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Reflections on a Decade
as the Director of the IHS

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The "politicking" that began after Emery Johnson's 1981 retirement was, to me, unseemly. As a result, I made it clear that if it was necessary to campaign for the directorship of the Indian Health Service (IHS), I could not permit my name to be considered. So, I was surprised that December when a message from the Assistant Secretary for Health, Department of Health and Human Services, was waiting for me upon my return from my favorite pastime, hunting quail in southwestern Oklahoma.

I had assumed that I would not be asked to consider the directorship. Since I was extremely happy as Chief of Infectious Diseases and Professor of Medicine at the University of Oklahoma College of Medicine, I was not sure how to respond. I was well aware that management of a large organization was not one of my strengths, and I had the natural anxiety about functioning in or near the seat of power of the federal government.

Despite all of these doubts, I found the critical question was, "How would I feel in the future, knowing that I had chosen not to accept this offer?" I came to the realization that I was not prepared to live with the potential consequences, as involved as I had been with Indian affairs, particularly those related to health, for 15 years, including 10 years on the Kiowa Tribal Business Committee.

My deliberations were very heavily influenced by my lifelong preoccupation with responsibilities to my grandparents, great grandparents, and other ancestors who had lived valiantly on the plains of America before the country was settled by whites. Somehow betraying their legacy was as prominent a source of fear as was the idea of becoming the first Indian to

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assume the directorship of a vast and complicated organization charged with carrying out an almost impossible task. I have always felt enormously privileged to know, personally, those who had hunted buffalo and who had gone on war journeys. It was the immediacy of this recent heroic past and the extraordinary dignity, spirituality, and dedication of these tribal elders that persuaded me that I could not refuse this great opportunity, despite my fears.

Since I made my decision in December, I had hoped that I might take up my new duties the following July, one of the natural breakpoints in academic medicine. However, the Assistant Secretary was adamant that the new director should report as soon as possible, and we compromised on February 1, 1982 as the reporting date. I had hoped for time to close down my duties at the University and to allow my daughter to complete the academic year. Well, everyone who works in the public sector makes sacrifices from time to time, and my family had often made sacrifices in the past for my medical work, so we loaded up our station wagon and pickup camper and headed for Rockville, Maryland, in the middle of one of the fiercest winter storms on record. Family sacrifices such as this proved to be essential in my ultimate success and survival as director.

I am certain that one of the things that helped me the most in the subsequent 11 years as director is that I truly had not sought the position and at no time did I ask anyone for endorsement or support. Innumerable times during my tenure I was fortunate that I had made no previous commitments that could conceivably interfere with advocacy for Indian people or with the IHS goal of raising the status of health of Indian people to the highest possible level.

One of the earliest discoveries in my new job was that, even though I had worked closely with the IHS for years, and thought I knew a good deal about it, I, in fact, had no idea of the extraordinary complexity and vastness of the many elements of the program. The caution shared by the deputy director, that it would take at least two years to understand the program, turned out to be conservative, especially the labyrinthine process of annually putting together the President's budget. One of my frustrations was my inability to get anyone to understand that the IHS was one of the most complex medical (or non-medical, for that matter) establishments in the entire world.

In any case, as an "outsider" appointed to this critical office, I often felt at a distinct disadvantage, and wished that the program had not had to wait for me to become sufficiently familiar with its many interdigitating parts. I did have a firm belief that, because of my previous awareness of the competence of the IHS, the program would be successful if I simply followed the old medical doctrine to "first, do no harm." During my tenure as director, I had the pleasure of continually rediscovering that the IHS is made up of tremendously capable and caring people who will make any director successful, provided that the director supports those strengths, and permits as much freedom of operation and expression as possible. Although I did not always succeed in this, I did make it a guiding principle throughout my federal career. It also helped, I think, that I happened to be in total agreement with the philosophy of the IHS and its unique application of public health principles to clinical services.

I also attempted to fulfill another principle that I had learned under the leadership of Dr. Stewart Wolf, the first full-time Oklahoma Chairman of Medicine under whom I studied: recruit bright individuals and leave them as much leeway as possible to develop their own programs. I was not always as successful with this as one would wish, but it was worth the effort. I very quickly discerned that another basic tenet of the IHS, maximum decentralization, was not only superior to other organizational structures but in fact provided by far the best basis for real progress. Although from time to time circumstances make it very difficult, the IHS continues to operate under this principle. One of my first requests following the elevation of the IHS to Agency status in 1988 was that all possible authorities be delegated to Area Directors and ultimately to Service Unit Directors.

Another important principle daily illustrated to me was the benefit of having a single goal towards which to strive. I think it is not sufficiently recognized that this is one of the most important elements that an organization could have. For the IHS, it provided a basis for the mission statement and the formulation of annual objectives. The goal, to raise the health status of Indian people to the highest possible level, at first glance appears to be too abstract and platitudinous. It has consistently proven otherwise.

. . . first, do no harm.

It is also worth emphasizing that, as my predecessor, Dr. Emery Johnson, has repeatedly pointed out, this goal is quite distinct from the mere provision of medical services, which might form a less thoughtful goal. On the contrary, it includes the extremely important concept of community-oriented preventive, as well as curative, care. It is a concept that the country should immediately adopt as it struggles with new approaches to health care for the nation.

Another important, and little known, philosophy of the IHS, and one that I always tried to nurture, is the concept of the "institutionalization of innovation." An example of this was the establishment of a smoke-free environment as conceived of and implemented by Drs. Chuck North (Keams Canyon, AZ), Rice Leach (Phoenix Indian Medical Center, Phoenix, AZ), and Lee Fairbanks (IHS Clinical Support Center, Phoenix, AZ). The public knows little of the many contributions made by the IHS to similar advances over the past decades.

When I came into the IHS, I sought a simple set of rules or precepts for dealing with people that, if followed, would serve Indian people well. I call these "the four Cs." The first,

and most important, attribute I sought in people was compassion. I do not believe there is a place in an organization such as ours for individuals who do not possess this basic trait, and I believe that, with relatively few exceptions, this is a universal characteristic of IHS employees. The second C is competence. The individual must possess some set of basic abilities through which the mission of the organization can be successfully realized. Compassion, after all, is largely wasted if one cannot put it into successful execution. Partly as a result of considering these two Cs, the IHS enjoys a really outstanding group of Area Directors and Associate Directors. As director, I put a lot of effort into selecting the very best persons that I could find for these critical jobs. These are managers and leaders who would stand out in any organization.

To these two Cs I then add curiosity. This perhaps is not as obvious as the first two, but I believe we indeed have a responsibility to push back the boundaries of ignorance, which after all is an important underlying contributor to excess mortality, and I do not see how one can be very successful with inquiry into the workings of nature without some underlying curiosity. I really do not believe a person, or an organization, can formulate a vision without it.

The final C is one that is somewhat more elusive, and one that too often cannot be observed ahead of time. That C is commitment. Commitment is different from the first three Cs, and I regard it as synonymous with loyalty. Although we have an extraordinary body of committed and loyal employees, I believe the basic nature of the IHS makes it susceptible to exploitation by those who do not have the same level of commitment as the usual worker does.

During my tenure, two additional aspirations were (1) to foster healthy Indian people who could contribute their own special vision to the well-being of the entire U.S. population and (2) that every single child be born into a caring, nurturing family, become educated, and lead a life of wellness.

Throughout my tenure, I was acutely aware that the history of the IHS since 1955 was marked by most extraordinary leadership. This began with the exceptional gifts of Dr. Ray Shaw, the first director who instituted the principles that I might call clinical public health. The second director, Dr. Carruth Wagner, brought to bear principles of management, including some of Deming's precepts, long before they were known in the rest of the country. Dr. Stu Rabeau brought his own years of effort in local care and continued the philosophy of innovation, largely through, but not confined to, the Office of Research and Development in Tucson. Dr. Emery Johnson, who also worked his way "up through the ranks" was responsible for all the exciting additions and concepts that were implemented in the 1970s: consumer involvement; tribal participation; passage of the Indian Health Care Improvement Act; the Community Health Representative program, and many other innovations. These were indeed giants that I had to follow.

