is important to note that in traditional Hmong culture, there is a belief that organs of the body are directly related to the souls of the body. If the organs are disturbed or removed, then the souls cannot go to the after world.

Another recently discovered effect of SUNDS is the political maneuvering occurring within the Hmong community. According to an Advisory Board member, some people in the community are using the recent sudden deaths as a lever to encourage people to fight harder for the return of Hmong to Laos. He describes fears that many Hmong have for the health and safety of their children. They are consequently buying as much health insurance as they can.

Impact of SUNDS on Individuals and Families of Victims

A young man in the Twin Cities whose father died of SUNDS said in an interview that there were three main effects on his family: tremendous grief, loss of the bread winner of the family, and worry that the same thing would happen to other men in the family. His cousin said the sadness his family felt was greater than usual because the death was so unexpected. "Before he came to this country he was very happy, strong and healthy. The doctors here said he was in good health. If he had died after a sickness, we would understand and not be so sad. My aunt cries a lot."

There exists an incredible sense of worry in this young man and his family about SUNDS, as they fear that he may be next. His wife woke him 15 times a night after her father-in-law's death. "Now she only wakes me a few times a night to check me. She insists that I not sleep on my back because my father died while sleeping on his back." The young man's wife was the first person to discover the death of her father-in-law, and she noted that he was in the supine position. This young man fears that the death of his father was caused by "the gases used by the Communists in Laos." A friend in Laos died a year prior to the young man's father, and he believed that the friend also died of chemical warfare.

Since the death, the family has moved from their old apartment to a new one where the reminders are not as strong. Grief due to the death of a loved one is certainly not new to many Hmong. But the sadness of SUNDS and the lack of an explanation seem to add to the grief. Like the rest of the Hmong community, this family is left to guess at the real cause of death.

An understanding of the full impact of SUNDS on families in the community is far from complete. But for those members of the community who are most fearful of SUNDS like the young man interviewed by the Project staff, every strange and unfamiliar aspect of his new country poses a threat in his mind as

a possible cause for the sudden deaths. It is difficult to imagine how much of a disruption this causes in his life and in other lives around him. One of the Advisory Board members stated, "It is apparent to me in my interactions with younger Hmong men that SUNDS is of concern to all of them and for some it has become a major burden in terms of fear, anxiety, and concern. It is clear that one key individual in a family experiencing this sort of long-term emotional trauma will affect that person's family life in a profound manner. This, of course, ripples into the community."

Concern about SUNDS does not begin in the United States. Stories travel back to the refugee camps and cause fear there as well. This fear follows people to the United States. A Project staff member recently interviewed a member of the local Hmong community and this issue arose. "Sudden death is a new killer," says a 60-year-old Minneapolis resident. "I first heard about this killer in the Thai refugee camp. It frightened me. Death itself does not worry me that much; it is an unavoidable consequence of life. But sudden death worries me. It is like an enemy stalks at night who can strike at any time without warning." This man is also worried about his sons, four of whom are between the ages of 20 and 40. "This killer intensifies the thought of death, especially the death of my son. I don't know how their families are going to survive if they should die suddenly."

Concern over the welfare of young men is an obvious outgrowth of SUNDS because it affects men between the ages of 25 and 45. One older Hmong man who attended a presentation about SUNDS given by Project staff at his English class was so concerned about SUNDS that he offered to recruit groups of young men who would not only be interested in hearing more about SUNDS but would be willing to undergo whatever testing could be done to discover risks factors.

More than 140 Southeast Asian high school and college students in the Twin Cities attended presentations by the SUNDS Planning Project staff in the summer of 1984. Many of their concerns revolved around issues of prevention. There was an eagerness to understand more about SUNDS, but there was also a frustration that there appeared to be so little effort to find the cause of the syndrome.

An Advisory Board member who is a public health nurse overheard a Hmong student discussing how worried he was about the fact that he was experiencing breathing problems during sleep. When she approached him to discuss SUNDS, she discovered he already knew quite a bit about it but he was still afraid of being tested.

Impact on Service Providers

The mistrust and fear of the American health care system by Southeast Asian refugees is a double-edged sword affecting both refugees and service providers who work with them. Misunderstandings on both sides are compounded by SUNDS which has no known and explainable cause.

