THE IHS PRIMARY CARE PROVIDER

A journal for health professionals working with American Indians and Alaska Natives

September 2003 **Volume 28 Number 9**

Use of Geographic Information Technology to Identify Motor Vehicle Crash Cluster Sites: Emerging Technology Expands Tribal Partnerships

Antoinelle Benally Thompson, BA; Injury Prevention Coordinator, Human Services Division, Fond du Lac Indian Reservation, Cloquet, Minnesota; Diana Kuklinski, Acting Chief, Environmental Health Services Section, Bemidji Area Indian Health Service, Bemidji, Minnesota; and Jennifer Barrows, BS, MS Candidate, University of Wisconsin, Eau Claire, Wisconsin

Introduction

Motor vehicle crashes (MVCs) are the leading cause of death for American Indians and Alaska Natives ages 1 - 44 residing in Minnesota.[1] Furthermore, MVC injury mortality rates for American Indians/Alaska Natives (AI/AN) are disproportionately higher than rates for other races. For example, during 1999 - 2000, the age-adjusted unintentional MVC injury mortality rate for Minnesota AI/AN was over three times higher than the Minnesota All-Races rate (43.7 per 100,000 vs. 13.9 per 100,000, respectively).[1]

MVC site investigations are conducted to determine the patterns and potential cofactors and causative factors of MVCs in a community. This information is necessary for the development of targeted interventions to reduce MVC-related injuries and death. MVC investigations have historically been conducted by collecting crash incident reports from police jurisdictions, analyzing the data, and developing pin maps to visually identify crash cluster sites.

Geographic Information Systems (GIS) are tools for processing and displaying spatial geographic information. For at least a decade, GIS has been used in public health epidemiology to visualize the progress and determine causes and risk factors for diseases, famine, toxic spills and other health issues. More recently, GIS has been used in the field of injury prevention to analyze data from injury-related incidents, especially those involving MVCs.[2] Computer mapping offers several advantages over pin maps: 1) portability; 2) flexibility in displaying MVCs and numerous variables of interest; 3) precision in marking MVC sites; and 4) ease in updating data. For many small injury prevention programs, the major limitation to implementing GIS technology is the lack of computer software to map the incidents and the lack of trained personnel needed to use GIS. For this reason, GIS crash mapping is more suited

In this Issue...

for communities with large numbers of MVCs and access to staff and software resources. Pin mapping is more suited for smaller reservations or communities with few crashes. Even smaller communities can benefit from GIS, however, when they are primarily rural and cover a wide geographic area.

This paper describes the methodology we developed for a pilot project involving application of GIS technology to investigate MVCs on the Fond du Lac Reservation in Northeastern Minnesota. By developing partnerships with tribal community college GIS departments, and law enforcement jurisdictions, we overcame our major technical and resource limitations to using computer software (ArcView) to map MVCs from crash investigations.

Methods

MVCs were defined as collisions involving two or more vehicles; collisions with a fixed object, animal, bicyclist or pedestrian; or an overturn, submersion, and/or vehicle leaving the pavement and landing in an embankment or ditch. We included MVCs occurring on any public road on the Fond du Lac Reservation during calendar years 1999 and 2000. Figure 1 on page 196 shows the steps involved in this pilot study.

We first developed a data collection form by revising a crash investigation form used on the Colorado River Indian Tribes Reservation in Arizona. We added additional data elements from the *Minnesota Motor Vehicle Accident Report*. We included demographic information and crash incident variables such as alcohol use, type of crash, occupant restraint use status, weather, road conditions, and lighting. We pre-tested the form using three records from the Fond du Lac Tribal Police Department. Next, we collected and cross-matched MVC incident reports from the five law enforcement jurisdictions on the Reservation: the Fond du Lac Tribal Police, City of Cloquet Police Department, Carlton County and St. Louis County Sheriff Departments, and Minnesota State Police. We next cross-matched these cases with those listed on a Minnesota Department of Transportation crash printout.

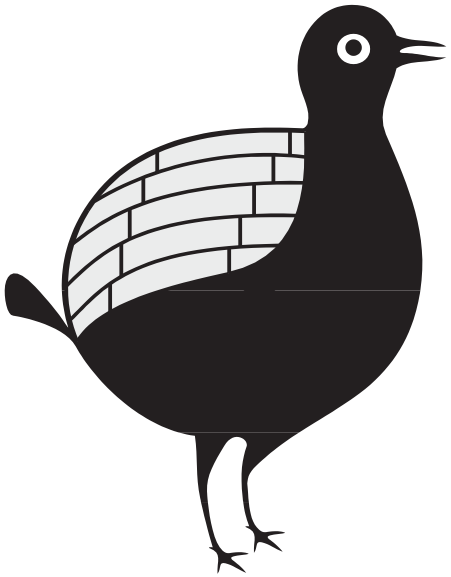
We visited crash sites to conduct basic MVC investigation and to obtain Global Positioning System (GPS) coordinates and digital photos. GPS readings were taken where the vehicle left the pavement (single vehicle crashes) or at the intersection of the crash (multiple vehicle incidents).

Most applications of GIS technology link GPS coordinates directly with ArcView software to generate maps. We added an intermediate step by developing a Microsoft (MS) Access 2000 program. We chose this route because MS Access facilitates ease of data entry and analysis and because MS Access allows exporting of data variables into Excel for statistical calculations. Further, Access data tables can later be linked to ArcView, allowing generation of maps showing MVCs with respect to numerous desired variables, crash photographs, and raw data. We worked with the Lac Courte Oreilles Ojibwa Community College in Wisconsin to develop the MS Access program. The Fond du Lac Natural Resources Department supplied Reservation base maps needed for generating ArcView maps. We also partnered with the Fond du Lac Tribal and Community College to link the MS Access data and digital photographs with ArcView to generate MVC maps.

We entered data from 30 MVCs into the MS Access program, and linked the variables with ArcView to generate crash cluster maps.

Results

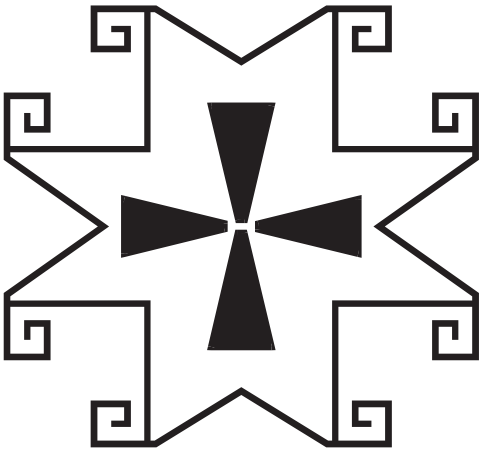
Figure 2 on page 197 shows a sample MVC ArcView map from the Fond du Lac Reservation. Preliminary analysis shows that two crash cluster sites are emerging. After additional MVC crash reports from 2000 – 2002 are obtained and developing cluster sites are identified, it may be necessary to conduct additional field investigations at these cluster sites. After presenting this information to the Reservation Business Council, law enforcement, and other policy makers, we will work on developing a coalition of community, county, state, and federal partners to assist in developing an MVC intervention action plan for these priority cluster sites. The interventions developed by the committee may include any or all of the following: enhanced enforcement of laws, environmental modification, and community education.



Because of the multiple law enforcement jurisdictions at Fond du Lac, obtaining and cross-matching MVC incident reports is time-consuming. Other tribes in the Bemidji Area Indian Health Service (Minnesota, Wisconsin, and Michigan) have similar multiple law enforcement jurisdictions. Many tribes also have community partners with GIS technology resources such as tribal community college GIS departments and natural resource departments. Developing partnerships with community colleges allows us to share manpower and technical resources. For example, next year we will be working with students at the Fond du Lac Tribal and Community College to teach them how to collect and enter MVC data, generate maps, and identify crash cluster sites. Students will gain expertise in using GIS technology and will learn principles of injury epidemiology and developing interventions to reduce MVC injuries.

One major difficulty that we encountered during this pilot study was in determining the exact location of crashes from records because of the age of the crash or the incompleteness or illegibility of records. We will be addressing this issue by presenting the data from this study to officers from the five police jurisdictions and discussing with them the need we have for complete and legible records. Meeting with these jurisdictions, we also hope to streamline the data collection process, emphasizing standardization of reporting and more efficient sharing of data.

Three tribes in the Bemidji Area have been using ArcView for MVC mapping and investigation. Limitations in financial and technical resources as well as community partners that can supply these resources can discourage tribes from implementing GIS technology in crash mapping. To address this issue and make MVC GIS mapping more feasible for additional tribes and communities, the Indian Health Service Office of Environmental Health Services is proceeding with a plan to develop a Web-based MVC mapping system in 2003.



Acknowledgements

Special thanks to Dr. Lawrence Berger, Clinical Associate Professor of Pediatrics, University of New Mexico, for technical review of this document.

References

1. Centers for Disease Control, National Center for Injury Prevention and Control, Web-based Injury Statistics Query and Reporting System, 1999-2000.
2. Lightstone AS, Dhillon PK, Peek-Asa C, Kraus JF. A geographic analysis of motor vehicle collisions with child pedestrians in Long Beach, California: comparing intersection and midblock incident locations. *Injury Prevention*. 2001;7:155-160.