My frustrations have generally been the result of my own shortcomings. The inability to sufficiently explain the special nature of the IHS to the rest of the country, especially to the Congress and administrative levels above the IHS; often having to make decisions in which some individual could not be served well; the necessity of making decisions with insufficient information or even without the ability to completely understand the outcome; these were the source of constant concern on my part.

The word unique gets overused, but the IHS is truly unique in that it is designed and operated utilizing public health and community-based clinical practice as its foundation. Its application of preventive measures involving environmental, educational,and outreach activities combined with therapeutic endeavors into a single national health system is, in many ways, a model for national health care reform. The IHS has been at the forefront of new and better ways to implement health care. Prevention, managed care, health promotion, patient information systems, and service integration are just some examples of the pioneering efforts by the IHS that have instructive value for the health care of the population at large.

There are other very important attributes of the IHS that are somewhat more abstract and therefore less noticeable, but which form the basis of a truly unique organization. These include the inherent validity of the concept of an Indian Health Service itself; the value of its health status and self-determination goals; its special relationship with and the support it receives from Indian tribes; and especially the dedication of IHS personnel, Indians and non-Indians alike, to improving the lives of Indian people.

The public knows little of the many contributions made by the IHS . . .

It has been tremendously rewarding for me to have been a participant in the many achievements of the IHS during that decade. A partial list of these achievements includes the development of community injury prevention, environmental health,and health promotion and disease prevention activities; the development of primary care protocols that emphasize health assessment and timely follow up to prevent unnecessary illness and disability; refinement of resource allocation; ever increasing, genuine dialogue with tribal leaders; improvements in management at all levels; establishment of managed care enhancements, including use of a fiscal intermediary to pay approximately $200 million for contract services; increasing collections from third parties from approximately $30 million to more than $90 million; great progress in assuring the placement of well qualified Indian persons to top management positions; the establishment of a new Office of Human Resources, which holds great promise for developing future Indian managers and health care workers; the establishment of a chronic diseases program; establishment of a cancer detection and prevention program; improved tech-

niques for involving field managers in budget execution; reauthorization and refinement of major Indian self-determination and Indian health legislation; establishment of important links with the American Cancer Society, the National Cancer Institute, the Centers for Disease Control and Prevention, the American Red Cross, and others organizations; and finally, success in maintaining the distinctively humane quality and the Indian character of the services we provide.

During my tenure, there was dramatic growth in the service population from 920,000 to almost 1.3 million (a 41% increase). With this growth came an escalating demand for preventive, curative, and community care services, and a budget that grew from $617 million to $1.85 billion. Ambulatory visits increased from nearly 4 million to just over 5.3 million (32.5% increase); and dental services from 1.6 million to 2.4 million (50% increase).

Also during this period, seven ambulatory centers were built and six hospitals were replaced (Tahlequah, Oklahoma; Browning, Montana; Kanakanak, Alaska; Crownpoint, New Mexico; Chinle, Arizona; Rosebud, South Dakota; and Sacaton, Arizona). When I left in 1993, construction was underway for a hospital at Pine Ridge, South Dakota; hospitals at Kotzebue and Anchorage, Alaska were in the design stage; two health centers were under construction, and three were being designed.

In many ways, the IHS has been at the forefront of new and better ways to implement health care.

Other advances and innovations included: interruption of the largest outbreak of hepatitis B in North America; establishment of a national adolescent alcohol and substance abuse prevention and treatment program; establishment of a smoke free environment in all clinical and administrative areas; establishment of the first clinical fellowship in community injury control; establishment of a national child protection team; and establishment of the country's leading fetal alcohol syndrome program. There were also improvements in research activities with an emphasis on local epidemiology and development of many community health promotion and disease prevention activities.

In addition, the IHS achieved Joint Commission on Accreditation of Healthcare Organizations (JCAHO) accreditation for 95% of its hospitals, and all hospital laboratories were accredited by the College of American Pathologists. More than 75% of physicians had completed specialty training.

The following decreases in mortality rates were achieved during this time: infant death rate, 23.6%; accident death rate, 27.0%; motor vehicle crash death rate, 23.5%; and alcoholism, 19.1%.

The future is going to be far more challenging and threats to the special character of the IHS and its successes are going to increase. There is little doubt but that there are going to be even more severe budgetary constraints. We have shown that the provision of services stimulates demand and this demand is going to steadily grow. In the face of tough questions raised in a time of continuing budgetary constraints, the IHS will need to continue communicating the purposes of the IHS, the worth of its programs, and the return on investment.

However, the future of the IHS, as it always has, lies outside its own jurisdiction. Reduction of the role of the federal government in providing individual services and the implementation of Indian Self-Determination and Self-Governance are accelerating with no serious consideration of the basic role and responsibilities of the Indian Health Service. Perhaps it really has been intended that as tribes take over the program, the IHS should disappear, as has been proclaimed by more than one Indian leader. It is hard to see how the interests of Indian people will be served by "balkanization" of this magnificent program.

Over the years, I have been struck by the continued avoidance of dealing with the central fact of the Indian-federal relationship: the inherent contradiction between tribal sovereignty on the one hand and the often proclaimed trust responsibility of the federal government on the other. I believe this contradiction cannot continue indefinetly. Self-Governance may indeed be one attempt to deal with it. However, I'm not so sure that those advocates of Self-Governance realize that they cannot have true self-government without forfeiture of the federal trust responsibility. Perhaps that is what is desired, but it should be called by its correct name, termination. One looks in vain for leadership by the Congress, the only place where this fundamental contradiction can be resolved.

Even questions of a lesser nature cannot continue to be postponed. The definition of "Indian" and its distinction from eligibility for services will one day have to be dealt with. It is sad that there is little discussion of the basic principles upon which the Federal responsibility for Indian health care is being carried out. There is a very great need for clarification of the roles and responsibilities of the IHS.

Against these developments, as time begins to lengthen following my departure from the IHS, memories of wonderful relationships become warmer. Each of the Area Directors and Associate Directors were distinctive and special to me in their own way, and working with them permitted me to learn and grow. The working people in the trenches always touched me by their dedication. I want to thank each and every employee for the work that they have chosen to do in support of better health for Indian people. As the previous director, they have my respect and support, and as an Indian person, they have my heartfelt thanks. □

Nutrition and Dietetics Training Program

Jean Charles-Azure, MPH, RD, Chief, IHS Nutrition and Dietetics Training Program, Santa Fe, New Mexico; Karen F. Strauss, MS, RD, Chief, IHS Nutrition and Dietetics Section, Rockville, Maryland; and Suzanne Pelican, MS, RD, Nutrition Training Officer, IHS Nutrition and Dietetics Training Program.

The Nutrition and Dietetics Training Program (N&DTP) promotes healthy nutritional practices in culturally appropriate ways among American Indians and Alaska Natives. The N&DTP is an Indian Health Service (IHS) Headquarters Program located in Santa Fe, New Mexico. The five-person staff (4.5 full-time equivalents) is part of the Nutrition and Dietetics (N&D) Section under the Chief, N&D Section in Rockville, Maryland.

Since its establishment in 1968, the N&DTP has responded to the changing nutrition training needs in American Indian and Alaska Native (AI/AN) communities. Thirty years ago, the most pressing nutrition training need was to teach tribal members to become food service supervisors at local IHS hospitals. Today, in order to better serve IHS, tribal, and urban Indian (I/T/U) programs, the N&DTP has evolved to provide a wide range of services including innovative workshops; up-to-date nutrition information; networking with I/T/U nutrition professionals nationwide; guidance to local, regional, and national nutrition services; recruitment and retention of nutrition professionals; orientation for new nutrition professionals; and to act as liaison with other programs, agencies, and national organizations.