Even without SUNDS, there would be misunderstandings and mistrust between the Hmong refugees and the American health providers. Misunderstandings have arisen from failure of American medical research to approach the Hmong community through the structure of its true leadership. Part of this problem results from the fact that most Americans do not know who the "true leaders"

are among the Hmong community and why it is important to consult with them. The Hmong community structure includes exogenous clans and their former military leaders. The lack of communication between researchers and community leaders allows for considerable speculation on the part of Hmong leaders and community members about the true intentions of medical and social science researchers.

Misunderstandings have arisen from the failure to explain the justification for normal medical procedures. The relationship between a person feeling ill, the going to a medical clinic, having a sample of tissue, usually blood, removed, laboratory analysis of the blood, diagnosis of the findings, determination of medication, and administration of medication is unclear to many Hmong. The rationale behind this chain of events has not in general been explained to Hmong patients in research projects and health clinics in a manner in which the Hmong understand. Again this lack of communication leaves much room for speculation by Hmong about medical researcher's and practitioner's motives. For example, it raises a question why do doctors need so much blood?

Some difficulties stem from the perception by Hmong that, since several studies have already been conducted into the problem of sudden death, that American doctors already know what causes these death, but that they are not telling. There are perhaps three factors contributing to this difficulty. First, most Hmong who are subjects in research projects do not understand the conceptual basis for undertaking research or the relationship between research efforts and the treatment of medical conditions. Consequently, when a Hmong subject is seen by a doctor during the course of a research effort, the Hmong individual may expect either to be checked for a medical condition or to receive medication for it at the end of the "visit." While this doesn't apply to all Hmong individuals, it does seem to characterize the majority of Hmong who only since their arrival in the United States are beginning to receive Western education and literacy skills. Second, a contributing factor results when an occasional researcher, in an effort to "sell" his/her research effort to the subject community, promises greater returns for the research than can in fact be expected. That is, a researcher may be tempted to tell the Hmong interpreter that this research "will" contribute to an effort that "might" determine the causes of sudden death which can then "help lead" to a cure or at least preventive action. The Hmong interpreter talking to the Hmong subject most likely does not or even cannot translate the subtleties in English of "may" and "might" to the subject who is then left with expectations that participation will lead to a cure. Finally, difficulties arise when Hmong subjects perceive American medicine as powerful, so why can't an answer be quickly learned?

If Southeast Asians do not trust or understand the procedures utilized by American health care workers, then many of them will not submit to tests doctors feel are necessary for them, or will submit but will come away feeling negative about the experience. This perpetuation of mistrust is very detrimental in the search for answers to many health problems, in particular SUNDS. If the patients will not be tested, health care providers care left with little to go on. Such has been the experience of several physicians in the Twin Cities. Lack of subjects has brought two research projects related to SUNDS to a halt.

The fear, mistrust, and confusion felt by the Hmong is mirrored in the service provider community because providers do not know why the mistrust has built up and because they cannot identify potential victims of SUNDS. There is a

differential in awareness among different medical care providers about SUNDS, and those linked most closely to the refugee community may feel impatient with their colleagues who are not well aware of the situation.

In regard to needing information about SUNDS, the service providers that come to mind first are those working directly with Southeast Asians in emergency situations. Personnel in emergency rooms, paramedics, and persons responsible for the "911" emergency call number need to have accurate information to be able to respond quickly.

During the SUNDS Planning Project, staff members spoke to numerous groups of Hmong refugees in the Twin Cities. Staff members at those meetings heard stories from Hmong who described trouble utilizing the 911 emergency telephone system. Officers from both the police and fire departments met with a Project staff member to discuss the problem. Several issues arose in this meeting: identification of the caller's problem, location of the caller in a situation where the caller is not a native speaker of English, and the need to educate community members about when to use 911.

The officers' description of the local 911 system may be of interest to persons working with refugees. Each 911 service area in the Twin Cities has an automatic tracing system. The tracing system uses the billing address of the telephone from which a 911 call is placed. Occasionally a mixup occurs when the billing address differs from the actual address of the emergency. Personnel at the 911 station are instructed to verify the caller's address, but the automatic tracing system provides a backup essential for non-English speaking persons. The next priority is to identify the nature of the incident so that police or firemen can be dispatched. Because of prank calls, officers assign lower priority to calls which cannot be identified or verified.