Figure 1. Steps in the process of using Global Information System technology in motor vehicle crash site investigation, Fond du Lac Reservation

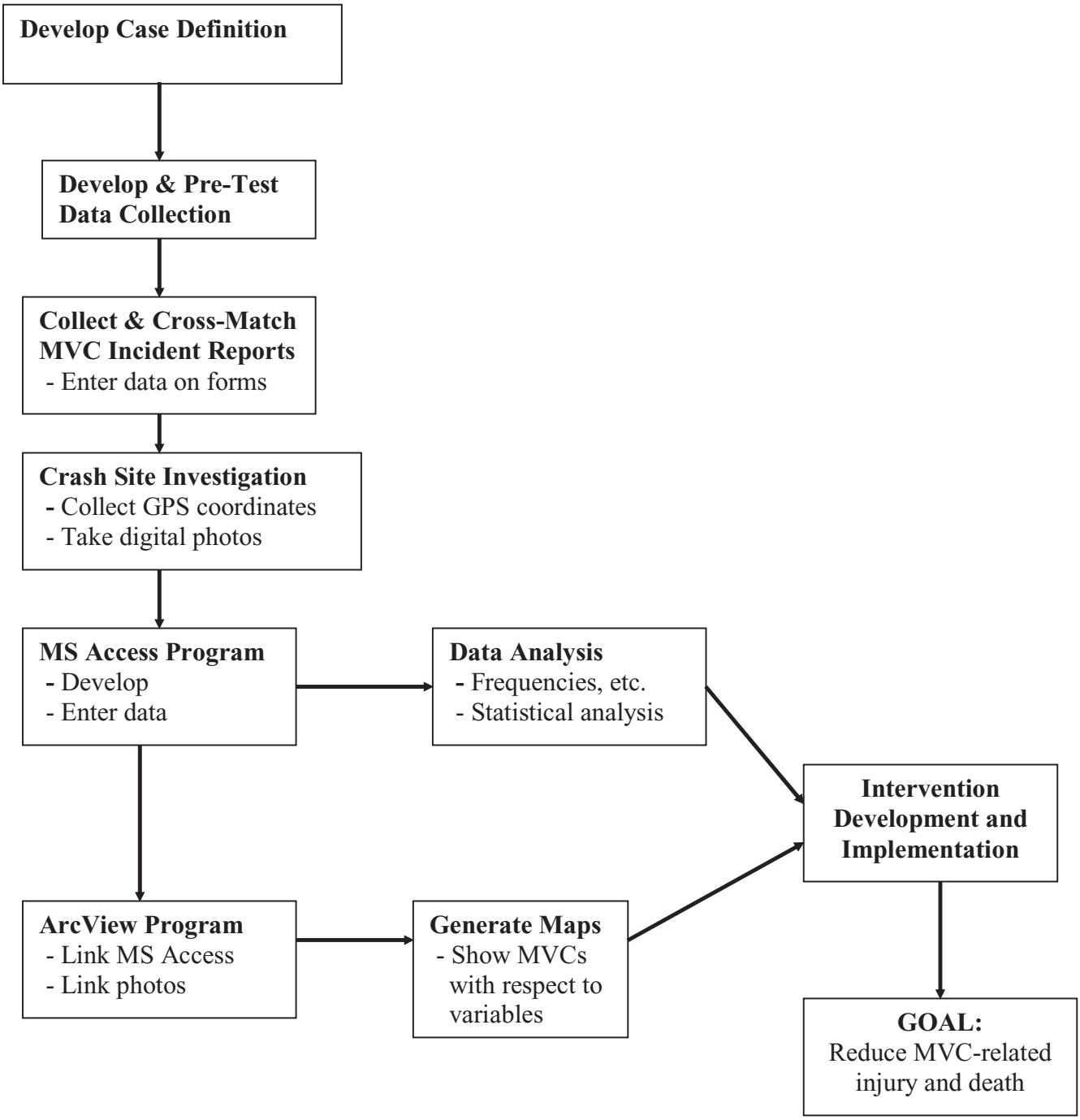
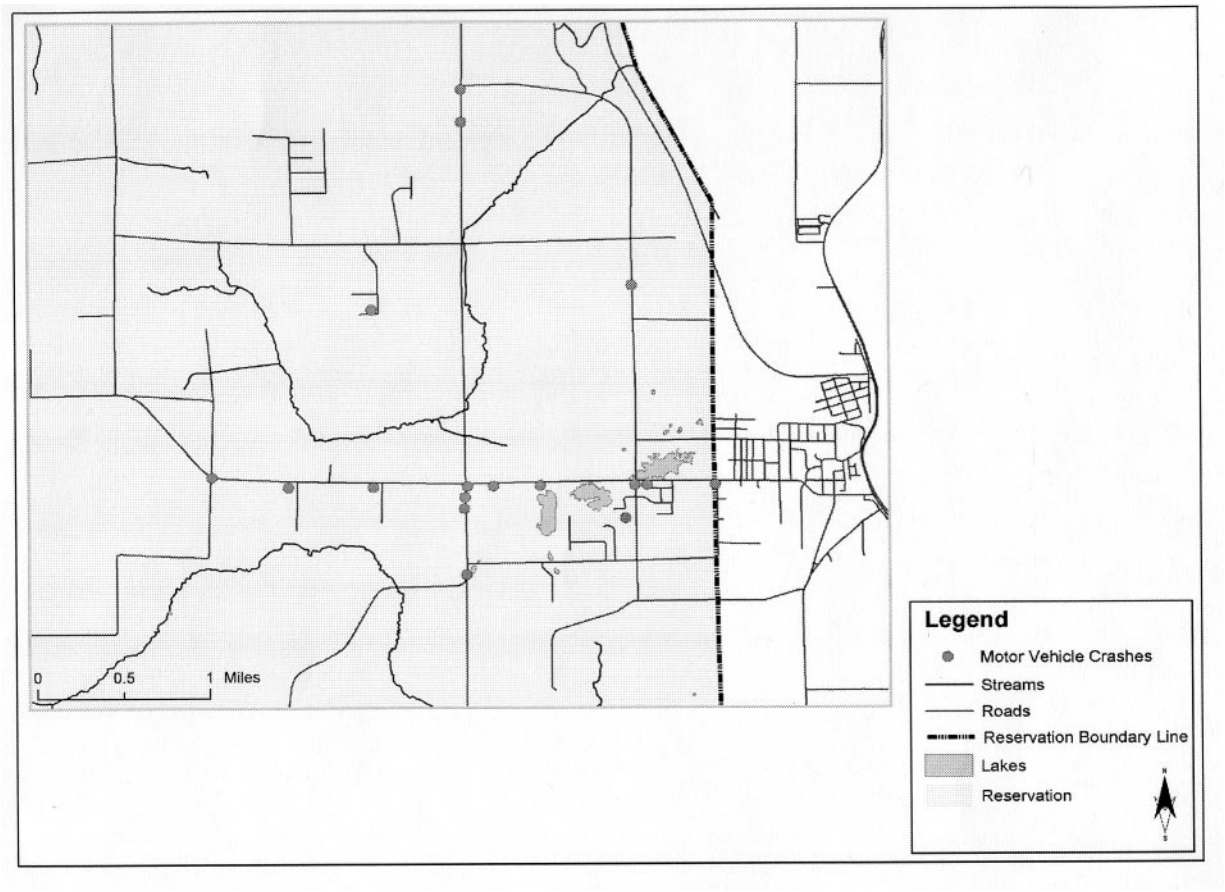


Figure 2. Sample motor vehicle crash map generated with GPS



Guidance on Constructing, Enlarging, and Managing a Dental Clinic

Frank Martin, DDS, MPH, Consultant, IHS Dental Program, Rockville, Maryland

In the past, healthcare facilities serving Indian people were predominately built by the Indian Health Service (IHS) using congressionally appropriated funds. The number of healthcare facilities constructed by tribes has increased as the number of tribally managed programs has increased and as tribes develop better economic bases. Since oral health services are important to and desired by Indian people, most of these facilities include dental programs. Tribes have also constructed a number of stand-alone dental clinics using their own funds or funds from various grant programs.

When the IHS constructs a healthcare facility, it uses criteria developed by its Division of Facilities Planning and Construction. Clinics constructed by tribes using their own funds are not required to use these criteria, and the majority of the time look to the local dentist as the dental clinic planning expert. Since dentists are not trained in dental clinic planning and construction, and few of them have experience in this area, they must spend a lot of time researching what needs to be done, resulting in lost patient care time. Even with this research, the clinics they build are often deficient in one or more critical factors.

The lack of dental clinic planning, construction, and management information, as well as people experienced in all these areas is not unique to Indian country. State supported community clinics face the same problems. In the winter of 2000, the Ohio State Dental Director, Dr. Mark Siegal, determined he needed to provide more assistance to communities in Ohio that were seeking to construct and manage dental clinics. He did not have the expertise on his staff to provide the required support and decided to form a team of "experts" to develop a manual to provide needed information to communities that were looking to support a community dental clinic. When he discussed this endeavor at a meeting of State and Territorial Dental Directors there were many at the meeting who had similar needs. After the meeting Dr. Siegal obtained a grant from the Maternal and Child Health Bureau, Health Resources and Services Administration. With assistance from the Association of State and Territorial Dental Directors he began to develop a manual for providing communities with assistance in planning, constructing and operating a dental clinic. The IHS was asked to participate in the development of this manual.