In fiscal year (FY) 1996, the N&DTP trained 255 I/T/U nutrition and health staff from over 120 tribes/corporations/urban programs in 25 states, including hospital cooks, tribal cooks, Community Health Representatives (CHRs), nutrition aides, nutrition professionals, nurses, alcohol counselors, and health educators. Additionally, the N&DTP responded to approximately 250 requests from I/T/U and Women, Infants, and Children program nutrition and health professionals nationwide for culturally appropriate educational materials, information about cultural sensitivity, nutrition reference materials, information on traditional foods,

Changing Nutrition Training Needs

1968 **Food Service Training Center,** established in Santa Fe, New Mexico.

- Trained tribal members to become food service supervisors at IHS hospitals.
- The four-month training was followed by nine months of supervised experience.

1971 **Nutrition Technician Training Course,** taught in Santa Fe, New Mexico.

- Trained tribal staff to help plan, implement, and evaluate community nutrition programs.
- The four-month course was followed by 8 months of supervised field experience.

1976 **Nutrition Training Program** was established in Tucson,Arizona.

- Provided 3- to 5-day nutrition courses for staff such as CHRs and nutrition technicians.
- Courses included basic nutrition, prenatal nutrition, and pediatric nutrition.

1978 **Nutrition and Dietetics Training Program** was established in Santa Fe, New Mexico.

- Evolved by uniting the Food Service Training Center and the Nutrition Training Program.
- Nutrition workshops taught at field sites and at the Santa Fe Training Facility.
- Attendees include I/T/U nutrition professionals, health care professionals, and allied health staff.
- Facility includes classroom, library, and an institution-size teaching kitchen.

guidance on educational material development, and nutrition resources.

Four new workshops were developed this year in response to the nutrition training needs of I/T/U health staff. In addition, the informational bulletin *Nutrition Happenings* was developed and distributed to more than 350 I/T/U nutrition professionals, and included a listing of position vacancies. Statistical data were entered by the N&DTP staff into the Generic Activity Reporting System for I/T/U nutrition service providers, including hospital and food-service staff. The N&DTP also acted as an advocate for American Indians and Alaska Natives with national professional organizations, such as the Society of Nutrition Education, the American Public Health Association, and the American Dietetic Association. Informational and educational nutrition articles have been prepared for professional health journals by N&DTP staff.

The N&DTP provides nutrition and dietetics training to I/T/U nutrition and health staff utilizing input from the Annual Nutrition Training Needs Survey. This year, more than 160 surveys were returned by I/T/U nutrition professionals and key tribal representatives. The N&DTP plans to provide six workshops at field sites and six at the Santa Fe training facility, which has an institutional teaching kitchen. N&DTP workshops empower participants to meet the health needs of their local Indian communities by increasing their knowledge and skills related to specific nutrition topics. Workshop topics for FY 1997 include: Nutrition and Noninsulin-dependent Diabetes Mellitus (for nutrition professionals, nurses, and physicians), Promoting Good Nutrition in Tribal Programs (for tribal cooks), Head Start (for Head Start cooks, teachers, and directors), Nutrition and Renal Disease (for nutrition professionals and nurses), Alcohol and Nutrition (for alcohol counselors and nutrition professionals), Intermediate Hospital Food Production (for hospital cooks), Cultural Awareness for New Nutrition Professionals, and Mobilizing Local Communities (for community teams made up of nutrition professionals, community members, and health educators). Additionally, a Nutrition Seminar (for nutrition professionals) will be held in Albuquerque, New Mexico in spring 1997. Workshop announcements are sent to all I/T/U nutrition professionals. For more information contact: Jean Charles-Azure, MPH, RD, Chief, IHS Nutrition and Dietetics Training Program, PO Box 5558, Santa Fe, New Mexico 87502 (phone: 505-988-6470 or 505-988-6518). □

Guidelines for Chronic Anticoagulation Therapy

Addressing the Special Needs of Native American Patients

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Introduction

The number of American Indian and Alaska Native patients requiring chronic anticoagulation therapy has grown dramatically over the past several years as the incidence and prevalence of coronary artery disease as well as other forms of cardiovascular disease increases. In addition, based on the results of well formulated, randomized trials of anticoagulation in large numbers of patients, cardiovascular conditions for which warfarin therapy is now indicated have become more well-defined in recent years. The result is an increasing need for primary care providers to be closely involved in the initiation, maintenance, and monitoring of warfarin therapy.

This article will review the mechanisms of action of warfarin, as well as the common indications for its use; discuss the recommended intensity of anticoagulant therapy for common clinical indications for anticoagulation; review the recommendations for frequency of follow up; and discuss a suggested mechanism for the improved delivery and monitoring of anticoagulation services within the Indian health system.

Warfarin: Mechanism of Action

Warfarin is the most widely used oral anticoagulant preparation in the United States.[1] It is rapidly absorbed orally, has a half-life of 36-42 hours, and is metabolized in the liver. Its dose-response relationship varies widely among both ill and healthy subjects. The drug is heavily protein bound in the

blood. The clinical effects of warfarin are influenced by concurrently prescribed drugs that may alter protein binding and metabolism.[2] Our clinical experience with Native Americans has suggested that lower doses of warfarin are generally needed to provide adequate anticoagulation, compared to the general U.S. population. The reason for this has not yet been elucidated.

Warfarin's effects are due to its activity as a vitamin K antagonist. Vitamin K is a cofactor in the transformation of vitamin K dependent proteins in the coagulation cascade (prothrombin or Factor II, Factors VII, IX, and X). As a result, warfarin inhibits the conversion of these proteins to their active forms, resulting in prolongation of the prothrombin time and its anticoagulant effects. The effects of warfarin are overcome by low doses of vitamin K; for this reason, patients are warfarin resistant for up to one week or more if given large doses of vitamin K to reverse anticoagulation.

Vitamin K is also involved in the synthesis of the anticoagulant cofactors, protein C and protein S. These factors are depleted early in the course of therapy with warfarin, which would enhance coagulation. Therefore, heparin is often initiated to counter this theoretical procoagulant effect of warfarin-induced protein C and S deficiency.

Drug Interactions

A number of commonly used medications will alter the anticoagulant effects of warfarin. Great care must therefore be taken in prescribing these drugs to patients on stable doses of warfarin. Similar care must be taken in the interpretation of an International Normalized Ratio (INR) which had previously been stable and is found on repeat measurement to be out of the therapeutic range. The possible contribution of drug interactions must be considered in this situation. The most prudent intervention, if the new drug is to be used briefly and the INR level is only mildly affected, may be no change in warfarin dosing at all, with a repeat INR after the new agent is discontinued. A list of commonly used agents with significant effects on the INR are listed in Table 1.

Table 1. Common drug interactions with warfarin.*

Drugs that may decrease the INR	
Carbamazepine	Rifampin
Phenobarbital	Sucralfate
Nafcillin	Estrogens
Vitamin K (TPN,† tube feeds)	Cholestyramine
Phenytoin	
Drugs that may increase INR	
Cotrimoxizole	Steroids
Erythromycin	Amiodarone
Clarithromycin	Propafenone
Metronidazole	Quinidine
Isoniazid	Propranolol
Ciprofloxicin	Cimetidine
Fluconazole	Omeprazole
Simvastatin	Lovastatin
Allopurinol	

* Adapted from Drug Facts and Comparisons. St. Louis,MO: Lipincott; 1993.
† TPN = Total parenteral nutrition.