The officers proposed to develop a brochure for distribution among Southeast Asian refugees to explain what information should be provided by the 911 caller and to educate community members about what justifies a 911 call. They suggested that events justifying an emergency call include risk of death, significant risk of physical impairment, or sudden deterioration of victim's condition. Such criteria need to be approved by authorities in the areas in which a brochure would be distributed. Finally, the officers emphasize that Hmong callers have created very few problems. They were not able to estimate if the Hmong were overusing or underusing the 911 number.

Another group of professionals who have been affected by SUNDS, sometimes in dramatic confrontation with refugee families and leaders, have been having little need to be extensively involved with events in the community at large in order to practice their profession, may be suddenly and unexpectedly engulfed by the mistrust in the refugee community toward the medical establishment. At a time of berevement, families may focus their sense of anger on the medical examiner. Cultural differences over autopsies compound the problem. To make matters worse, the medical examiner is forced to tell the family that no cause of death was found even after the hated autopsy.

Physicians and nurses seeing Southeast Asian patients are also affected by SUNDS. Their needs center on knowing how to identify and respond to potential SUNDS victims or how to answer the questions of those who are worried about SUNDS. The following questions have arisen in discussions between project

staff and health care workers.

1. What line of questions can be used to obtain information about potential SUNDS-related problems?
2. What presenting symptoms have been identified for SUNDS?
3. What kind of tests can be recommended?
4. Who can patients be referred to?
5. What kinds of preventive measures can be described?

The primary need of medical personnel is information to use to respond effectively. Two examples of situations in which more information in the hands of a physician and a paramedic could have reduced a great deal of anxiety in one case and potentially prevented a fatality in the other were discovered by Project staff. In March 1983, a Hmong man living in Wisconsin was seen by his wife to be unconscious. That day he had done some outdoor work for a friend. Returning home in the evening, he had a mild headache. After a regular Hmong dinner prepared by his wife, he went to bed at 10 P.M. In the early hours of the morning, sometime between 1 and 2 A.M., his wife awoke him because she heard him making groaning noises. He told her he still had a headache, and she gave him medicine. They both went back to sleep. Ten minutes later she heard him groaning again. She tried to wake him, but found him unresponsive. She forcefully twisted his arm and the pain caused him to awaken. The man denied that he had been awake before. He said he was having a dream in which three deceased relatives came to take him. As they were pulling him through the roof, he was awakened by pain in the arm. The next day he felt a mild chest discomfort and went to see his family doctor. After a thorough examination, there was no explanation for the pain.

The second story was related to the SUNDS Planning Project by one of its consultants. A Laotian man living in a suburban community in a western state experienced chest pains and breathing difficulties in his sleep. His family was able to revive him, and he began to feel better. In the meantime, a relative had phoned 911. An ambulance soon arrived. The paramedics proceeded to take the man to the hospital. En route, the man died of a cardiac arrhythmia. The ambulance was not equipped with a defibrillator.

Stories of Southeast Asian men going in for a checkup after what they consider to be a SUNDS-type incident and being given a clean bill of health are not infrequent. A few stories have surfaced of men who have experienced SUNDS-type episodes, been taken to a hospital, examined, and then released because of the lack of anything else to do.

Concerns about SUNDS arise frequently in mental health programs for Southeast Asian refugees in the Twin Cities. A staff member of the mental health program at the Community University Health Care Clinic (CUHCC) stated, "We don't see much anxiety about SUNDS directly. But we do see quite a bit of concern about physical ailments. We hear complaints about heart, respiratory, and sleep problems." She continued that it was difficult to know what the direct effects of SUNDS are on their clients and their program. She added, "Refugees don't or can't discuss their fears about SUNDS directly. They often refer to mental health issues in relation to the liver. CUHCC could use forms or sets of questions that would tease these concerns out from the others."

