# Nurse Practitioner Patterns of Screening for Diabetic Complications

By

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Nurse Practitioner Patterns of Screening for Diabetic Complications

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Abstract

Title: Nurse Practitioner Patterns of Screening for Diabetic Complications

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In 1989 the American Diabetes Association (ADA) published the Standards of Medical Care for Patients with Diabetes. The publication was an attempt to establish uniform standards for the primary care of patients with diabetes. In the years since the publication of the ADA standards there has been little health care provider awareness of the standards. The literature continues to document that patients with diabetes still receive suboptimal medical care. In 1997 the Oregon Health Division published the Population-Based Guidelines for Diabetes Mellitus. The guidelines provide a standardized means to measure the quality of health care provided to diabetics. The guidelines also provide a strategic focus for office-based care by prioritizing the interventions which provide the greatest epidemiologic impact on overall diabetes morbidity and mortality. In keeping with the outpatient primary care provider approach, the recommendations within the Oregon guidelines are cost-effective, less invasive, and less technology-intensive.

This is a descriptive study of nurse practitioner (NP) alignment with the 1997 Oregon Population-Based Guidelines for Diabetes and provides a baseline for quality

improvement measures. All eligible NPs in Lane County, Oregon, who provide primary care to adults with diabetes were invited to participate. Data were collected via a random chart audit spanning a one year period using a tool developed to target activities recommended by the Population-Based Guidelines for Diabetes Mellitus. The tool includes the 12 categories of care addressed by the guidelines and is specific to type 1 and type 2 diabetes mellitus. The tool was piloted prior to data collection to ensure that it captured the relevant information and to increase efficiency with the audit process. Interrater reliability (93%) was established by independent audits of the same charts. Demographic data were collected by a brief self-administered questionnaire.

Data were analyzed using descriptive statistics to summarize the frequencies with which screening activities were performed and the degree to which the recommended guidelines were met. The area in which NPs demonstrated the best alignment with the guidelines is blood pressure screening (95%). Good NP alignment was observed in the areas of annual and semiannual $HbA_{1c}$ levels (82%). NPs demonstrated the lowest level of alignment in the areas of oral/dental screening (14%) and visual foot inspection (9%). Activities performed less than 70% were considered to be in need of improvement. Areas in need of improvement included patient education, eye examination, foot screening, early nephropathy detection, lipid screening, tobacco use assessment, aspirin prophylaxis, oral/dental screening, immunizations, and preconception counseling.

Recommendations for improved screening of diabetic complications include the development of a collaborative effort to enhance alignment with the guidelines. This effort should be comprehensive and consist of continuing education that will increase familiarity with the guidelines and rationale for the recommended activities; the use of a standardized chart tool that tracks management and screening activities; and periodic peer review and consultation designed to promote quality improvement.

# CHAPTER 1

## Introduction

### Problem Statement

In 1993 there were approximately 7.8 million diagnosed cases of diabetes in the United States (National Institute of Diabetes and Digestive and Kidney Diseases (NIDDKD), 1995). In addition to the diagnosed cases, there are probably 7 million undiagnosed cases of diabetes in the U.S. (NIDDKD). Approximately 600,000 new cases of diabetes are reported in the United States each year. Among the population aged 65 and older, 9% have been diagnosed with diabetes, and another 10% in this age group may have diabetes which has not yet been diagnosed (Levetan and Ratner, 1995). Diabetes, with its complications, is the third leading cause of death by disease in the United States (Kerr, 1995). Diabetes is the seventh leading cause of visits to a primary care physician, and of the top 10 reasons for visits, it is the one that has the most significant impact on community mortality rates (Kerr). Diabetes is one of the most complicated disease managed in primary care. The Oregon Center for Disease Prevention and Epidemiology estimated that 150,000 people in Oregon (5% of the population) have diabetes [Oregon Health Division (OHD), 1995].