Monitoring Warfarin Therapy

Measuring the prothrombin time has been the most common method of monitoring the anticoagulant effects of warfarin.[1] This measurement is responsive to decreases in three of the four vitamin K dependent Factors (II, VII and X). During the first few days of therapy, the prothrombin time is initially elevated due to a decrease in circulating levels of Factor VII, which has the shortest half-life, approximately 6 hours.

The prothrombin time assay uses tissue thromboplastin and calcium. The thromboplastin is produced from a variety of tissue sources that vary markedly in their responsiveness to the anticoagulant effects of warfarin. Because of the variable response of these various thromboplastins, prothrombin time results in different laboratories, or even using different lots from the same laboratory, may not be reproducible. Identical prothrombin time values at different lab facilities may therefore represent very different intensities of anticoagulation.

For this reason, the Committee on Antithrombotic Therapy of the American College of Chest Physicians (ACCP) and the National Heart, Lung and Blood Institute (NHLBI) have recommended the use of the INR for the regulation of anticoagulant therapy.[1] The INR system has replaced the prothrombin time (PT) method of reporting anticoagulation. In fact, the current recommendations for anticoagulation intensity from the Fourth ACCP Consensus Conference on Antithrombotic Therapy published in 1995 suggest the use of the INR exclusively.[1]

In 1977, the World Health Organization (WHO) designated a sample of human brain thromboplastin as the first international reference preparation for the INR. A calibration system was developed using the following mathematical formula:

$$\text{Protime Ratio} = \frac{\text{Patient PT(sec)}}{\text{Plasma Control PT (sec)}}$$

This ratio is raised by an exponential value, designated the International Sensitivity Index (ISI), a value provided by the manufacturer as a measure of the responsiveness of the thromboplastin reagent. In this way, the prothrombin time is converted to an INR using the reference standard and the local laboratory's control. The INR is the prothrombin time one would obtain using the WHO reference thromboplastin rather than the local substrate.[1] Thus, the same blood sample at two different laboratories could have different prothrombin times, depending on the responsiveness of the tissue thromboplastin

being used for the assay. The ISI is a standardization which assures that patients with the same degree of anticoagulation will have the same INR, although their protime times may differ.

The clinical effectiveness of warfarin has been established, in most cases, based on the results of well designed, randomized trials. Many of the large studies have been placebo controlled, and have compared two different levels of anticoagulant intensity. The clinical situations for which anticoagulation with warfarin has been recommended include the primary and secondary prevention of venous thrombosis and pulmonary embolism; prevention of systemic embolism in patients with prosthetic heart valves; atrial fibrillation; following acute anterior myocardial infarction; and in patients with valvular heart disease, primarily mitral stenosis. A range of recommended INR values has been established by the ACCP and the NHLBI. These values are provided in Table 2.

Table 2. Recommended therapeutic range for warfarin therapy.*

Indication	INR
Treatment of pulmonary embolism	2.0-3.0
Treatment of venous thrombosis	2.0-3.0
Prevention of systemic embolism	2.0-3.0
Tissue prosthetic heart valves	2.0-3.0
Mitral stenosis and atrial fibrillation or left atrial enlargement (>55 mm)	2.0-3.0
Atrial fibrillation	2.0-3.0
Mechanical prosthetic valves	2.5-3.5
Acute anterior myocardial infarction	2.5-3.5†

* Adapted from: Dalen JE, Hirsh J, eds. Chest. 1995;108(suppl to No. 4):231S.

† Some authors differ, and suggest an INR of 2.0-3.0. See text for

Atrial Fibrillation

The general recommendations for antithrombotic therapy in patients with atrial fibrillation are based on the results of five large, randomized, controlled trials.[3-7] These studies have recommended that long term anticoagulant therapy with warfarin should be considered for all patients without contraindications, with atrial fibrillation, older than age 65, and all those younger than 65 with risk factors (as discussed below). A target INR of 2.0 to 3.0 is recommended. Most of the patients who suffered strokes in these studies were significantly underanticoagulated at the time of the event, underscoring the need for close follow up and regular evaluation of the INR in these patients.

A number of clinical risk factors have been identified from these studies which suggest a higher risk for stroke.[8] These include the history of a prior transient ischemic attack (TIA) or stroke, hypertension, heart failure, diabetes, clinical coronary artery disease, mitral stenosis, prosthetic heart valves, or thyrotoxicosis. Therefore, all patients younger than age 65 with any of these risk factors should be strongly considered for warfarin therapy. In addition, increasing age has been recognized as a significant risk factor for stroke in atrial fibrillation.

Rarely patients with atrial fibrillation do not require anticoagulation. These patients have "lone atrial fibrillation." By definition, these patients are less than 65 years old with no evidence of heart disease after a full evaluation. Note that the presence of either diabetes or hypertension indicates the need for chronic anticoagulation in atrial fibrillation even without structural or ischemic heart disease, based on the high risk clinical indicators outlined above.

Warfarin therapy is recommended in patients with atrial fibrillation who are over 65 years of age, because of the relatively high risk of stroke associated with advanced age. However, the decision to anticoagulate in the elderly, as with all patients, needs to be carefully balanced by issues of compliance and the risk of anticoagulation, including the risk of falling.[1]

Aspirin has not been shown to be as efficacious as warfarin in atrial fibrillation, with the pooled results of the randomized trials suggesting that warfarin is approximately twice as effective.[9] Annual event rates with aspirin averaged about 3.9%, while those with warfarin therapy averaged about 2.0%. On the other hand, the annual risk of stroke in atrial fibrillation with neither intervention was about 6.4%. However, aspirin is recommended as an alternative to warfarin in patients considered to be poor candidates for chronic anticoagulation.

Several studies[3-7] suggest no difference in the stroke rate for patients with persistent versus paroxysmal atrial fibrillation. Therefore, both of these groups should be strongly considered for therapy with warfarin.

Recommendations for patients undergoing elective cardioversion for stable atrial fibrillation present for more than 48 to 72 hours include therapeutic anticoagulation with warfarin for 3 weeks before and 4 weeks after the procedure, whether cardioversion is electrical or chemical (using antiarrhythmic agents). This regimen allows the "stunned" atria to regain their contractile function in the days to weeks following the procedure.[1]

Valvular Heart Disease

The incidence of systemic embolism is extremely high in patients with rheumatic mitral valve disease, particularly mitral stenosis. Untreated patients suffer embolic events at rates of up to 9.6% per year. The incidence increases still further with the development of atrial fibrillation in this setting.[10] As with atrial fibrillation alone, the incidence of embolism increases with age. In patients who suffer a first embolic event, the annual incidence of recurrent embolism is 30% to 65%, with the majority occurring in the first 6 months.[11]

Long term anticoagulant therapy has been shown to be highly effective in reducing the risk of embolic events in patients with mitral valve disease in retrospective analysis.

With these data in mind, long term therapy with warfarin should be strongly considered in all patients with rheumatic mitral stenosis and atrial fibrillation, with a target INR of 2.0-3.0. In addition, because the risk of atrial fibrillation is increased in patients with an enlarged left atrium, patients with rheumatic mitral valve disease and echocardiographically measured left atrial size more than 55 mm should be strongly considered for anticoagulation.[12]

Patients who suffer embolic phenomena despite therapeutic warfarin dosing should be considered for additional therapy with low dose aspirin (80-100 mg/day) with continued warfarin treatment.

The risk of embolic phenomena in other forms of rheumatic and valvular heart disease is considerably lower. Therefore, anticoagulation is not recommended in the absence of prior embolic events, atrial fibrillation, or associated mitral valve disease.