A Ramsey County social worker who is a member of the Hmong community and an

Advisory Board member, stated that "sudden death increases family problems, makes things out of control and the family wants a quick answer." Such feelings can be frustrating for service providers who are perhaps dealing with other issues during the interaction.

One community program already conducted is cardiopulmonary resuscitation (CPR) training. A special effort by the American Red Cross to train Hmong refugees in CPR occurred in 24 metropolitan areas in the United States. The intention of the program was to train bilingual refugees as CPR instructors. In the Twin Cities, 165 members of the Hmong community were trained in CPR by June of 1984. Lao Family Community in St. Paul, recruited participants, and Red Cross volunteers training 95 persons in St. Paul and 70 persons in Minneapolis during one of four half day sessions. No more training was scheduled after the first four sessions, because the "initial burst of interest waned," said one American Red Cross staff person. The president of Lao Family Community commented in an interview that "if people knew more about SUNDS and how CPR could help them, they would take it. But they are unaware about it." He added that Lao Family Community does not currently have the staff to educate and recruit people for CPR classes. But he feels that it is a very good idea and has undergone the training himself.

Teachers of English as a second language have seen the effects of SUNDS as well. Students have been expressing their concerns in class, requesting information, and, in a few cases, men have shown the effects of little sleep after spouses have awakened them in the night to check on them. Many teachers have begun incorporating information about SUNDS and health issues into their curriculum. Several are considering ways to develop simple English phrases that can be posted near a phone and utilized in an emergency. ESL teachers are very eager to be of assistance in communicating information about SUNDS to Southeast Asian students, many of whom are in their 20's, 30's, and 40's.

Recommendations

For members of the Southeast Asian community refugee communities, health officials should:

1. Develop educational materials about SUNDS utilizing as many media as possible:

   A. Video tapes available for viewing at local mutual assistance association offices, schools, libraries, social service offices, clinics, and video stores
   B. Curriculum for ESL classes
   C. Radio programs
   D. Written materials in Southeast Asian languages and lay English summarizing the current state of knowledge about SUNDS including an explanation of why certain commonly held notions of its cause among Southeast Asians are not true.
   E. Oral presentations utilizing storytelling traditions within each Asian community.

2. Promote health and emergency training programs for:

A. Cardiopulmonary resuscitation
B. 911 emergency number (how it can be used, and simple English phrases that can be posted near the telephone for use in an emergency)
C. General health and medical information (medical procedures and tests, what to expect during the test, and what is done with the test results)
D. Stress reduction.

3. Organize support for family members of SUNDS victims.

4. Provide consistent and regular information to bilingual health care workers about SUNDS.

5. Identify and establish persons within each Southeast Asian community who can direct inquiries about SUNDS to appropriate agencies, researchers, physicians, and others.

For Members of the service-provider community, health officials should:

1. Encourage the use of screening protocols and questionnaires which elicit information about sleep, cardiac and respiratory problems, and psychological difficulties from Southeast Asian patients.

2. Develop educational materials about SUNDS, its presenting symptoms and risk factors and who to contact if potential SUNDS victims are found.

3. Strengthen communication between the refugee leaders and American service providers for research and educational efforts.

14. SUNDS AND THE FUTURE

The Sudden Unexpected Nocturnal Death Syndrome Planning Project was organized to examine options and to create plans for approaching the problem of SUNDS. Many of the preceding sections of this report contain specific recommendations formulated by the Project staff in consultation with the Project's Advisory Board and with colleagues, refugees, researchers, and other interested persons. The project sincerely thanks those who have contributed ideas. At the same time, it accepts full responsibility for the content of the recommendations, offered in a spirit of sharing. The recommendations should not be considered exhaustive, or complete, or sanctioned by official health agencies in the United States.

In this final section, the staff wishes to summarize its experiences during the six-month planning period and to encapsulate its sense of what various groups of people seem to think about SUNDS now and for the future.

Those directly affected by SUNDS, the various Southeast Asian refugee communities, are fearful of SUNDS and often express a feeling of helplessness and hopelessness in regard to it. Some members of these communities even express the opinion that American health officials know what causes SUNDS but are not telling the refugees. One advisory board member describes SUNDS as a political issue within one particular refugee community. On the other hand, there appears to be a strong desire on the part of most of the refugees to obtain information about SUNDS, especially if that information is presented in a format which is accessible and understandable. The highly technical research needs to be stated in every day language, possibly using a story-telling technique, before a significant portion of the refugee community is in a position to respond appropriately.