During the next two years, over 70 people, including community leaders, dentists, dental hygienists, accountants, and clinic managers, participated in developing the "Safety Net Dental Clinic Manual." The title is based on the fact that community clinics in Ohio that are built using state grant funds are called Safety Net Clinics. The manual is web-based and has many links to other websites such as the Office of Safety and Occupational Health, the Centers for Disease Control, and the American Dental Association. These links provide up-to-date information on various regulations and procedures referenced in the manual. The manual is also available on CD for those locations that have limited access to the internet. To connect to the links one must be on the Internet. Since many of the users will not be dentists, but community leaders who are interested in starting a community dental program, the manual is written so that the reader does not have to be a dentist to understand it.

The information in this comprehensive manual highlights all aspects of dental clinic development as well as ongoing operations, unlike most clinic manuals, which are operations manuals specific to a particular clinic or clinic system. Beginners may look at the chapters as a series of steps for starting a dental clinic. Those wanting to improve an existing dental clinic facility or services can pick and choose what interests and helps them to attain their specific objectives.

This on-line, practical reference will help the user make good decisions. The easy-to-use format has:

- Links to user-friendly tools: e.g., clinic policies, efficiency tips, professional standards, supply lists, floor plans, design tips, photos of equipment options, budget worksheets, funding strategies, quality improvement plans, fact sheets, and websites
- Interactive worksheets to get you where you want to go
- The flexibility for a user to select as little or as much content as you feel you need
- Search capability to let you find the information you want
- Tools to help you make good decisions.

Chapter One of the manual discusses ways to gain community support for a community dental clinic, including ways to develop a task force, form partnerships, and develop a strategic plan for the effort. The planning information includes everything from ways to raise funds to determining what services should be offered by the dental clinic.

Chapter Two provides vital information for organizations that have determined a need for a fixed dental clinic facility. Information is provided on areas such as the size of facility needed to optimally serve different population sizes; estimates

of construction costs; estimates of supply, instrument, and equipment costs; staff configurations for different clinic sizes; dental clinic layouts; construction specifications for a dental facility; and how to select dental equipment, instruments, and supplies. Information from this chapter will be very useful when considering funding and budget issues discussed in Chapter Three.

Chapter Three helps you "crunch the numbers" for constructing and equipping a dental clinic and determining the financial sustainability by addressing:

- Financial feasibility (Getting to the "bottom line")
- Factors that affect patient care revenue
- Start-up and maintenance expenses
- Building your own budget and exploring various "what if" scenarios with an interactive budget planning worksheet
- Managing your clinic's finances
- Using budgets and financial reports
- Using a long-range business plan
- Bringing in additional dollars to supplement patient care revenue
- Grant seeking and writing tips
- Fundraising

Chapter Four covers the operations of a safety net dental clinic, including:

- staffing
- risk management
- health records and information management
- purchasing and inventory management
- patient scheduling and consent
- billing and collections
- infection control
- environmental health
- safety issues

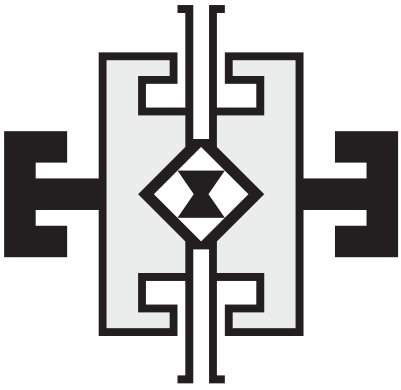
The framework for organizing all of these clinic operations is generally through a Policies and Procedures Manual. Details and examples of policies, procedures, guidelines, regulations, etc. are provided through text and links.

Chapter Five of the manual discusses how to assess, maintain, and improve the quality of clinical services and administrative processes. Section 1 contains general background material on quality assurance and quality improvement (QA/I). Section 2 is a short discussion on accreditation, while Section 3 presents some tools for tracking and measuring services. The tools are not listed in order of importance; all are important to your QA/I program. Section 4 provides more in-depth materials on quality improvement for those who wish to delve deeper into the topic.

The forms and tools presented in Chapter Five are meant to be used as examples and templates; they are not the only methods available. They should allow new clinics to begin QA/I activities without needing to have a QA/I expert on staff. If the dental clinic is part of a larger health center or hospital, then a QA/I program or department may already exist where you can seek guidance.

The website for the "Safety Net Dental Clinic Manual" is *www.dentalclinicmanual.com*. The site includes instructions on how to use the manual and provides a link for the reviewer to comment on the manual. This is a "living document" that will be updated on a regular basis. If the reader feels materials should be added to or deleted from the manual, the coordinating committee will review the request and take appropriate action. There has been a lot of positive feedback those who have read the manual and some useful suggestions have been made.

This manual can be very useful to Indian communities that are planning a dental clinic or expanding an existing one. IHS dental clinic personnel who are looking for a way to improve the management their program may find that some sections are useful. Several IHS dentists have used a draft of the supply section to develop a start-up supply list for a new facility at their location. Both IHS and tribal program staff are encouraged to visit the site when looking to start or expand their dental services or even to look for ways to improve their present program.



CEU/CME Module Sponsored by The Indian Health Service Clinical Support Center

Editor's Note: This is the second of a two-part series on Diabetes in Pregnancy (Part 1 appeared in the April 2003 issue of The Provider*). This module will concentrate on management; it is also available online at http://www.ihs.gov/MedicalPrograms/MCH/M/DP21.asp#top. The posttest at the end of this module can be found at http://www.ihs.gov/MedicalPrograms/MCH/M/DP37.cfm#top. Please note the online version has hundreds of hyperlinks to references, abstracts, and full text articles that are not included in this hard copy for space considerations. The links that were not removed in this paper version show up as references, but would be "clickable" hotlinks in the online article that would bring you to the source material.*

Diabetes In Pregnancy, Part 2: Management, Delivery, and the Postpartum Period

George J. Gilson, MD, Maternal Fetal Medicine, Alaska Native Medical Center, Anchorage, Alaska; Neil J. Murphy, MD, OB/GYN Chief Clinical Consultant, IHS, Southcentral Foundation, Women's Health Service, Alaska Native Medical Center, Anchorage, Alaska; and Burton Attico, MD, former Maternal Child Health Coordinator, Phoenix Indian Medical Center, Phoenix, Arizona

How to Participate

This module has been produced in accordance with ACCME standards and is intended for the use of physicians, midwives, advance practice nurses, and nurses. It has been field tested and found to take approximately two hours to complete. For more details about how to participate in this CEU/CME program, see the Perinatologist Corner page, described elsewhere in this issue. Also please see the information about Goals, Sponsorship and Credit, and Disclosure, below.

Goal

The student will understand the maternal and fetal consequences of, methods and limitations of screening for, and diagnosis and management of diabetes in pregnancy.

Objectives

The objectives for this module are as follows:

The participant will understand

- the maternal and fetal consequences of diabetes in pregnancy.
- the methods and limitations of screening for diabetes in pregnancy
- the management of diabetes in pregnancy.

Case scenario

(Case continued) . . . As you will recall from *Diabetes in Pregnancy, Part I: Screening and Diagnosis*, our case patient, SK, is a 38-year old G8P7006 diagnosed with gestational diabetes mellitus (GDM) by an abnormal 3-hour glucose tolerance test (GTT) shortly after 24 weeks of gestation. She is begun on a no-added sweets diet, restricting total carbohydrates to 40% of total intake. Since her body-mass index (BMI) is approximately 37 kg/M^2, she is overweight for height, and therefore is restricted to 25 kilocalories per kg (pre-pregnant ideal weight).

Diet and Exercise

Case continued . . . The rest of her intake can be divided between protein and fats, but ideally, for her long-term cardiovascular health, you will counsel her not to eat too much fat, and the fat that she does eat will be of the "heart healthy" polyunsaturated variety. Many traditional American Indian /Alaska Native (AI/AN) diets are low in carbohydrates, and you may be able to appeal to the patient's cultural tradition to foster a healthy diet for her.

Diet

Breakfast should be the patient's smallest meal, if possible, because the "diabetogenic" hormones of pregnancy tend to be secreted in a diurnal fashion, with peaks in the mornings. Many AI/AN women eat at irregular intervals, when they are hungry, and do not eat the standard Western "three square meals" a day. You may therefore have to adjust your therapy around that, or see if it is feasible for her to make some further changes in her lifestyle with regard to when she will eat, as well as what she will eat.

It would be hoped that she would not gain more than 20 pounds during the pregnancy because of her already high BMI. While pregnancy is not the time for weight loss, the more adipose tissue the patient has, the more insulin resistant she will

be. Many overweight women will have almost no weight gain during pregnancy and still have a normal size or even macrosomic infant. This again reflects our lack of evidence-based interventions for this disorder.

Medical nutrition therapy (MNT), while intuitively reasonable, has never been demonstrated in a randomized control fashion to have a significant impact on perinatal outcomes, although it will help short-term glucose control. The Cochrane Library states "There is not enough evidence to evaluate the use of primary dietary therapy for women who show impaired glucose metabolism during pregnancy."

Exercise

If, in the literature, diet is not proven to work, then just what is an evidence-based, helpful intervention? There are data to support the benefit of exercise in the control of fasting and postprandial glucose (Bung et al; Jovanovic-Peterson et al). Dyck et al describe a successful exercise program in Aboriginal women in Saskatoon, Saskatchewan.