Prosthetic Heart Valves

There have been no randomized clinical trials of warfarin versus placebo establishing the effectiveness of oral anticoagulants in patients with mechanical prosthetic heart valves, for ethical reasons. However, a number of trials have been performed establishing the minimal effective intensity of this therapy. Lower intensity regimens with an INR of 2.5 to 3.5 have been found to be just as efficacious as higher intensity dosing in prevention of thromboembolic complications. However, in several trials, higher intensity regimens have produced a greater risk of bleeding complications.[13] It is reasonable to consider the addition of low dose aspirin therapy to warfarin in patients considered to be at exceptionally high risk for thromboembolism, such as those with a prior embolic event despite therapeutic oral anticoagulation. Aspirin has been shown to significantly decrease mortality and embolic events in these patients, albeit with an increased risk of bleeding.[14,15]

Embolic complications have been reported to be frequent in the first 3 months following insertion of bioprosthetic (tissue) valves, particularly those in the mitral position. Therefore, it is recommended that all patients with bioprosthetic valves in the mitral position be treated with oral anticoagulants to achieve an INR of 2.0 to 3.0 for a period of 3 months following insertion. This therapy is optional for bioprosthetic valves in the aortic position.[1]

Coronary Artery Disease

A number of studies have focused on the incidence of embolic events following myocardial infarction. Studies place the risk of stroke at up to 5.5% for all patients with acute myocardial infarction (MI), with up to a 9.4% risk for patients suffering anterior MI.[16] Echocardiographic studies suggest that the incidence of left ventricular thrombus is rare in inferior, but quite common in anterior, MI, occurring in up to 40% of patients.[15] Most mural thrombi are formed within the first 24 hours after acute MI, but studies suggest they may appear as late as two weeks following the event.[17] Most systemic emboli, however, occur within the first week after myocardial infarction. The Food and Drug Administration has recommended that all patients with acute anterior MI be treated with intravenous heparin in therapeutic doses (partial thromboplastin time [PTT] approximately 50-80) throughout their hospitalization (until discharge) continuing with warfarin anticoagulation at an INR of 2.5 to 3.5 for 3 months. Some authors, including one of the editors of the ACCP guidelines, differ, suggesting that a lower intensity of anticoagulation is appropriate, with a target INR of 2.0-3.0 (verbal communication). The degree of anticoagulation should be determined with the patient's compliance and risk of bleeding complications in mind.

After discontinuation of warfarin, aspirin therapy should be initiated at 325 mg every day.

Deep Venous Thrombosis and Pulmonary Embolism

Patients with deep venous thrombosis or pulmonary embolism should be treated with intravenous heparin as first line therapy. This treatment has been shown to significantly reduce the incidence of recurrent thromboembolic events as well as mortality in this setting.[18-20] Heparin should be continued for 5 to 10 days and oral anticoagulation with warfarin may begin on day 1. A period of 5 days of overlap therapy of these two agents is recommended. This is based on the known half-lives of plasma cofactors, as well as theoretical and anecdotal experience suggesting that loading doses of warfarin in the absence of heparin may initially have a paradoxical procoagulant effect.[1]

Recent publications have examined the role of low molecular weight heparin given subcutaneously as an alternative to therapy with intravenous heparin for acute deep vein thrombosis. This therapy has been shown to be both safe and efficacious, requiring no monitoring of the PTT during therapy, and with a reduction in bleeding risk compared to intravenous heparin. This therapy may see an expanded role in the future.[21,22]

Long term anticoagulant therapy should be continued for a minimum of three months with a target INR of 2.0-3.0. Longer and possibly indefinite therapy should be considered in patients with recurrent thromboembolism or in patients with continuing risk factors for a recurrent event (malignancy, protein C or S deficiency, lupus anticoagulant, immobility, or congestive heart failure). An alternative is vena caval interruption.[1]

Risks vs. Benefits of Chronic Anticoagulation in Native Americans

While chronic anticoagulation has been proven to be beneficial in an increasing number of conditions, it also has the potential to cause considerable morbidity and mortality.

Inherent in its use is the necessity for meticulous follow-up and dosage modification. The risk of significant bleeding is directly related to the intensity of anticoagulation and the lack of appropriate follow-up. Therefore, close monitoring is vital in order to prevent over-anticoagulation. Such monitoring is often more difficult for many Native American patients, particularly those living on a reservation, for several reasons. First, these patients often live a considerable distance from their primary clinic facilities, and availability of transportation may be a major obstacle. Second, patients may utilize more than one physician or facility for their care, further confounding the dosing and follow-up of warfarin therapy. In addition, drug interactions cause still further confusion, especially if the patient is taking medications prescribed by multiple physicians and health facilities. Furthermore, many of these patients do not have phones and, as a result, follow-up and dosage adjustments are cumbersome, often requiring the use of mail, visiting nurses, community health representatives, or tribal police to inform patients of potential problems or necessary dosing changes. Finally, there is the issue of education for the patients and their families. Language barriers, as well as cultural differences, may make it difficult for providers to impress on patients the need to have their anticoagulation checked frequently and to report bleeding complications promptly.

The Southwestern Native American Cardiology Program was initiated in 1993 and, as an extension of the program, began developing a database for the follow-up of patients requiring warfarin therapy in the Phoenix, Navajo, and Tucson Areas of the Indian Health Service. Since its inception, the morbidity and mortality of anticoagulation therapy appear to have declined, despite an ever increasing number of patients being followed. Within this program, at the time of warfarin initiation, the patient's name, address, diagnosis, referring physician, and Indian Health Service (IHS) clinic are entered in a computerized warfarin registry. Initial warfarin doses and PT/INR values are recorded. Education about warfarin's indications, dosing schedule, side effects, drug interactions, dietary restrictions, and recommendations for PT/INR checks is provided to the patient prior to discharge. Patients also receive written educational material and a 7-day pillbox to improve medication compliance.

Following the patient's discharge, the patient's PT and INR, as well as changes in warfarin dosing, are obtained by phone from the local service unit medical records department, pharmacy, and/or laboratory. When the INR is out of the therapeutic range and an intervention has not been implemented, the patient's primary physician is notified and, if necessary, the patient. Once the patient's INR is therapeutic, INR values and doses are checked a minimum of once per month. However, while dosages are being adjusted, daily, weekly, or biweekly checks may be necessary.

Recommendations for Enhancing the Care of IHS Patients

The Southwest Native American Cardiology Program assists service units, hospitals, and clinics in the management of their anticoagulation patients. However, for the optimal care of anticoagulation patients, it is the local hospital staff who can best provide the services of medication and INR monitoring. Several hospitals and clinics have initiated such programs already. Registered nurses, nurse practitioners, physician assistants, and pharmacists are all well trained in the important task of education for those patients on warfarin therapy. Moreover, these professionals,in conjunction with one or more of the service unit physicians, could coordinate the follow-up of these patients and make appropriate dosing recommendations based upon standing orders for the regular reevaluation of the INR. Further suggestions for improvement include the following:

1. All patients who are initiated on warfarin therapy at an IHS service unit should have a special label or designation on the outside of their chart. This would alert all involved health professionals as to the need for special vigilance of the INR. We recommend the INR be checked no less frequently than once per month, regardless of the stability of the INR. Local record keeping could utilize either computer software or handwritten logs, as illustrated by the example modified from a form developed by the IHS clinic in Kayenta, Arizona (see box).
2. It is recommended that the local pharmacy play a central role in warfarin follow-up. Pharmacists are in the unique position of having sound training in drug therapy, access to INR results, and gatekeeper status in dispensing additional prescriptions of warfarin. It would be relatively simple for pharmacists to review the patient's INR status to be sure it is both current and therapeutic before additional refills are provided. However, any provider (nurse, nurse practitioner, physician assistant, pharmacist, or physician) should order an INR if their review of the chart suggests too long an interval has passed since the last measurement, or if prior studies suggest inappropriate variability in the INR.
3. Additionally, such local coordination would assist in the monitoring of adverse effects resulting from anticoagulation therapy. This would allow for the alteration of practice guidelines on a local basis, addressing the unique needs of the service units with attention to differences in the provision of care at each facility. In that way, adverse events could be documented and the causes critically analyzed in an effort to improve future care and monitoring. Again, this experience could be shared to enhance care throughout the IHS.
4. Patient education should be made a priority for those on warfarin therapy. Patients should be encouraged to take responsibility for their care by teaching them the necessity for fastidious follow-up of the INR. A patient warfarin identification card (see Figure 1) could be provided to allow them to record their most recent INR measurement and warfarin dose. This would serve the dual purpose of keeping the patients involved with the follow-up of their anticoagulation as well as providing a portable medical record for other practitioners at other service units. Additional medications could be listed on these cards as well, simplifying issues of drug interactions and general record keeping.