The issue of SUNDS has importance beyond the borders of the United States. The SUNDS Planning Project's staff made a number of contacts in Japan, the Philipines, and Thailand who are also interested in SUNDS and who have stated their willingness to cooperate in joint research efforts.

Concern about SUNDS is also evident among Americans working directly with Southeast Asian refugees in the United States. A variety of professionals--in health, education, and other human services--have requested information about SUNDS. There has been strong interest from journalists, politicians, and government officials.

In a letter to the project staff, November 5, 1984, Dr. Stephen Thacker, from the Centers for Disease Control, makes the point that SUNDS has potential importance beyond the refugee community. "Given the low rate of atherosclerosis in the Hmong, we may have the opportunity here to investigate an etiology of sudden death which has historically been attributed to coronary artery disease in other racial and ethnic groups. This opportunity, however, is not one which may exist for long, and not one that exists with other population groups..."

Observers seem to agree about which research directions are most promising for

further study of SUNDS. The most immediate research need appears to be the development of a case registry and surveillance system for SUNDS. Without a bedrock of data, other research studies in epidemiology and genetics cannot be properly conducted. It is also evident that local, state, or private organizations are not in a position to accomplish registry and surveillance tasks without the assistance and authority of the appropriate federal health agency. Other directions for research point to sleep disorders, cardiovascular conditions, nutrition, metabolic patterns, toxicology, and anthropology (including traditional medicines). Of these directions, existing facts indicate that the study of sleep disorders in selected Southeast Asian refugees might be the most important avenue of research.

Public health agencies are presently not very active in the area of SUNDS, probably because there is no marker for identifying persons at risk for SUNDS and because there are few, if any, strategies for community intervention. One major exception is in the field of public health nursing. Public health nurses who deal directly with refugee clients can instruct refugees about emergency procedures and can insure that troubled or symptomatic refugees are evaluated in health care facilities. Referrals made by the public health nurses to clinicians need to be accompanied by efforts to make the clinicians receiving the referral aware of SUNDS.

Other important groups of health providers which need to be aware of SUNDS are the emergency paramedics, emergency room physicians and nurses, and medical examiners. Physicians who have Southeast Asian patients need to know what kind of evaluation and treatment is necessary for refugees at high risk for SUNDS. Unfortunately there are no guidelines for clinical evaluation at this time, and the important matter of who will pay for these evaluations has not been addressed.

Affecting all of these public health and personal health issues is the fact that those affected by SUNDS have different cultures from those who are studying the problem, conducting health evaluations, and proposing community interventions. Nihilists in both camps may have hampered efforts to protect individuals and communities in the past because cultural differences have created significant mistrust and misunderstanding between some refugees and health providers. SUNDS Planning Project staff, however, has seen a very genuine desire on the part of everyone to overcome cultural differences between refugees and researchers in order to find the cause and the means of prevention of SUNDS. Patience, flexibility, and a new commitment to mutual trust are necessary for progress to continue.

As usual, those caught in the middle of misunderstandings are in the best position to neutralize them. One group situated in the middle of the mistrust are American health and mental health providers who see large numbers of Southeast Asian patients. They observe certain refugees' seemingly irrational fears of noninvasive or low risk medical procedures. At the same time, they see their technically-oriented colleagues having trouble coping with the anxiety which accompanies a cross-cultural exchange.

Another group of people caught in the middle of the mistrust are bilingual health and mental health workers in American agencies. Their schizophrenic existence as an agent of both the client and the American agency leads to a lot of stress for them. It is clear, however, from examples around the world that

"primary health workers," "village health workers," or "barefoot doctors" have been the key to solving health problems in many locations. Perhaps if they are effectively positioned to bridge the cultural gap between the refugees and the researchers, the Southeast Asian bilingual health workers in the United States are the key to solving the problem of SUNDS.