An "exercise prescription" is something from which women with GDM should benefit. One rule of thumb is to encourage the patient to exercise intensely enough so as to be able to talk, but not to sing. Something as simple as walking at a comfortable pace for 20-30 minutes after meals will usually favorably impact post-prandial glucose values and result in lower birth weight, if done as part of a regular regimen.

Monitoring: Glucose, Renal, and Eye

Case continued . . . Ms. K is provided with a reflectance photometer, test-strips, lancets, and intensive diabetic education. She is instructed to measure her fingerstick capillary glucose every morning, fasting, as well as three times a day, two hours after every meal. She is advised that the goal is to keep her fasting blood sugar (FBS) <95 mg/dL, her 1-hour post-prandial glucose < 130-140 mg/dL, and her 2-hour glucose <120 mg/dL. She is appointed for the following week and brings in this glucose log:

Day	FBS	Breakfast 2-hr PPG	Lunch 2-hr PPG	Dinner 2-hr PPG
1	109	201	134	157
2	104	194	162	139
3	99	187	144	171
4	101	175	"forgot"	129
5	122	222	109	122
6	103	144	124	117
7	96	169	119	-

Monitoring: Glucose, Renal, and Eye

Scanning the first week of reported values it appears that her fasting blood sugars and her 2-hour post-breakfast sugars are all out of the target range, but that her post-lunch and post-dinner sugars have largely come into the desired limits with diet alone. It would probably be appropriate to reinforce diet and exercise, with particular attention to the morning meal, and see her again in another week. On the other hand, since her FBS values are all out of range, one might predict that she will still need something more than diet. You compliment Ms. K on her progress and encourage her to keep up her efforts.

If Ms. K had been a pre-existing diabetic or does get treated with insulin, then she would be a candidate for careful monitoring of renal and eye complications, both of which are known to advance during pregnancy (Meltzer et al). You would also want to obtain a HgbA1c each trimester.

Insulin Therapy

Case continued . . . Ms. K returns the following week and presents this glucose log (ranges reported for simplicity):

Day	FBS	Breakfast 2-hr PPG	Lunch 2-hr PPG	Dinner 2-hr PPG
8-15	98-121	131-203	103-129	92-118

Insulin Therapy

Despite two weeks of MNT, the fasting and the post-breakfast glucose values remain out of range, but the other post-prandial sugars are good. On the basis of the elevated fasting sugars one might again suspect that she may actually be a pre-gestational diabetic ("class B"; see the White Classification in the first article). Nevertheless, the interventions are essentially the same at this point.

You decide to start Ms. K on split dose insulin. She is now classified as "GDM, class A-2," no longer diet-controlled. How should you decide on an insulin dose for her? There are several ways to do this, and most will be successful in individuals who are not type 1 diabetics.

One method would be to administer a small dose of short acting (regular or lispro) insulin before each meal to control the post-prandial sugars, and a small dose of longer acting insulin (usually NPH) at bedtime to control the fasting glucose. Another way would be to give NPH and regular insulin together twice a day, before breakfast and again before dinner. A third regimen would be to give lispro three times a day at each meal and give NPH twice a day, on arising and at bedtime.

Type 1 diabetics often need ultralente insulin or one of the newer analogs, in order to provide them 24-hour basal insulinization. The short acting insulin should control the glucose excursions after eating, and the NPH should both smooth out the daytime control, and work during the night to result in a target range FBS.

The advantage of lispro is that it is conveniently given as the patient sits down to eat, not 30 minutes before the meal, as is appropriate for regular insulin. The disadvantage is that lispro cannot be mixed with NPH, thus requiring "two sticks" if NPH is to be given concomitantly.

How to Start Iinsulin Therapy

Case continued . . . Ms K agrees to insulin therapy and you and she together decide that to start "two shots a day" would work most conveniently for her. The total daily dose of insulin is usually calculated by weight, as follows:

Current pregnancy weight in kilos x 0.5-1.0 units/kg = total daily dose

So, for her, starting low: 187 pounds = 85 kg; 85 x 0.5 units = 42 units total/day. Since the diurnal variation of the diabetogenic hormones of pregnancy results in their being secreted in higher concentration in the morning (referred to as "the dawn phenomenon"), 2/3 of the total dose is usually given in the morning, and 1/3 in the evening. Based on a total dose of 42 units:

42 units/d x 2/3 = 28 units in AM
42 units/d x 1/3 = 14 units in PM

It is usually split by giving 2/3 as NPH and 1/3 as regular:

28 x 2/3 = 18 units NPH + 10 units regular in AM and
14 x 1/3 = 10 units NPH + 4 units regular in PM

How to Start Insulin Therapy

These are only starting guidelines, and the patient's response will determine dosage adjustments. She should be seen at least weekly, if possible, until the dosages chosen keep all the fasting glucoses <95 and all the post-prandial values <120. Increase the evening NPH to control the fasting glucose but remember "the Somogyi effect," whereby too much evening insulin may cause hypoglycemia during the night with rebound morning overshoot. If the fasting glucose levels are hard to control despite increasing evening NPH, have the patient check a 2 AM sugar to see if this is occurring. As pregnancy advances and the effect of the "diabetogenic hormones of pregnancy" increases, one can anticipate increasing insulin requirements, and the patient should be reassured that this is the norm.

How About Alternatives to Insulin?

Please note that the Cochrane Library finds that there appears to be no clear evidence of benefit from very tight glycemic control for pregnant diabetic women. Since very strict control may have a substantial impact on lifestyle, this suggests caution in advising such a degree of control.

The Cochrane Library also finds a comparison of the effects of human and animal insulin, as well as of the adverse reaction profile, did not show clinically relevant differences. Many patient-oriented outcomes like health-related quality of life or diabetes complications and mortality were never investigated in high-quality, randomized clinical trials. The story of the introduction of human insulin might be similar to contemporary launching campaigns to introduce pharmaceutical and technological innovations that are not backed up by sufficient proof of their advantages and safety.

Some patients will be reluctant to give themselves multiple daily insulin injections, and it would be convenient to be able to offer them an alternative. Classic teaching is that oral hypoglycemic agents can cause severe hypoglycemia during pregnancy and are to be avoided. Currently, investigation of the use of oral hypoglycemic agents in pregnancy is in progress, but their use can not yet be considered the standard of care. Their use should be as part of a research protocol, or only if the patient clearly understands that these agents are not FDA approved for this use in pregnancy at this time; this should be documented in the record.

The agent that has been most extensively studied in pregnancy is the sulfonylurea, glyburide. Level I results have been encouraging to date (Langer et al). Glyburide does not cross the placenta because of its molecular size. Hence, like insulin, it will control the maternal blood sugar without affecting fetal glucose homeostasis. Nevertheless, its mode of action, stimulating secretion of insulin from the pancreatic islet cells, probably does not well address the underlying pathophysiology of this disorder, which is characterized by insulin resistance and hyperinsulinemia.

Metformin, a biguanide, would seem to be an ideal choice from a physiologic standpoint, since it works at the "post-receptor" level to enhance glucose utilization. Metformin is a small molecule and readily crosses the placenta. This fact has limited its investigation in pregnancy. Nevertheless, metformin should not cause hypoglycemia in euglycemic subjects, and fetal effects should theoretically be minimal. There is a small body of experience with the drug in patients with infertility secondary to polycystic ovaries. These patients have conceived on metformin, and then continued it during pregnancy (Glueck et al). At the present time, it cannot be recommended for clinical use.

Acarbose, because it works locally in the gut to decrease glucose absorption, might also be expected to be safe in pregnancy, but its use is limited by its side effects of bloating and diarrhea. Insulin, therefore, remains the standard of care for those patients who cannot maintain euglycemia on medical nutrition therapy.

Fetal Monitoring

Case continued . . . Ms. K returns a week later and almost all her values are in range. You make minor adjustments where necessary and compliment her on her progress. What other parameters should you be following at this time?

Hemoglobin A1c determinations are not sufficiently sensitive during pregnancy, due to the normal physiologic plasma volume expansion and subsequent dilution effect on hemoglobin, and following them will only provide false reassurance. It is recommended that women with gestational diabetes, especially those who are insulin-dependent, should have fetal growth followed with ultrasound every four weeks.

Remember, ultrasonographic fetal weight determination formulas are subject to at least a 20% or greater error rate in the third trimester. It has been demonstrated that if fetal growth is excessive, as determined by an abdominal circumference greater than the 70th percentile, then even in the woman with acceptable glucose values, instituting small doses of insulin may be effective in preventing the further progression of the macrosomia (Kjos et al 2001).

Even if the patient maintains euglycemia, macrosomia may result, because there are other factors, less well understood and controllable, which determine fetal size in the diabetic woman. As noted above, there have never been any randomized, controlled trials documenting the value of maintaining euglycemia with diet and insulin as regards perinatal outcome, although the data from a few cohort studies have reinforced what has become standard of care.

There are also no data from randomized trials of antepartum testing in patients with GDM, but women whose GDM is not well controlled, who need insulin (like our patient), or who have other risk factors (hypertensive disease, prior poor obstetric outcome, also like our patient), are recommended to undergo testing. Many current protocols call for weekly or twice weekly non-stress testing (NST), with or without amniotic fluid (AFI) determinations after 32 weeks gestation (Kjos et al 1995), though any combination of standard methods is reasonable.