The complications related to diabetes exact a great cost in morbidity, mortality, and financial expense. Diabetes accounts for nearly 15% of all national health care expenditures (OHD, 1995). The financial and medical burden of diabetes among the Medicare population alone is substantial, with close to $30 billion spent annually, or

27% of the entire Medicare budget (Levetan and Ratner, 1995). People with diabetes incur health-care costs more than four times greater than those without diabetes, ultimately accounting for nearly 15% of the entire U.S. health-care budget. The per capita health-care expenditures were estimated to be $9500 for each diabetic patient compared to $2600 for patients without diabetes; the difference stems from a five-fold increase in hospitalization (Levetan and Ratner). Costs escalate as a result of diabetic complications of which many are preventable.

Prevention and early detection, accompanied by prompt intervention, can greatly reduce the devastating impact of diabetes. Complications of diabetes including blindness, end-stage renal disease, neuropathy, heart disease, stroke and lower extremity amputations are preventable, or at least can be delayed with good diabetic medical care (OHD, 1997c; Diabetes Control and Complications Trial Research Group (DCCT), 1993). The efficacy of specific routine screening procedures for complications of diabetes have been demonstrated yet most people with diabetes do not receive the recommended care (Center for Disease Prevention & Epidemiology, 1995). In 1989 the American Diabetes Association (ADA) published the position statement, "Standards of Medical Care for Patients with Diabetes Mellitus," in an attempt to establish uniform standards for the primary outpatient care of diabetic patients. In the years since the publication of the ADA standards there has been little physician awareness of them and no published evidence of any impact on physician practice or diabetes mortality (Kerr, 1995). Consequently, diabetes remains

the leading cause of blindness, lower extremity amputations, and kidney disease requiring dialysis (Levetan and Ratner, 1995).

In response to this problem, the Oregon Health Division has developed the Population-Based Guidelines for Diabetes Mellitus (1997b). The guidelines were developed through a collaborative effort of 36 clinicians, educators, managed care plan administrators, epidemiologists, and people with diabetes. The guidelines are largely based on the results of clinical trials which have demonstrated an effect on the development or progression of specific diabetes complications (1997). The guidelines were released in provisional form in October 1995. After review of comments, literature reviews, and review by an expanded advisory group, the provisional guidelines were amended and the 1997 Population-Based Guidelines for Diabetes Mellitus were published. The guidelines provide recommendations for routine screening of diabetic complications, that if implemented, would substantially reduce the morbidity, mortality, and financial expense associated with complications of diabetes (Funnell & Haas, 1995).

Although care for diabetes must be individualized, the guidelines include procedures that help minimize the risk of diabetes complications and apply to all, or almost all, patients with diabetes. The population-based guidelines are not meant to be clinical practice guidelines; they do not define the full range of care necessary to treat patients with diabetes. The guidelines are at minimum a set of procedures designed to be widely applicable and, more importantly, to be measurable on a

population basis (OHD, 1997c). The guidelines will be used to evaluate the quality of care delivered to diabetic populations.

## Significance to Nursing

Nurse practitioners (NPs) who provide primary care to persons with diabetes will be expected to align their practice behaviors with those outlined by the guidelines. Because there is considerable variation in practice patterns from one geographic area to the next (Weiner, Parente, Garnick, Fowles, Lawthers, and Palmer,1995), it is important that measures to improve diabetic care be tailored to fit the specific need of the local providers.

The purpose of this study is to identify the practice patterns of NPs in Lane County who provide care to persons with diabetes. The hope is that the final report will be used as a springboard for discussion, prioritization, and collaborative planning by the local NPs who provide diabetic care. Thus, improve outcomes for persons with diabetes in Lane County and at the same time serve as a model for other providers.

# CHAPTER II

## Review of Related Literature

The discussion of the review of literature is divided into two sections. The first review will establish the scientific rationale for each of the specific aspects of preventive care recommended by the Population-Based Guidelines for Diabetes Mellitus, thereby giving credence to the use of the guidelines as an indicator of optimal diabetic care. The second section of the review will establish the rationale for the method chosen to research NP practice patterns.