WARFARIN/COUMADIN FLOW SHEET

Patient Name (Addressograph)	Indication For Warfarin Therapy: _____ Goal INR _____

Patient Education:

1. Indication for warfarin (Patient understanding).
2. Risks and benefits of warfarin. When to seek health care (e.g., excessive bleeding, bruising, pink urine, bloody stools).
3. Importance of monthly INR.
4. Use of OTC medications: notify MD/pharmacist.
5. Food and drug interactions (e.g., green leafy vegetables, antibiotics).
6. Other _____

Documentation of Patient Education: (By # above)

Date, Initials, & # _____ Date, Initials, & # _____
Date, Initials, & # _____ Date, Initials, & # _____
Date, Initials, & # _____ Date, Initials, & # _____

Date	INR	Warfarin Dose	Dose Adjustment	Next Follow-Up Date	Comments and Initials
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WARFARIN/COUMADIN FLOW SHEET (SIDE 2)

Date	INR	Warfarin Dose	Dose Adjustment	Next Follow-Up Date	Comments and Initials
__/__/__					
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Figure 1. Example of patient warfarin identification card (outside and inside).

COUMADIN/WARFARIN PATIENT CARD

Name _____

Current medications:

_____

_____

_____

_____

_____

I am using Coumadin (Warfarin) for:

_____

My **Goal INR** is _____

Last INR and Date	Current Coumadin Dose	Dose Changes	Next INR (date)

Summary

Anticoagulation therapy with warfarin has been shown to decrease cardiovascular morbidity and mortality in a number of clinical situations. However, this therapy requires frequent monitoring to assure efficacy and to prevent the potentially serious consequences of over-anticoagulation. This can best be accomplished through the coordinated efforts of physicians and other motivated health professionals such as pharmacists, nurses, nurse practitioners, and physician assistants at the individual IHS service units. We feel that pharmacists are perhaps best positioned to effect a significant impact. The Southwest Native American Cardiology Program would be pleased to assist the service units, hospitals, and clinics initiate and coordinate such efforts through the sharing of the currently established database, consultation, formal teaching, or regular teleconferencing. Only through such organization and dedication can we assure the best quality care for the patients we serve.

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Anticoagulation Consultation Available

The Southwest Native American Cardiology Program (SWNACP) is available to consult with IHS, tribal, and urban Indian clinics and hospitals regarding initiation and management of organized, anticoagulation monitoring efforts. Flow sheets and other written materials will be provided, if needed, to interested health care providers. The SWNACP could stay involved at the request of the local service unit/facility to provide a safety net for this vital program, assuring continuity, and acting as an information resource for difficult or complex management questions. Monthly conference calls with the local coordinator to allow for the airing of questions and updating of the database would be encouraged.

As anticoagulation monitoring is currently a billable service through third party payers, this is an excellent mechanism for dramatic improvements in the quality and continuity of health care provision, as well as a mechanism for local income generation. In addition, suggestions for improvement in clinical care (which would result from the input and experience of many IHS and tribal practitioners) would be shared in an organized manner with all practitioners in the Indian health system.

For more information,contact Eric A. Brody, MD, FACC, Associate Director, or James M. Galloway, MD, Director, Southwest Native American Cardiology Program, University of Arizona, 1501 North Campbell, Room 6603, Tucson, AZ 85724-5037 (phone: 520-694-7000).

Call for Papers

9th Annual IHS Research Conference

The Ninth Annual Indian Health Service (IHS) Research Conference, sponsored by the IHS Research Program and the IHS Clinical Support Center (accredited sponsor) will be held April 28-30, 1997 in Albuquerque, New Mexico.

Papers are invited for oral or poster presentation in the following categories: Aging, AIDS, Alcohol and Substance Abuse, Cancer, Cardiovascular Disease, Diabetes, Environmental Health, Epidemiology, Health Care Administration, Health Promotion and Disease Prevention, Health Services Research, Injury Prevention, Mental Health, Nutrition, Oral Health, and Women's Health. Research measuring the effectiveness of innovative health care delivery interventions or research that demonstrates partnerships between researchers and tribes is especially welcome.

Abstracts must be received no later than close of business on March 7, 1997 to be considered for review (see "Instructions for Preparing Abstracts" below). Notice of acceptance of abstracts will be mailed by March 31, 1997.

For abstract consultation, contact one of the following Research Conference Planning Committee members: Linda Arviso-Miller at 505-248-4142 or Cherie Thomas at 505-248-4145 (Fax: 505-248-4384).

Instructions for Preparing Abstracts

1. Use the abstract form on the next page to prepare your abstract. All copy must fit within the frame. This form may be copied.
2. Accepted abstracts will be reduced and printed in the conference program. Remember that you are producing camera-ready copy. Submit your abstract in a type size no smaller than 12 pitch typewriter type or a 10 cpi font on a word processor. Single space all copies. Do not include figures, tables, equations, mathematical signs or symbols, or references in the abstract.
3. The abstract content should be structured as follows; title, author and affiliation, purpose/background, methods, results, and conclusions. Place an asterisk next to the name of the presenting author. Conclude your abstract with the sentence: "For further information: [Name and address of author serving as point of contact]." The abstract must fit within the frame on a single abstract form and be no more than 250 words in length.
4. Check the desired form of presentation: oral, poster, or either.
5. All abstracts should be sent to: Conference Coordinator, Indian Health Service Research Program, 5300 Homestead Road, N.E., Albuquerque, New Mexico 87110 (phone: 505-248-4142). **Submit one original signed by the primary author. If possible, please also submit a diskette with the abstract in a WordPerfect or ASCII text file.**
6. A biographical sketch must accompany the original abstract. Use the form below. **Do not submit a curriculum vitae or resume.**
7. Abstracts must be received by close of business March 7, 1997.
8. We will notify authors of the acceptance or rejection of their papers by March 31, 1997.

Any questions about style should be directed to Linda Arviso-Miller, Conference Coordinator at (505) 248-4142.

Biographical Sketch

(Please Type)

Primary Author/Presenter:

_____

(As you would like it printed in the Final Conference Program)

Mailing Address: _____

_____

City/State/Zip: _____

Telephone Numbers: Work _____ Fax: _____

Home: _____ Position Title: _____

Secondary Authors: (Name, Title, Degree, Place of Employment) _____

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Send abstract and biographical sketch to: Linda Arviso-Miller, Conference Coordinator, IHS Research Program, 5300 Homestead Road, N.E. Albuquerque, NM 87110.

Indian Health Service Research Program
9th Annual Conference
Call for Papers
ABSTRACT FORM

Submitted for:

❑ Oral Presentation ❑ Poster Presentation ❑ Either

If this abstract is not accepted for oral presentation, would you consider a poster?