Labor and Delivery

Case continued . . . Ms. K has an ultrasound done at 38 weeks gestation that reports an estimated fetal weight of 4086 g (>90th percentile for this gestational age). The AFI at this exam is 20.7. Her fundal height is 41 cm. Her total weight gain has been 12 pounds. Her blood pressure is normal. She reports good fetal movements and her NST are consistently reactive. Her glucose control remains satisfactory with most values in range, on 28 units of NPH and 12 units of regular before breakfast and 18 units of NPH and 12 units of regular before supper. Vaginal exam reveals that her cervix is 2 cm dilated, 50% effaced, soft, posterior, with a vertex presentation at –3 station. She wants to know if she could be delivered before the baby gets any bigger.

Labor and Delivery

There is some evidence that inducing labor in insulin-dependent diabetics at 38 to 39 weeks may decrease the incidence of macrosomic infants and shoulder dystocia, and, in women with a prior stillbirth, such as our patient, many experts would recommend this policy.

Conway et al found that an ultrasonographically estimated weight threshold as an indication for elective delivery in diabetic women reduces the rate of shoulder dystocia without a clinically meaningful increase in cesarean section rate. Lurie et al found that the incidence of shoulder dystocia in patients in whom labor was electively induced at 38 to 39 weeks of gestation was 1.4% as compared to 10.2% in patients who delivered beyond 40 weeks' gestation ($p < 0.05$).

The ADA suggests that prolongation of gestation beyond 38 weeks may increase the risk of fetal macrosomia without reducing the cesarean delivery rates, so that delivery during the 38th week is recommended unless obstetric considerations dictate otherwise.

On the other hand, the Cochrane Library points out that there is very little evidence to support either elective delivery or expectant management at term in pregnant women with insulin-requiring diabetes. Limited data from a single randomized, controlled trial suggest that induction of labor in women with gestational diabetes treated with insulin reduces the risk of macrosomia. The small sample size does not permit one to draw conclusions.

At this gestational age, amniocentesis for confirmation of fetal lung maturity is not necessary in well-dated, well-controlled patients. One should anticipate that the cesarean delivery rate will be higher in women who are induced with an unfavorable cervix, but our patient is a multipara with an inducible cervix. We should of course like to avoid another shoulder dystocia and the poor outcome that occurred during her previous pregnancy.

Ultrasound is not a very good predictor of fetal macrosomia, having a positive predictive value of only 20 to 40%, comparable to Leopold's maneuvers. Its negative predictive value is much better however, over 90%, but it is always best to put the whole clinical picture together.

Elective cesarean delivery for suspected macrosomia is not a reasonable strategy, as over 400 cesareans would have to be performed in women with GDM to prevent one shoulder dystocia with sequelae.

Naylor et al reported that the mere presence of the diagnosis of GDM may lead to increased rates of cesarean delivery, without regard to a specific indication, nor improvement in maternal or infant outcome.

On the other hand, if a prolonged second stage with arrest of descent of the head occurs, it would be most imprudent to attempt a forceps or vacuum assisted vaginal delivery of a fetus suspected to weigh over 4000 g.

The American College of Obstetrics and Gynecoloy (ACOG) states that for women with GDM and an estimated fetal weight of 4,500 g or more, cesarean delivery may be considered because it may reduce the likelihood of permanent brachial plexus injury in the infant.

There is evidence that maintaining maternal euglycemia in labor is effective in preventing neonatal hypoglycemia, actually more so than antepartum control (Curet et al, Anderson et al). Thus, continuing insulin therapy intrapartum with close monitoring is indicated. A set of intrapartum insulin drip orders is available by hyperlink.

Postpartum Management

Case continued . . . Ms. K is scheduled for induction shortly after 38 weeks. She is NPO and her usual morning insulin is not given. Her FBS is 79. An infusion of D5LR at 125 mL/hr is begun. An insulin drip with 125 units of regular insulin in 250 mL of NS (1 unit/mL) is also begun at 1 unit per hour. A fingerstick glucose is checked hourly, and the insulin drip is adjusted to maintain the maternal blood sugar between 60-90 mg/dL.

Labor is induced with low dose vaginal misoprostol and is well tolerated by the fetus.

After approximately 8 hours of labor, a rapid vaginal delivery of a normal appearing 8 pound 2 ounce baby girl with Apgars of 9 and 9 takes place. The baby's first heel-stick glucose is 42 and remains above 40 when checked hourly over the next 4 hours.

Ms. K's FBS the next morning is 72 and her post-prandial sugars are also all under 120; insulin therapy is not continued. She is discharged on the second postpartum day with recommendations for a no added-sweets diet. She is breast-feeding without difficulty, and is still undecided about family planning.

Postpartum Management

Patients with pre-gestational diabetes may experience a "honeymoon" period with euglycemia without therapy in the immediate postpartum period. By definition, gestational diabetic women should remain euglycemic without any specific therapy. It is recommended however, especially in women like our case patient, that glucose tolerance be evaluated in the postpartum period.

The patient should be encouraged to continue the exercise and dietary habits learned during pregnancy and to try to maintain her ideal body weight, if possible. As noted above, a significant portion of AI/AN women who have GDM, especially if their BMI is >27, will develop frank type 2 diabetes in as soon as five years. The GDM patient should receive a 75 gram OGTT at 6-8 weeks postpartum and every three years thereafter (see details below).

Long Term Management

Having GDM can be seen as a "red flag" that may help to encourage the patient to make or maintain the necessary lifestyle changes that may delay or prevent the onset of overt disease. This may be the most important public health measure we perform when taking care of women with this entity.

Kim et al performed a meta-analysis of a total of 28 studies. After the index pregnancy, the cumulative incidence of diabetes ranged from 2.6% to over 70% in studies that examined women 6 weeks to 28 years postpartum. Conversion of GDM to type 2 diabetes varies with the length of follow-up and cohort retention. Adjustment for these differences reveals rapid increases in the cumulative incidence occurring in the first five years after delivery for different racial groups. Targeting women with elevated fasting glucose levels during pregnancy may prove to have the greatest effect for the effort required.

The most sensitive test for use at the six-week postpartum visit is the 75 g 2-hour OGTT, but a fasting plasma glucose (FPG) can be diagnostic and may be logistically easier. Outside of pregnancy, the laboratory criteria for the diagnosis of DM are:

Normoglycemia	Impaired Fasting Glucose (IFG)/ Impaired Glucose Tolerance (IGT)	Overt Diabetes
FPG<110 mg/dL 2-hr PG<140 mg/dL	FPG 110-125 mg/dL 2-hr PG 140-199 mg/dL	FPG>126 mg/dL 2-hr PG>200 mg/dL

These values would need to be repeated on a subsequent day to confirm the diagnosis.

The postpartum visit may also be a good time to discuss preconception issues if another pregnancy is planned in the future. Glucose control should be the best possible before conception (FBS<100, 2-hr PPG<140, normal hemoglobin A1c), in order to minimize the risk of congenital malformations, and folic acid, 1 mg daily should be taken for the same reason.

Can Diabetes Be Prevented?

There are good Level I data to show that once a patient has developed IGT that lifestyle and medication interventions may slow the onset of further glucose intolerance.

In 2001 the Finnish Diabetes Prevention Study Group reported on randomly assigned middle-aged, overweight subjects (172 men and 350 women; mean age, 55 years; mean body-mass index, 31) with impaired glucose tolerance to either the intervention group or the control group. Each subject in the intervention group received individualized counseling aimed at reducing weight, total intake of fat, and intake of saturated fat, and increasing intake of fiber and physical activity. During the trial, the risk of diabetes was reduced by 58 percent (P<0.001) in the intervention group. The reduction in the incidence of diabetes was directly associated with changes in lifestyle. They concluded that Type 2 diabetes can be prevented by changes in the lifestyles of high-risk subjects.

In 2002 the Diabetes Prevention Program (DPP) reported a study that randomized IGT patients to lifestyle interventions that included diet and moderate exercise, or metformin. The DPP found that lifestyle changes and treatment with metformin both reduced the incidence of diabetes in persons at high risk. The lifestyle intervention was more effective than metformin.

Please note that these lifestyle changes were very attainable and that this study included AI/AN subjects, hence is entirely applicable to AI/AN. The mean weight loss goal was only 7 percent in 2.8 years and 150 minutes of moderate exercise per week. The DPP outlined their eight main steps for lifestyle intervention. See the DPP description of lifestyle intervention for details.

Contraception

All contraceptive modalities are appropriate for the woman who has had GDM. Caveats include:

- estrogen containing combination oral contraceptive agents may increase insulin requirements in the overt diabetic
- injectable depot medroxyprogesterone acetate (Depo-Provera; DMPA)) may result in undesirable weight gain (Espey et al)
- very limited retrospective data suggest progestin only contraceptive pills may increase the incidence of glucose intolerance (Kjos et al 1998)

Espey et al studied a cohort of 172 Navajo women who had used DMPA continuously for one or two years (the study group). A cohort of 134 Navajo women who used a non-progestin method or no method over one or two years comprised the comparison group. Study subjects gained a mean of six pounds over one year and 11 pounds over two years relative to the comparison group ($p < 0.001$) after controlling for possible confounding variables including age, parity, and initial weight.