### Clinical Guidelines

Prior to 1993 the most important question for clinicians caring for diabetic patients was whether the risk of complications could be altered by careful control of glycemia. In 1993, the debate was settled with the publication of the Diabetes Complication and Control Trial (DCCT). This landmark study was a randomized, multicenter (29 sites across North America), controlled clinical trial that examined whether intensive treatment of type I diabetes, with the goal of maintaining blood glucose concentrations close to the normal range, could decrease the frequency and severity of diabetic microvascular and neurologic complications (Skyler, 1996). The results showed unequivocally that intensive therapy effectively delays the onset and slows the progression of diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy in patients with type 1 diabetes (Skyler). Although the DCCT was specific

to type 1 diabetes, the ADA has subscribed to extending the findings of the DCCT to type 2 diabetes (1993b, 1994).

In the DCCT two groups of patients were followed long term, one treated conventionally (standard treatment group) and another treated intensively (intensive treatment group). The goal for the standard treatment group was clinical well-being while the goal for the intensive treatment group was normalization of blood glucose. Over the study period, which averaged seven years, there was a statistically and clinically significant reduction in risk between the intensive treatment group and the standard treatment group in diabetic retinopathy, nephropathy, and neuropathy (American Diabetes Association, 1993b). In the intensive treatment group diabetic retinopathy was reduced by 70.3%, nephropathy was reduced by 60%, and neuropathy was reduced by 64% (Skyler, 1996). The benefit of intensive therapy was seen in all categories of subjects regardless of age, sex, or duration of diabetes (DCCT, 1993).

It is important to note that the findings of the DCCT are limited to type 1 diabetics ages 13 to 39 years. The reduction of retinopathy, nephropathy, and neuropathy documented in the study is due to the delay of microvascular complications in the type I diabetic. The study did not show a significant change in macrovascular disease, which is more closely associated with the type 2 diabetic complications. Of the two major forms of diabetes, type 2 diabetes is far more common; it accounts for 80% to 90% of those diagnosed with diabetes (Henry,

1996). For the primary care practitioner, more than 90% of their patients with diabetes have type 2 and are in the over-40 age group (Fore, 1995). This difference between the DCCT sample population and the typical clinical practice population raises some important questions concerning the application of the findings from the DCCT to all patients with diabetes.

The major difference between type 1 and type 2 diabetes with regard to long-term complications lies not in the diabetes-specific complications of retinopathy, nephropathy, and neuropathy, but in the less specific macrovascular complications. The hyperglycemia of type 2 diabetes is often associated with other metabolic abnormalities such as obesity, hyperinsulinemia, hypertension, dyslipidemia, and impaired fibrinolysis, all of which favor the development of diabetic complications and premature cardiovascular disease (Henry, 1996; Nathan, 1995). The DCCT recommends the maintenance of tight glycemic control in type 1 diabetes. The problem with applying this concept to type 2 diabetes is these patients tend to require insulin therapy, usually in large doses, if the goal of near-normal glycemia is to be achieved. Large doses of exogenous insulin are associated with hyperinsulinemia and weight gain, both of which correlate with an increased incidence of cardiovascular complications (Henry, 1996). A concern with intensive treatment in type 2 diabetes is the potential for the treatment to cause or exacerbate underlying cardiovascular disease. The prevalence of cardiovascular disease is considerably higher in patients with type 2 diabetes than in those with type 1 diabetes. Since the consequences of

even a slight increase in cardiovascular disease are profound, any suggestion of increased risk associated with intensive therapy weighs heavily against its implementation.

The Veterans Affairs cooperative study explored the feasibly of using intensive insulin therapy in 153 male type 2 diabetics (Colwell, 1996). Although a 2% lowering of $HbA_{1c}$ was seen, the patients receiving intensive therapy had about a two-fold increase in major cardiovascular events, including myocardial infarction, congestive heart failure, cerebrovascular accident, amputation, or cardiovascular death, compared with patients who received standard therapy during the 27 months of the study (Nathan, 1995).