11/2/84

CASE QUESTIONNAIRE FOR SUDDEN UNEXPECTED NOCTURNAL DEATH AMONG SOUTHEAST ASIAN REFUGEES

Designed by Neal Holtan and Chris Thao of the SUNDS Planning Project based on material from Ronald Munger and Marshall Hurlich (Seattle); Janice Godes (Saint Paul); and the Centers for Disease Control (Atlanta). This questionnaire has not been approved by nor is it required by any state or federal health agency.

PERSONAL DATA

City: Date of interview:

Interviewer: Phone:

Translator: Phone:

Informant: Phone:

NAME OF CASE:

1. Date of death: ___/___/___ (mo da yr) Time of death: ____:____ AM PM

2. Age: 3. Sex: ____M ____F

4. Marital status: ____married ____never married ____widowed

____separated or divorced

Name of spouse:

5. Country of birth:

6. Ethnic background:

7. Date of departure from country of origin: ____/____ (mo yr)

8. Date of arrival in US: ____/____ (mo yr)

9. Occupation: in Southeast Asia

in US

10. Education (in years):

11. Ability to speak English at time of death: ____none ____poor ____fair

____good ____excellent

CIRCUMSTANCES OF DEATH

1. Where did the subject go during the day of death; what activities was he involved with?

2. What did he do during the evening just before death?

3. What time did he go to bed?

4. Did he have sexual relations that night?

5. Did anything seem different about the nature of his sleep before he died?

6. Was the death witnessed? By whom?

7. What time was the first symptom noticed? Was the subject asleep or awake at this time?

8. What sounds did he make? Had these sounds been heard before?

9. What was his muscle tone? (limbs rigid or limp?) How did this change during the course of the episode?

10. Did he urinate or have a bowel movement?

11. Outcries or indications of pain?

12. Did he make efforts to breath?

13. How many minutes after the onset of symptoms did he die?

14. What did anyone do to help him?

15. Did anyone else in his family ever die suddenly at night or in sleep?

MEDICAL HISTORY

1. What illnesses and injuries did the subject have in the past?

2. Did the subject ever have any bad reactions to food or medicines such as rashes of difficulty breathing?

3. Was the subject ever hospitalized? Give dates, reasons, location.

4. Did the subject ever have a seizure? Describe.

5. Did the subject ever have dreams which he talked about? Describe.

6. Did the subject ever lose consciousness or pass out? Describe.

7. Did the subject ever show evidence of becoming faint, dizzy or weak? Describe.

8. What medications from medical doctors or drugstores did he take during the week before he died? Include types, dates, dosages, frequency.

9. What native or traditional medicines did he take during the week before he died? Include nature of treatment, dates, frequencies.

10. Was the subject depressed before his death? For how long? How was this known? Did he ever talk about wanting to end his life?

11. In the last two weeks of life did the subject complain of:

a.	headache	yes	no	unknown
b.	heart flutter (or palpitations)	yes	no	unknown
c.	difficulty breathing	yes	no	unknown
d.	cough	yes	no	unknown
e.	abdominal pain	yes	no	unknown
f.	fever	yes	no	unknown
g.	chest pain	yes	no	unknown
h.	a feeling of heaviness on the chest	yes	no	unknown
i.	forgetfulness	yes	no	unknown
j.	poor appetite	yes	no	unknown
k.	loss of interest in things he usually liked	yes	no	unknown

12. Did the subject experience any significant changes in weight during his life? Gain or loss? How much?

13. Was the subject ever exposed to gas or chemical weapons?

14. Had he talked about spirits, ghosts, or ancestors in the weeks before he died?

SLEEP HABITS

For the following categories, describe any observations:

	Usually	Week Before Death
1. Time to bed		
2. Time required to fall asleep after going to bed		
3. Awakening during night		
4. Movements during sleep		
5. Talking during sleep		
6. Sleepwalking		
7. Nightmares or night terrors		
8. Breathing during sleep: regularity shallowness or depth respiratory pauses sounds		
9. Snoring		
10. Feeling that he was unable to move		