Kjos et al, 1998 reported a retrospective cohort study of 904 Latinas with GDM who gave birth between January 1987 and March 1994, in whom postpartum diabetes was excluded at 4 to 16 weeks postpartum. The report is limited because the patients with progestin only OCs were significantly heavier, significantly higher parity, and significantly higher weight gain in follow-up compared to patients on combination agents.

IHS Online Resources

If you are a member of the Indian Health Service or Tribal wide-area network (WAN), the resources on this page are available to you in the online version of this article. If you are not a member of the Indian Health Service or Tribal wide-area network, some of the resources on this page will not be available to you; for additional resources please go to Other Online Resources.

What Is the Latest ACOG Statement on This?

The following recommendations are taken from the following reference:

> Gestational Diabetes. ACOG Practice Bulletin No. 30. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2001;98:525–538

Summary of Recommendations (OB/GYN Chief Clinical Consultant Note:

AI/AN should be universally screened regardless of other risk factors. High risk AI/AN populations may go directly to single step 3-hour oral glucose testing.)

The following recommendations are based on limited or inconsistent scientific evidence (Level B):

- The laboratory screening test should consist of a 50-g, 1-hour oral glucose challenge at 24–28 weeks of gestation, which may be administered without regard to the time of the last meal.
- A screening test threshold of 140 mg/dL has 10% less sensitivity than a threshold of 130 mg/dL but fewer false-positive results; either threshold is acceptable.
- The screening test generally should be performed on venous plasma or serum samples using well-calibrated and well-maintained laboratory instruments.
- Available evidence does not support a recommendation for or against moderate caloric restriction in obese women with GDM. However, if caloric restriction is used, the diet should be restricted by no more than 33% of calories.
- For women with GDM and an estimated fetal weight of 4,500 g or more, cesarean delivery may be considered because it may reduce the likelihood of permanent brachial plexus injury in the infant.
- When medical nutritional therapy has not resulted in fasting glucose levels less than 95 mg/dL or 1-hour postprandial values less than 130–140 mg/dL or 2-hour postprandial values less than 120 mg/dL, insulin should be considered.

The following recommendations are based primarily on consensus and expert opinion (Level C):

Although universal glucose challenge screening for GDM is the most sensitive approach, there may be pregnant women at low risk who are less likely to benefit from testing. Such low-risk women should have all of the following characteristics (again, as per the above OB/GYN Chief Clinical Consultant note, AI/AN should be universally screened regardless of other risk factors

1. Age younger than 25 years
2. Not a member of a racial or ethnic group with high prevalence of diabetes (eg, Hispanic, African, Native American, South or East Asian, or Pacific Islands ancestry)
3. Body mass index of 25 or less
4. No history of abnormal glucose tolerance
5. No previous history of adverse pregnancy outcomes usually associated with GDM
6. No known diabetes in first degree relative

There is insufficient evidence to determine the optimal antepartum testing regimen for women with GDM with relatively normal glucose levels on diet therapy and no other risk factors. Either the plasma or serum glucose level established

by Carpenter and Coustan or the plasma level designated by the National Diabetes Data Group conversions are appropriate to use in the diagnosis of GDM.

Reference Texts

1. Obstetrics: Normal and Problem Pregnancies, 4th Edition. Gabbe SG, Neibyl JR, Simpson JL (Eds.). Diabetes mellitus, Chapter 32. Churchill Livingstone, New York, 2002. Pages 1081-1116 (level III).
2. Williams Obstetrics. Diabetes, 21st Edition. Cunningham GF, et al (Eds.) Section 12, No. 51, pp. 1359-1382. McGraw-Hill, 2001 (Level III).
3. Davidson, MB. Diabetes Mellitus: Diagnosis and Treatment. Volume 1. John Wiley and Sons, New York. 1981 (Level III).
4. ACOG Practice Bulletin. Gestational diabetes. Number 30, September 2001. Obstet Gynecol. 2001 Sep;98(3):525-38 (Level III).
5. ACOG Practice Bulletin No. 40, November 2002 – Shoulder Dystocia Obstet Gynecol 2002 Nov;100(5 Pt 1):1045-50 (Level III).
6. ACOG Practice Bulletin No. 17, June 2000 – Operative vaginal delivery Obstet Gynecol 2000 June 95, (6) American College of Obstetricians and Gynecologists. Washington, D.C. (Level III).
7. ACOG Practice Bulletin No. 22, November 2000 – Fetal macrosomia Obstet Gynecol 2000 Nov 96, (5) American College of Obstetricians and Gynecologists. Washington, D.C. (Level III).
8. ACOG Practice Bulletin No. 10, November 1999 – Induction of labor. Obstet Gynecol 1999 Nov 94, (5) American College of Obstetricians and Gynecologists. Washington, D.C. (Level III).

Reference Articles

1. Andersen O, Hertel J, Schmolker L, Kuhl C. Influence of the maternal plasma glucose concentration at delivery on the risk of hypoglycaemia in infants of insulin-dependent diabetic mothers. *Acta Paediatr Scand* 1985 Mar;74(2):268-73 (Level III).
2. Bung P, Bung C, Artal R, Khodiguian N, Fallenstein F, Spätling L. Therapeutic exercise for insulin-requiring gestational diabetics: effects on the fetus—results of a randomized prospective longitudinal study. *J Perinat Med* 1993;21:125–137 (Level II-2).
3. Conway DL, Langer O. Elective delivery of infants with macrosomia in diabetic women: reduced shoulder dystocia versus increased cesarean deliveries. *Am J Obstet Gynecol* 1998 May;178(5):922-5 (Level II-2).
4. Curet LB, Izquierdo LA, Gilson GJ, Schneider JM, Perelman R, Converse J. Relative effects of antepartum and intrapartum maternal blood glucose levels on incidence of neonatal hypoglycemia. *J Perinatol* 1997 Mar-Apr;17(2):113-5 (Level III).
5. The Diabetes Prevention Program (DPP) Research Group. The Diabetes Prevention Program (DPP): description of lifestyle intervention. *Diabetes Care* 2002 Dec;25(12):2165-71 (Level III).
6. Dyck RF, Sheppard MS, Cassidy H, Chad K, Tan L, Van Vliet SH. Preventing NIDDM among aboriginal people: is exercise the answer? Description of a pilot project using exercise to prevent gestational diabetes. *Int J Circumpolar Health* 1998;57 Suppl 1:375-8 (Level III).
7. Espey E, Steinhart J, Ogburn T, Qualls C. Depo-provera associated with weight gain in Navajo women. *Contraception* 2000 Aug;62(2):55-8 (Level II-2).
8. Glueck CJ, Wang P, Kobayashi S, Phillips H, Sieve-Smith L. Metformin therapy throughout pregnancy reduces the development of gestational diabetes in women with polycystic ovary syndrome. *Fertil Steril* 2002 Mar;77(3):520-5 (Level II-2).
9. Jovanovic-Peterson L, Durak EP, Peterson CM. Randomized trial of diet versus diet plus cardiovascular conditioning on glucose levels in gestational diabetes. Am J *Obstet Gynecol* 1989;161:415–419 (Level II-1).
10. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care* 2002 Oct;25(10):1862-8 (Level III).
11. Kjos SL, Leung A, Henry OA, Victor MR, Paul RH, Medearis AL. Antepartum surveillance in diabetic pregnancies: predictors of fetal distress in labor. *Am J Obstet Gynecol* 1995 Nov;173(5):1532-9 (Level II-3).
12. Kjos SL, Peters RK, Xiang A, Thomas D, Schaefer U, Buchanan TA. Contraception and the risk of type 2 diabetes mellitus in Latina women with prior gestational diabetes mellitus. *JAMA* 1998 Aug 12;280(6):533-8 (Level II-2).
13. Kjos SL, Schaefer-Graf U, Sardesi S, Peters RK, Buley A, Xiang AH, Bryne JD, Sutherland C, Montoro MN, Buchanan TA. A randomized controlled trial using glycemic plus fetal ultrasound parameters versus glycemic parameters to determine insulin therapy in gestational diabetes with fasting hyperglycemia. *Diabetes Care* 2001 Nov;24(11):1904-10 (Level I).
14. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002 Feb 7;346(6):393-403 (Level I).
15. Langer O, Conway DL, Berkus MD, Xenakis EM, Gonzales O. A comparison of glyburide and insulin in women with gestational diabetes mellitus. *N Engl J Med* 2000 Oct 19;343(16):1134-8 (Level I).
16. Lurie S, Insler V, Hagay ZJ. Induction of labor at 38 to 39 weeks of gestation reduces the incidence of shoulder dystocia in gestational diabetic patients class A2. *Am J Perinatol* 1996 Jul;13(5):293-6 (Level II-2).
17. McFarland MB, Langer O, Conway DL, Berkus MD. Dietary therapy for gestational diabetes: how long is long enough? *Obstet Gynecol* 1999 Jun;93(6):978-82 (Level II-3).
18. Meltzer S, Leiter L, Daneman D, Gerstein HC, Lau D, Ludwig S, Yale JF, Zinman B, Lillie D. 1998 clinical practice guidelines for the management of diabetes in Canada. Canadian Diabetes Association. *CMAJ* 1998;159 Suppl 8:S1-29 (Level III).
19. Naylor CD, Sermer M, Chen E, Sykora K. Cesarean delivery in relation to birth weight and gestational glucose tolerance: pathophysiology or practice style? Toronto Trihospital Gestational Diabetes Investigators. *JAMA* 1996 Apr 17;275(15):1165-70 (Level II-2).
20. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V, Uusitupa M; Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 2001 May 3;344(18):1343-50 (Level I).