Because of the similarity in microvascular complications between type 1 and type 2 diabetes, it is likely that intensive therapy will have a similar impact on the microvascular and neurological complications of diabetes in patients with type 2 diabetes. However, because of the differences between the two types of diabetes, the side effects of the intensive therapy necessary to achieve normoglycemia in patients with type 2 diabetes are unknown. The increased weight gain and possible increased risk for cardiovascular events must be factored into any decision to implement intensive insulin therapy in type 2 diabetes. A long term multicenter collaborative trial is needed to assess the benefit/risk ratio of intensive therapy for the type 2 diabetic patients in whom pharmacological therapy failed to provide glycemic management (Colwell, 1996).

R. Henry (1996) addressed the concern over the use of exogenous insulin to treat type 2 diabetes by explaining that after a period of intensive insulin management with improved glycemic control, basal hepatic glucose production rates are reduced to those seen in nondiabetic patients, and peripheral insulin action is improved. Hyperinsulinemia and weight gain frequently accompany intensive insulin management, but their severity may be attenuated by combining insulin therapy with maximal doses of oral hypoglycemic agents, particularly when insulin is given in the evening. If intensive insulin management is implemented in type 2 diabetes, special attention should be given to achieving the best glycemic control with the lowest dose of insulin.

While the DCCT Research Group declined to advise implementation of intensive therapy in type 2 diabetes, the ADA took the position that, " ... there is no reason to believe that the effects of better control of blood glucose levels would not apply to people with type 2 diabetes." (1993b). This statement was qualified by the explanation that intensive management is inappropriate in the case of the patient being unable or unwilling to comply with the prescribed treatment regime, the risk for or from hypoglycemia is excessive, or concomitant diseases are present which would adversely influence the risk/benefit ratio or substantially shorten life expectancy. Examples of such patients include the very old or those with significant dementia, malignancies not responsive to various therapies, renal failure; those with advanced cardiovascular disease manifested by stroke, multiple myocardial infarctions, severe

congestive heart failure, or major amputations; and those with hypoglycemic unawareness due to autonomic neuropathy (ADA 1993b; Henry and Genuth, 1996; NIDDKD, 1995).

Although tight control is warranted, there is no favored form of treatment to achieve tight control of blood glucose levels. The method chosen should be tailored to fit the preference of the patient and the ability of the health-care team to provide the necessary resources and support. For the type 1 diabetic the options available are multiple daily injections of insulin versus an insulin pump. In type 2 diabetes, diet, exercise, and oral drugs may achieve tight control, but insulin is often required (ADA, 1993b). The focus of intensive management of type 1 diabetes is the prevention of microvascular disease and its associated complications through tight glycemic control. Intensive management of type 2 diabetes must focus not only on the prevention of microvascular disease, but must implement measures to prevent macrovascular disease as well. Current recommended methods for reducing blood glucose levels in type 2 diabetes include diet therapy, exercise therapy, sulfonylurea, acarbose, metformin, troglitazone, and insulin therapy. These methods are typically applied in a stepwise or combination approach. Methods for reducing cardiovascular risk factors include diet therapy, exercise therapy, aspirin prophylaxis, antihypertensive agents, lipid-lowering agents, and smoking cessation programs (Clark and Vinicor, 1996).

Hypertension

Hypertension contributes to the development and progression of chronic complications of diabetes. Isolated systolic hypertension may occur with long duration of either type of diabetes and is, in part, due to inelasticity of atherosclerotic large vessels (ADA, 1994). In patients with type 2 diabetes, hypertension often is part of a syndrome that also includes glucose intolerance, insulin resistance, obesity, dyslipidemia, and coronary artery disease. Control of hypertension has been demonstrated to reduce the rate of progression of diabetic nephropathy and reduce the complications of hypertensive nephropathy, cerebrovascular disease, and cardiovascular disease (ADA). Hypertension traditionally has been defined as a systolic blood pressure $\geq$140 mmHg and/or a diastolic blood pressure of $\geq$90 mmHg. In the general population, the risks for end-organ damage are lowest when the systolic blood pressure is $<$120 mmHg and the diastolic is $<$ 80 mmHg. Most epidemiological studies have suggested that risk due to elevated blood pressure is a continuous function, so these cutoff levels are arbitrary (ADA). The ADA (1994) has established the primary goal of therapy for diabetic adults be to decrease blood pressure to $<$130/85 mmHg. The Sixth Report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (1997) recommends initiation of drug therapy to treat hypertension for blood pressures of 130-139/85-89. The report of the 32nd Annual Meeting of the European Association for the Study of Diabetes emphasized the importance of treatment of even a mild elevation in blood