❑ Yes ❑ No

Indicate the major content area of your abstract:

❑ Nursing ❑ Medicine ❑ Environmental Health

❑ Community Health ❑ Nutrition ❑ Behavioral/Mental Health

❑ Dentistry ❑ Epidemiology ❑ Other_____

Abstracts must be received by March 7, 1997

Signature of primary author: _____ Date: _____

The Strong Heart Study

Cardiovascular Disease in American Indians

Available data indicate that cardiovascular disease has become the leading cause of death in American Indians. However, limited information is available on cardiovascular disease incidence, prevalence, and risk factors in this population. Reported cardiovascular disease rates vary greatly among groups in different geographic areas. These rates have been obtained from studies of varying sizes and different methodologies. The Strong Heart Study, which uses a standardized methodology, is designed to estimate cardiovascular disease mortality and morbidity rates and the prevalence of known and suspected cardiovascular disease risk factors in American Indians. The study population consists of 13 tribes in three geographic areas: an area near Phoenix, Arizona; the southwestern portion of Oklahoma; and parts of North and South Dakota.

The editors believe that providers of health care to American Indians and Alaska Natives have a need to know about this study and its findings. The following is an annotated bibliography of the nine articles published as a result of this project thus far.

Lee ET, Welty TK, Fabsitz R, et al. The Strong Heart Study: a study of cardiovascular disease in American Indians: design and methods. *Amer J Epidemiology*. 1990;132(6):1141-1155.

Phase I of the Strong Heart Study included three components. The first was a mortality survey to estimate cardiovascular disease mortality rates for 1984-1988 among tribal members aged 35-74 years. The second was a morbidity survey to estimate incidence of both first and first or recurrent hospitalized myocardial infarction and stroke (cerebrovascular disease) among tribal members aged 45-74 years in 1984-1988. The third was a clinical examination of 4500 tribal members aged 45-74 years in order to estimate the prevalence of cardiovascular disease and its associations with risk factors. Family history, diet, alcohol and tobacco consumption, physical activity, degree of acculturation, and socioeconomic status were assessed in personal interviews. The physical examination included measurements of body fat, body circumferences, and blood pressure, examination of the heart and lungs, and evaluation of peripheral vascular disease. Laboratory measurements included fasting and postload glucose and insulin, fasting lipids, apoproteins, fibrinogen, and glycated hemoglobin, as well as a 12-lead electrocardiogram. Also measured were serum and urine creatinine and urinary albumin. DNA from lymphocytes was isolated and stored for future genetic studies.

Howard BV, Ngoc-Anh LE, Lee ET, et al. Associations of lipoproteins with obesity in American Indians: The Strong Heart Study. In: Oomura Y, Tarui S, Shimazu T, eds. *Progress in Obesity Research 1990*. John Libbey & Company, Ltd; 1990:291-294.

The increasing prevalence of obesity in the United States is of considerable concern because of its association with many other diseases, including cardiovascular disease. The increased prevalence of cardiovascular disease among obese persons is due in part to the increased occurrence of other risk factors, such as abnormalities in plasma lipoproteins. Several epidemiologic studies have shown relationships between obesity and increasing levels of plasma total and very-low-density lipoprotein (VLDL) triglycerides, and lower levels of high-density lipoprotein (HDL) cholesterol. In some studies, an association with higher low-density lipoprotein (LDL) cholesterol has been observed. The majority of these studies, however, have been conducted in Caucasian populations. Data available in other racial/ethnic groups, especially in blacks, suggest that relationships between obesity and lipoproteins may differ in other populations.

American Indian groups have a high prevalence of obesity and obesity-related diseases. However, few data are available on the relationship between obesity and lipoproteins in this population. The Strong Heart Study includes measurements of plasma lipoproteins and apoprotein concentrations, as well as measurements of obesity both by ratios of weight and height and by direct measurement of body fat using bioelectrical impedance. This paper presents preliminary data for nondiabetic individuals, examining relationships between lipoproteins and obesity as measured by body mass index (BMI; weight in kg/(ht in m)^2) and percentage body fat.

At the time of this analysis, approximately half the recruitment was completed and data were available for 289 non-diabetic men and 322 non-diabetic women. Subjects were relatively obese, with a mean BMI of 29.1 in men and 30.2 in women. Men had proportionately less body fat than did the women. Both BMI and percentage body fat were highly corre-

lated with weight in both men and women, in this population. BMI and percentage body fat were also highly correlated. Simple correlation analysis indicated that, in non-diabetic American Indian men, there were significant relationships between obesity and total or VLDL triglyceride and significant negative relationships between obesity and HDL cholesterol. These relationships were stronger when obesity was measured directly by percent body fat compared to BMI. The relationship between obesity and apolipoprotein A-I (apo A-I) reached statistical significance only with the measurements of percentage body fat. There was no relationship between total or LDL cholesterol and indices of obesity in non-diabetic American Indian men.

In women, obesity was associated negatively with concentrations of HDL cholesterol. There was no significant relationship between obesity and either total or VLDL triglyceride. Also, in contrast to men, there were significant negative relationships of indices of obesity with total and LDL cholesterol. The relationships between obesity and lipids in women were quite similar, whether assessed by BMI or degree of body fat.

Evaluations of these relationships, by sex, in multiple regression analyses adjusting for age, fasting insulin, and fasting glucose, indicated that, in men, obesity remained associated with HDL cholesterol. By contrast, obesity remained inversely associated only with total and LDL cholesterol in women.

Howard BV, Welty TK, Fabsitz RR, et al. Risk factors for coronary heart disease in diabetic and nondiabetic Native Americans: The Strong Heart Study. *Diabetes*. 1992;41(Suppl 2):4-11, 1992.

To date, preliminary data have shown that the three groups of Native Americans in the study are not homogenous for cardiovascular disease and its risk factors. Initial data analyses indicate that the prevalence of electrocardiogram-diagnosed myocardial infarction varies. Sioux in North and South Dakota have the highest prevalence, southwestern Oklahoma Native Americans have slightly lower, and the Pima in Arizona have the lowest. Preliminary analyses of data indicate that the prevalence of cardiovascular disease risk factors also differs from center to center. Diabetes is high in all groups, but highest among the Pima (more than 60%). Levels of cholesterol in Sioux and Oklahoma Native Americans are comparable to those for the rest of the U.S., but they are considerably lower among the Pima.

The prevalence of smoking is high in the Sioux (about 50%), low in the Pima, and intermediate in Oklahoma Native Americans. Overall, hypertension is less prevalent in all groups in this study than in the U.S. population, but the prevalence is higher among the Pima and Oklahoma tribes than among the Sioux. Sedentary lifestyle exists in all three groups. The prevalence of obesity is high in all three groups, and is highest in the Pima. Genetic admixture was determined by interview; more than 90% of Pima report they are "full-blood" American Indian, less than half the Sioux report being full-blooded, and 73% of Oklahoma American Indians report being full-blooded.

Lowe LP, Tranel D, Wallace RB, Welty TK. Type II diabetes and cognitive function: a population-based study of Native Americans. *Diabetes Care*. 1994;17(8):891-896.

The objective of this study was to explore the relationship between type II diabetes and cognitive function in older Native Americans, and to assess the effects of other selected risk factors for cognitive dysfunction on this relationship. Cognitive function was assessed in 80 diabetic and 81 nondiabetic Native Americans who were 45-76 years of age in a cross-sectional population-based sub-study of the Strong Heart Study. Thirteen cognitive function tests were administered during a personal interview. Information about six other risk factors for cognitive dysfunction, including depressive symptoms, physical function, alcoholism, current alcohol use, hypertension, and myocardial infarction, was ascertained from interviews and from abstraction of medical records.

Diabetes was associated with impairment on only two tests of cognitive function: verbal fluency ($P = 0.004$) and similarities ($P = 0.010$). Depressive symptoms were related to verbal fluency ($P = 0.004$), but did not explain the diabetes-related difference in performance. The effects of hypertension, depressive symptoms, and current alcohol use explained the diabetes-related performance difference on similarities. Cognitive function was not related to metabolic control (HbA_{1c} level).

We found little evidence that type II diabetes in this population of Native Americans is associated with a decrement in cognitive function. Some of the cognitive impairment previously attributed to diabetes may be related, at least in part, to the influence of other risk factors. This should be considered in the design of future studies in other populations.