Posttest

Case 1: Ms. T.

E. T. is a 28 y/o G3P2 who weighs 220 pounds and who has been diagnosed with GDM at 25 weeks. She has been on diet for over 2 weeks but is not able to keep her blood glucose values in range. Her FBS ranges between 99 and 113 mg/dL and her 2-hour post breakfast values are between 127 and 210 mg/dL. After lunch and after dinner her values are all over 120 mg/dL but no values are >200 mg/dL. You decide with her that insulin will probably be necessary to best manage her care.

Calculate her starting insulin doses using 0.5 units/kg for a twice daily NPH + regular insulin regimen and identify the most appropriate prescription from the choices below (rounding is acceptable):

a) AM: 22 units NPH + 12 units regular; PM: 10 units NPH + 6 units regular
b) AM: 12 units NPH + 6 units regular; PM: 22 units NPH + 10 units regular
c) AM: 12 units NPH + 22 units regular; PM: 6 units NPH + 12 units regular

Case 2: Ms. K.

A K is a 33 y/o G6P4 diagnosed with GDM at 24 weeks. She has had 3 previous macrosomic infants. GDM was diagnosed in her last pregnancy and that infant's delivery was complicated by difficulty delivering the shoulders. On medical nutrition therapy this pregnancy her glucose values have been in fair, but not optimal control. At 32 weeks an ultrasound for fetal growth reports that her fetus has an estimated weight that is >90th percentile and its abdominal circumference is >95th percentile. Her AFI is 25.6 and no fetal anomalies are detected.

Appropriate management at this point might include:

a) reviewing her daily diet log trying to lower her total car bohydrate intake
b) reinforcing her daily exercise regimen
c) beginning low dose insulin therapy
d) all of the above are appropriate

Case 3: Ms. LB.

JLB is a 39 y/o G4P3 who is in labor at 40 weeks gestation. She had been diagnosed with GD at 28 weeks and her sugars have been in fairly good control. She has a history of a prior infant weighing over 9 pounds. Your clinical estimate of the weight of this fetus is at least 4500 g. She has now been complete and pushing with good quality contractions for almost two hours and is getting tired. You are administering oxytocin because not much progress in descent has occurred over the last hour. You feel that the fetal head is in an occiput anterior position at a +2 station with caput. The fetal monitor strip remains reassuring.

The most appropriate management at this point would be:

a) observe her progress with pushing for another hour
b) begin nipple stimulation
c) attempt a vacuum extraction
d) proceed to a cesarean delivery

For CME/CEU Credits

This module is available on line at: *http://www.ihs.gov/MedicalPrograms/MCH/M/DP21.asp#top*

You can fill out the posttest and evaluation available at: *http://www.ihs.gov/MedicalPrograms/MCH/M/DP37.cfm#top*

When you hit SEND, it will go to numurphy@anmc.org. To complete this module now using one of the following two hard copy options listed below, please provide this information:

Name
Profession
Address
Address
City
State
Zip
Phone
Fax
E-mail address

You can fax a copy of your information and the posttest to Neil Murphy, MD at (907) 729-3172, or you can mail a copy to:

Neil Murphy MD
PCC-WH
4320 Diplomacy Drive
Anchorage, Alaska 99508

Sponsorship and Credit

This activity was planned and produced in accordance with the Accreditation Council for Continuing Medical Education's *Standards for Interpreting the Essentials as Applied to Continuing Medical Education Enduring Materials*. The IHS Clinical Support Center is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education for physicians. The IHS Clinical Support Center designates this continuing education activity for up to 2 hours Category 1 Credit toward the Physician's Recognition Award of the American Medical Association. Each physician should claim only those hours of credit that he or she actually spent in the completion of the activity.

The Indian Health Service Clinical Support Center is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center Commission on Accreditation, and designates this activity for 1.2 contact hours for each hour of participation.

The IHS Clinical Support Center adheres to all ACCME standards regarding industry support and attests to the fact that this activity was produced in compliance with the ACCME *Essentials*.

Date of original release:	January 1, 2002
Date of most recent review:	January 1, 2003
Date of expiration:	January 1, 2005

Disclosure

Each contributing author has completed the disclosure process and has affirmed that he or she has no financial interest in or relationships with any manufacturers of commercial products discussed in this module. They have agreed to use generic names or multiple trade names when referring to medications.

Chronic Kidney Disease Series: References and Resources

Andrew S Narva, MD, and Theresa Kuracina, RD, CDE, both of the IHS Kidney Disease Program, Albuquerque, New Mexico

This article lists the references used in the twelve-part series about chronic kidney disease that has been published in successive issues of *The IHS Provider*. A few other resources are also included.

References

1. National Kidney Foundation — Kidney Disease Outcome Quality Initiatives (K/DOQI) clinical practice guidelines for chronic kidney disease: evaluation, classification and stratification. *Am J Kidney Dis*. 2002; 39: S17 - S237 (suppl 1).
2. US Renal Data Systems. USRDS 2002 Annual Data Report: Atlas of End-Stage Renal Disease in the United States National Institutes of Health, National Diabetes and Digestive Kidney Disease, Bethesda, MD, 2002.
3. Cockcroft DW, Gault MH. Prediction of creatinine clearance from serum creatinine. *Nephron.* 1976; 16:31-41.
4. Levey AS, Bosch JP, Breyer Lewis J, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. *Ann Intern Med.* 1999; 130: 461- 470.
5. Pamar MS. Chronic renal disease. *BMJ*. 2002; 325:85-90.
6. Bakris GL, Williams M, Dworkin L et al. Preserving renal function in adults with hypertension and diabetes: a consensus approach. *Am J Kidney Dis*. 2000; 36: 646-661.
7. US Department of Health and Human Services, National Institutes of Health, National High Blood Pressure Education Program. The sixth report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure.1997. NIH publication No. 98-4080.
8. National Kidney Foundation - Kidney Disease Outcomes Quality Initiatives (K/DOQI) Clinical practice guidelines for nutrition in chronic renal failure. *Am J Kidney Dis.* 2000; 35: S1-S140 (suppl 2).
9. American Dietetic Association. Renal Practice Group - National Renal Diet Professional Guide (2nd ed). 2002: 2.
10. National Kidney Foundation - Dialysis Outcomes Quality Initiative (DOQI) clinical practice guidelines for anemia of chronic renal failure. *Am J Kidney Dis.* 2001; 37: S182-S219 (suppl 1).
11. National Kidney Foundation - Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines for managing dyslipidemia in chronic kidney disease. *Am J Kidney Dis.* 2003; 41: S1 - S91 (suppl 3).
12. National Kidney Foundation - Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines bone metabolism and disease in chronic kidney disease. (*Draft*). 2003; 5 – 195.
13. Bolton WK. Renal physicians association clinical practice guideline: appropriate patient preparation for renal replacement therapy: guideline number 3. *J Am Soc Nephrol.* 2003; 14: 1406-1410.
14. *www.dartmouth.edu/~coopproj/more_charts.html*.
15. *www.sf36.com/demos/SF-36v2.html*.
16. Narva AS. Spectrum of kidney disease in American Indians. *Kidney International. 2003;* 63: S3-S7.
17. Narva A. Caring for the patient with progressive renal disease. In: Galloway, JM, Goldberg, BW, Alpert, JS, eds. *Primary Care of Native American Patients.* Boston: Butterworth-Heinemann; 1999: 183-189.
18. Kuracina T, Narva A. Nutrition and kidney disease workshop: increasing knowledge and skills among nutrition professionals who serve American Indians/Alaska Natives. *Journal of Renal Nutrition* 1997; 7: 212-215.

Other Resources

www.aakp.org	American Association of Kidney Patients
www.dialysisfinder.com	Dialysis Unit Finder
www.hdcn.com	Hypertension, Dialysis and Clinical Nephrology
www.kidney.org	National Kidney Foundation
www.kidney.org/profesionals/doqi/index/cfm	K/DOQI guidelines
http://kidneyschool.org	Kidney School
www.lifeoptions.org	Life Options Rehabilitation and Advisory Council
www.nat.uiuc.edu/mainnat.html	Nutritional Analysis Tool 2.0
www.niddk.gov	National Institute of Diabetes, Digestive and Kidney Disorders
www.nephron.org	Nephron Information Center
www.renaladvances.com	Amgen
www.renalmd.org/publications.index.cfm	Renal Physician's Association
www.renalweb.com	Renalweb
www.unos.org	United Network for Organ Sharing
www.usrds.org	United Stated Renal Data Systems

CDC Pediatric Growth Charts Website

The Centers for Disease Control and Prevention (CDC) has recently revised the Pediatric Growth Chart Website to include growth charts in Spanish and French, Frequently Asked Questions, a new entry page for the interactive web-based training modules, a revised PowerPoint presentation, and a link to WIC-specific growth charts (for ages 2 to 5 years). All growth charts and related material can be accessed at *www.cdc.gov/growthcharts/*.