PERSONAL HABITS AND EXPOSURES

1. How often did the subject ever consume alcohol?

2. How often did the subject ever smoke tobacco?

RELIGIOUS AND SOCIAL LIFE

1. Did he go to church? What kind?

2. Did he believe what he heard in church?

3. Did he retain ancestor worship?
   What were his views about it?

4. Did he belong to any club or organization?

DIET

1. Did he eat any foods that other family members did not eat?

2. Please estimate the percentage of "American" food in his diet that he did not eat in Southeast Asia.

3. Describe the diet (including drinks) before death and the day of death.

	One day before			Day of death		
	Time	Item	Amount	Time	Item	Amount
Breakfast						
Lunch						
Dinner						
Bedtime Snack						
Spices						
Sauces						
Medicinal Tea						

PHYSICAL SETTING

1. Describe room arrangements at place of death.

2. Describe the type of heating and ventilation.

11/2/84

QUESTIONNAIRE FOR PERSONS WITH SUDDEN UNEXPECTED NOCTURNAL DEATH RELATED EXPERIENCES

Designed by Neal Holtan and Chris Thao of the SUNDS Planning Project based on material from Ronald Munger and Marshall Hurlich (Seattle); Janice Godes (Saint Paul); and the Centers for Disease Control (Atlanta). This questionnaire has not been approved by nor is it required by any state or federal health agency.

PERSONAL DATA

City: Date of interview:

Interviewer: Phone:

Translator: Phone:

1. Age: 2. Sex: ____M ____F

3. Marital status: ____married ____never married ____widowed
____separated or divorced

Name of spouse:

4. Country of birth:

5. Ethnic background:

6. Date of departure from country of origin: ____/____
mo yr

7. Date of arrival in US: ____/____
mo yr

8. Occupation: in Southeast Asia
in US

9. Education (in years):

10. Ability to speak English: ____none ____poor ____fair
____good ____excellent

MEDICAL HISTORY

1. What illnesses and injuries do you have?

2. Have you ever had any bad reactions to food or medicines, such as rashes or trouble breathing?

3. Have you ever been hospitalized? Give dates, reasons, location.

4. Have you ever had a seizure? Describe.

5. Have you ever lost consciousness or passed out? Describe.

6. What medications from medical doctors or drugstores do you take? Include types, dates, dosages, frequency.

7. What native or traditional medicines do you take? Include nature of treatment, dates, frequencies.

8. Are you depressed? Describe.

9. In the last two weeks have you had:

			Details
a.	headache	yes no	
b.	heart flutter (or palpitations)	yes no	
c.	difficulty breathing	yes no	
d.	cough	yes no	
e.	abdominal pain	yes no	
f.	fever	yes no	
g.	chest pain	yes no	
h.	a feeling of heaviness in chest	yes no	
i.	forgetfulness	yes no	
j.	poor appetite	yes no	
k.	loss of interest in things you like to do	yes no	

10. Have you experienced any significant changes in weight? Gain or loss? How much?

11. Have you ever wanted to end your life?

12. Have you been exposed to gas or chemical weapons?

SLEEP HABITS

For the following categories, describe what you have experienced or someone else has seen you do:

1. Time to bed

2. Time required to fall asleeep after going to bed

3. Awakening during night

4. Movements during sleep

5. Talking during sleep

6. Sleepwalking

7. Nightmares or night terrors

8. Dreams

9. Breathing during sleep:

   regularity
   shallowness or depth
   respiratory pauses
   sounds

10. Snoring

11. A feeling of not being able to move

12. A feeling that someone or something is sitting or standing on your chest

PERSONAL HABITS AND EXPOSURES

1. How often do you consume alcohol?

2. Do you smoke tobacco?

RELIGIOUS AND SOCIAL LIFE

1. Do you go to church? What kind?

2. Do you believe what you hear in church?

3. Do you believe in ancestor worship?
   What are your views about it?

4. Do you belong to any club or organization?

DIET

1. Do you eat foods that other members of your household do not eat?

2. Do you consider any foods taboo?

3. Please estimate the percentage of "American" food in your diet (food that you did not eat in Asia).

4. Describe your diet for the last two days.

	Day before yesterday			Yesterday		
	Time	Item	Amount	Time	Item	Amount
Breakfast						
Lunch						
Dinner						
Bedtime Snack						
Spices						
Sauces						
Drinks						
Medicinal Tea						