Lee ET, Howard BV, Savage PJ, et al. Diabetes and impaired glucose tolerance in three American Indian populations aged 45-74 years. The Strong Heart Study. *Diabetes Care*. 1995;18(5):599-610.

A total of 4549 subjects were examined, and diabetes status was determined for 4304 (1446 in Arizona, 1449 in Oklahoma, and 1409 in the Dakotas). In all three centers, diabetes was more prevalent in women than in men. Arizona had the highest age-adjusted rates of diabetes; 65% in men and 72% in women. Diabetes rates in Oklahoma (38% in men and 42% in women) and South and North Dakota (33% in men and 40% in women), although considerably lower than in Arizona, were several times higher than those reported for the U.S. population. Rates of impaired glucose tolerance among these three populations (14% to 17%) were similar to those in the U.S. population. Diabetes rates were positively associated with age, level of obesity, amount of Indian ancestry, and parental diabetes status.

Howard BV, Lee ET, Cowan LD, et al. Coronary heart disease prevalence and its relation to risk factors in American Indians: The Strong Heart Study. *Am J Epidemiol*. 1995;142(3):254-268.

Prevalence rates of definite myocardial infarction and definite coronary heart disease (CHD) were higher in men than in women at all three centers ($P<0.0001$) and higher in those with diabetes mellitus ($P=0.002$ in men and $P=0.0003$ in women). Diabetes was associated with relatively higher prevalence rates of myocardial infarction (diabetic:nondiabetic prevalence ratio = 3.8 vs. 1.9) and CHD (prevalence ratio = 4.6 vs. 1.8) in women than in men. Prevalence rates of heart disease were lowest in the communities in Arizona; prevalence rates were similar in Oklahoma and South Dakota/North Dakota and were two- to threefold higher than those in Arizona.

By logistic regression, CHD among American Indians was significantly and independently related to age, diabetes, hypertension, albuminuria, percentage of body fat, smoking, high concentrations of plasma insulin, and low concentrations of high density lipoprotein cholesterol. In contrast to reports from other non-Indian populations, diabetes was the strongest risk factor. The lower prevalence of CHD among Indians in Arizona is distinctive in view of their higher rates of diabetes, obesity, hypertension, and albuminuria, but it may be partly related to their low frequency of smoking and their low concentrations of total and low density lipoprotein cholesterol. These findings from the initial Strong Heart Study examination emphasize the importance of diabetes and its associated variables as risk factors for CHD in Native American populations.

Welty TK, Lee ET, Yeh JL, et al. Cardiovascular disease risk factors among American Indians: The Strong Heart Study. *Am J Epidemiol*. 1995;42(3):269- 287.

From 1989 to 1992, 4549 members from 13 tribes, aged 45-74 years (62% of eligible participants), were surveyed and examined for cardiovascular disease and its risk factors. Mean total cholesterol concentrations were over 20 mg/dL lower among the men and 27 mg/dL lower among the women than national mean levels for the same age groups. Cholesterol levels varied by tribal group; Arizona Indians had mean levels more the 20 mg/dL lower than those of Indians in South and North Dakota (SD/ND). The prevalence of hypercholesterolemia was almost twice as high among SD/ND Indians as among Arizona Indians, but the rates for all three groups were much lower than total US rates (all races). Mean levels of high-density lipoprotein cholesterol were lower among Indian men and women than in the US population as a whole.

The prevalence of hypertension among Arizona and Oklahoma Indians was higher than that for the entire United States. SD/ND Indians had significantly lower mean blood pressures and prevalence rates of hypertension than Oklahoma and Arizona Indians and the United States as a whole. The prevalence of cigarette smoking was higher for all Indian groups except Arizona women in comparison with US rates. Smoking rates were highest in SD/ND and lowest in Arizona. Indian smokers smoked fewer cigarettes per day than the average US smoker.

Arizona Indians had the highest prevalence of diabetes mellitus; over 60% of those participants were diabetic. In Oklahoma and SD/ND, one-third of the men, and over 40% of the women, were diabetic. In addition, 13% to 20% of the participants had impaired glucose tolerance. Proteinuria was also a common problem; almost half of the Arizona Indians had micro- or macroalbuminuria, and 20% of Oklahoma and SD/ND Indians had significant proteinuria.

The prevalence of obesity was high in all three groups, with Arizona Indians having the highest rates and the highest mean body mass indices. The prevalence of current alcohol use was lower among Indians than in the nation as a whole, but binge drinking was common among those who used alcohol. These results indicate that cardiovascular disease risk factors vary significantly among tribal groups. Prevention programs tailored toward decreasing the prevalence of risk factors are recommended for long-term reduction of cardiovascular disease rates in American Indian communities.

Robbins DC, Knowler WC, Lee ET, et al. Regional differences in albuminuria among American Indians: an epidemic of renal disease. *Kidney International*. 1996;49:557-563.

Albuminuria is a sign of renal disease and the presence of renal disease is a risk factor for comorbidity from cardiovascular disease. We conducted a cross sectional survey of 4549 older American Indians in Arizona, Oklahoma, and North and South Dakota for the prevalence of (micro) albuminuria. A range of 20.1% to 48.3% of all participants had either micro- (≥30 to <300 mg albumin/g creatinine) or macroalbuminuria (≥300 mg albumin/g creatinine). A total of 53% of the participants were diabetic, with the prevalence for diabetes in Arizona (65% to 70%) being significantly greater than the prevalence at the other two sites. The prevalences of micro- and macroalbuminuria were significantly higher among those who were older, diabetic, or hypertensive, and among participants from Arizona. Even normotensive, nondiabetic Arizona Indians had higher prevalence rates than similar participants elsewhere.

Higher prevalence rates of micro- and macroalbuminuria were also found among Arizona participants than participants with similar degrees of glucose intolerance from the other two sites. Indians reporting the greatest degree of Indian blood were more likely to have abnormal albuminuria ($P<0.0001$). The duration of diabetes, fasting plasma glucose, systolic blood pressure, fibrinogen, and Indian heritage were independently associated with micro- or macroalbuminuria. The association of albuminuria with subsequent end-stage renal disease, cardiovascular morbidity, and overall mortality suggests that these American Indians will face a large disease burden. The correlation with reported Indian blood implies a strong component of genetic susceptibility, possibly independent of diabetes.

Robbins DC, Welty TK, Wang WY, Lee ET, Howard BV. Plasma lipids and lipoprotein concentrations among American Indians: comparison with the US population. *Current Opinion in Lipidology*. 1996;7:188-195.

Lipoprotein measurements from the Third National Health and Nutrition Education Survey were used to estimate the need to measure fasting lipid concentrations and offer dietary and drug interventions in the US population. In this review, we compare the distribution of the Third National Health and Nutrition Education Survey population (according to National Cholesterol Education Program [NCEP] guidelines) with a contemporary sample of lipoprotein measurements in 4549 American Indians. Compared with data from the former, relatively fewer American Indians have cholesterol levels greater than 240 mg/dL and a much larger proportion have desirable cholesterol levels less than 200 mg/dL.

NCEP guidelines dictating measurement of fasting lipoprotein concentrations and dietary or drug intervention take into account age, presence of cardiovascular risk factors, and levels of both HDL and LDL cholesterol. The proportion of American Indians requiring these interventions is somewhat less than the Third National Health and Nutrition and Education Survey population, even though the American Indian population in this comparison generally are older (45-74 years of age) than the Survey participants (20 to more than 75 years of age).

The authors review the literature concerning lipoprotein measurements in other America Indian and other ethnic population groups that are undergoing rapid changes in lifestyle. In general, cardiovascular risk factors, including lipoprotein concentrations, are accumulating. These factors suggest that the public health impact of coronary heart disease will increase as these populations undergo further lifestyle changes. □

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