Interactive web-based training modules are aimed at pediatric health care professionals, including nutritionists, dietitians, nurses, and pediatricians, to provide training to develop expertise in using and interpreting the 2000 growth charts. Module topics include an Overview of the CDC Growth Charts, Using the BMI-for-age Growth Charts, and Overweight Children and Adolescents: Recommendations to Screen, Assess, and Manage. Other growth chart-related modules developed by the Health Resources Services Administration's Maternal and Child Health Bureau can also be accessed at the site. Please visit the website to access these materials.

Virtual Geriatric Institute Available

The New Mexico Geriatric Education Center presented their fourth Summer Geriatric Institute June 19-21, 2003, as part of an ongoing series of annual interdisciplinary workshops covering the essentials of geriatric practice. The Institute is intended to build over the next four years on the geriatric knowledge and skills presented, yielding a comprehensive approach to the health care of the elderly with an emphasis on American Indian elderly.

We will be presenting our second 'Virtual' Geriatric Institute from videotaped recordings of the general sessions. It will be on our website after August 25th. You can register on the site. *Tuition waivers are available from the IHS Elder Care Initiative and the NMGEC for IHS/tribal providers – e-mail us for approval.*

The 'Virtual' Institute, the theme of which is Dementia, Depression and Delirium, will include the following areas: Diagnosis, Assessment, Management, Pharmacology, Cultural Considerations, Family/Informal Caregiver Issues, and Program/Policy Concerns.

Continuing education credits are offered by the UNM Office of Continuing Medical Education for physicians (14 category 1 credits), nurses (17.1 contact hours), occupational therapy, and physical therapy.

If you interested, please contact:

Darlene A. Franklin, Associate Director
New Mexico Geriatric Education Center
University of New Mexico Health Sciences Center
E-mail: *dfranklin@salud.unm.edu*
Telephone (505) 272-4934

The New, Improved Perinatology Corner

Neil J. Murphy, MD, OB/GYN Chief Clinical Consultant, IHS, Southcentral Foundation, Women's Health Service, Alaska Native Medical Center, Anchorage, Alaska

Last year the *IHS Provider* introduced the Perinatology Corner (PNC), and since then, many providers have taken advantage of its great attributes. The PNC modules are online, case based continuing education modules for family physicians, obstetricians and gynecologists, advanced practice nurses, midwives, and nurses who care for pregnant women.

The PNC modules are the result of collaboration between George Gilson, MD, and Neil Murphy, MD. The clinical content is provided primarily by Dr. Gilson, who is a Maternal Fetal Medicine specialist at Alaska Native Medical Center. The web based materials, patient education materials, paper based materials, and clinical content are coordinated by Dr. Murphy, OB/GYN IHS Chief Clinical Consultant.

The new PNC modules also include collaboration with various Indian Health subject matter experts. The Diabetes in Pregnancy module included in this issue was produced with the help of N. Burton Attico, MD, former Maternal Health Consultant, Phoenix Indian Medical Center, who has recently retired after more than 40 years of service.

The PNC modules have just been made even better. Four new modules have now been released, and two additional modules are on the way. These modules are great sources of continuing education credit for physicians and nurses, but can also be used as great clinical "best practice" resources, with all the web surfing and reference research already done for you and incorporated into the text as links.

You can find the main PNC menu at *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/MCHpericrnr.asp*.

The PNC modules are:

- Case based
- Free CEU or CME credit
- ACOG/IHS Reference Text links (a.k.a. Denver Postgraduate Course Text)
- Best Practice material from ACOG, AHRQ, USPSTF, March of Dimes, National Guidelines Clearinghouse, PubMed, American Diabetes Association, and patient education resources
- Linked to online clinical material, as well as IHS proprietary online material for Indian Health, tribal and urban (ITU) users (e.g., Cochrane, UpToDate)
- Linked to paper based reference citations (e.g., Williams, Gabbe)

The NEW modules now have the following improvements:

- Recommendations are graded by strength of evidence
- References are graded by USPSTF system
- Instant references; hyperlinks for references are embedded in the text, and these links utilize PubMed abstracts or full text article when available
- American Indian/Alaska Native-specific references provided
- Expanded clinical content
- Expanded Implications for Practice from Cochrane Library
- Increased CME/CEU credits
- Frequently asked questions
- Improved Posttest

Recent modules

Diabetes in Pregnancy, Part 1: Screening and diagnosis *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/DP01.asp#top*.

Diabetes in Pregnancy, Part 2: Management and postpartum *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/DP21.asp#top*.

Group B Streptococcal disease in the perinatal period *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/DP41.asp#top*.

Post term pregnancy and induction of labor *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/DP61.asp#top*.

The Process is Simple

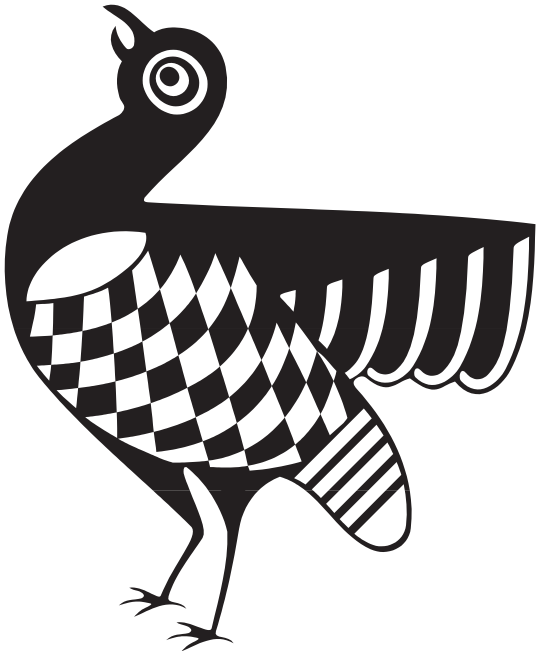
1. Read the materials provided, which include:
   - Objectives
   - Case-based scenarios
   - Background material
   - Links to on-line references
   - Paper-based references
2. Complete the Posttest, developed around case-based scenarios, and the evaluation.
3. Get feedback from Neil Murphy, MD, and George Gilson, MD.
4. Receive physician or nursing credit per module (the IHS Clinical Support Center is the accredited sponsor). Actual credits per module are noted on Perinatologist Corner main page

You can go directly to the Perinatology Corner main page at: *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/M/MCHpericrnr.asp*.

If you prefer to navigate to this site, these CME offerings are available through the IHS website, *http://www.ihs.gov*. The Maternal Child Health webpage can be found on the Medical Programs page: *http://www.ihs.gov/MedicalPrograms/Medical_index.asp*.

You will find a link to the Perinatology Corner on the Maternal Child Health main page at: *http://www.ihs.gov/MedicalPrograms/MaternalChildHealth/MaternalChild.asp*, which has many other great resources.

Category 1 CME credit is awarded by the IHS Clinical Support Center after completion of each case-based clinical module. The process can be completed on-line, or the questions can be downloaded and faxed to Neil Murphy, MD at (907) 729-3172. The answer sheet can also be mailed to Neil Murphy, MD at 4320 Diplomacy Drive, PCC-WH, Anchorage, AK 99508. If you have any questions, feel free to contact Dr. Murphy at (907) 729-3154 (voice-mail available); or e-mail him at *nmurphy@anmc.org* or Dr. Gilson at *gjgilson@anmc.org*.



Change of Address or Request for New Subscription Form

Name _____ **Job Title** _____

Address _____

City/State/Zip _____

Worksite: ☐ IHS ☐ Tribal ☐ Urban Indian ☐ Other

Service Unit (if applicable) _____ **Social Security Number** _____

Check one: ☐ New Subscription ☐ Change of address

If change of address, please include old address, below, or attach address label.

Old Address _____

THE IHS PRIMARY CARE PROVIDER

A journal for health professionals working with American Indians and Alaska Natives

THE IHS PROVIDER is published monthly by the Indian Health Service Clinical Support Center (CSC). Telephone: (602) 364-7777; fax: (602) 364-7788; e-mail: *the.provider@phx.ihs.gov.* Previous issues of THE PROVIDER (beginning with the December 1994 issue) can be found on the CSC Internet home page *(www.csc.ihs.gov).*

Circulation: The PROVIDER (ISSN 1063-4398) is distributed to more than 6,000 health care providers working for the IHS and tribal health programs, to medical schools throughout the country, and to health professionals working with or interested in American Indian and Alaska Native health care. If you would like to receive a copy, send your name, address, professional title, and place of employment to the address listed below.

Publication of articles: Manuscripts, comments, and letters to the editor are welcome. Items submitted for publication should be no longer than 3000 words in length, typed, double-spaced, and conform to manuscript standards. PC-compatible word processor files are preferred. Manuscripts may be received via e-mail.

Authors should submit at least one hard copy with each electronic copy. References should be included. All manuscripts are subject to editorial and peer review. Responsibility for obtaining permission from appropriate tribal authorities and Area Publications Committees to publish manuscripts rests with the author. For those who would like more information, a packet entitled "Information for Authors" is available by contacting the CSC at the address below or on our website at *www.csc.ihs.gov.*

Dept. of Health and Human Services
Indian Health Service
Clinical Support Center
Two Renaissance Square, Suite 780
40 North Central Avenue
Phoenix, Arizona 85004

PRESORTED STANDARD
POSTAGE AND FEES PAID
U.S. DEPT. OF HEALTH & HUMAN SERVICE
PERMIT NO. 5691

CHANGE SERVICE REQUESTED

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300