pressure, reduction and/or treatment of associated risk factors, and the use of aspirin prophylaxis for all diabetic patients with cardiovascular disease (Bloomgarden, 1997).

Dyslipidemia

Persons with type 2 diabetes tend to have an abnormal concentration of lipoproteins. At age 20-74 years, mean total cholesterol concentration is higher in person with type 2 diabetes, compared with persons with normal glucose tolerance (NIDDKD, 1995). A common abnormal lipid pattern in diabetic patients is an elevation of very-low-density lipoprotein (VLDL), a reduction in high-density lipoprotein (HDL), and a low-density lipoprotein (LDL) fraction that contains a greater proportion of small, dense atherogenic LDL particles (ADA, 1994). The small dense LDL particles are, in part, determined by the higher triglyceride levels among diabetic patients and may also have a familial genetic component (ADA, 1993a). Decreases in triglyceride levels through weight loss lead to a reduction in the prevalence of dense LDL particles.

Diabetes increases the risk for atherosclerotic vascular disease. This risk is greatest in persons who have other known risk factors such as dyslipidemia hypertension, smoking and obesity (ADA, 1994). Typically premenopausal women have a reduced risk of coronary heart disease when compared with men of the same age. Diabetes largely, if not completely, obliterates this cardioprotective effect (ADA, 1993a). Therefore, all adults with diabetes should be monitored and provided aggressive therapy for the prevention of cardiovascular disease.

Lipid abnormalities often characterize poorly controlled diabetic patients. Hypertriglyceridemia, hypercholesterolemia, and low HDL cholesterol levels may greatly improve with aggressive treatment of hyperglycemia. Therefore, the first approach to hyperlipidemia in the diabetic patient should be optimization of diabetes control with diet, exercise, and, when indicated, oral antihyperglycemic agents and/or insulin (ADA, 1993a). However, people with diabetes who have triglyceride levels >1000 mg/dL are at risk of pancreatitis and other manifestations of the hyperchylomicronemic syndrome (excess accumulation of serum fat particles, chylomicrons) (ADA, 1993a). These individuals need special, immediate attention and the generalist may consider consultation or referral.

Given the increased prevalence of macrovascular disease in patients with diabetes, it is reasonable to suggest that diabetic patients would benefit from risk factor amelioration. The 1993 ADA consensus statement, "Detection and Management of Lipid disorders in Diabetes" recommends that all adult patients with diabetes be tested for lipid disorders annually with a fasting serum cholesterol, triglyceride, HDL cholesterol and calculated LDL cholesterol. In this regard, Population-Based Guidelines for Diabetes Mellitus are in alignment with the ADA recommendations. However, not included in the Oregon guidelines is the ADA recommendation of a serum TSH measurement to rule out hypothyroidism if the cholesterol and LDL values are elevated, a not uncommon disorder in patients with diabetes (ADA, 1993a).

Renal Function

The patient with abnormal renal function is at risk for end stage renal disease and cardiovascular disease and requires heightened attention of control of other risk factors (ADA, 1994). Persistent albuminuria in the 30-300 mg/24 hour range, known as microalbuminuria, has been shown to be the earliest stage of diabetic nephropathy. Patients with microalbuminuria will likely progress to clinical albuminuria (>300mg/24 hours) with decreasing glomerular filtration rate over a period of years. Once clinical albuminuria occurs, the risk for end stage renal disease is high in type 1 diabetes and significant in type 2. Hypertension usually develops during the stages of microabluminuria or clinical albuminuria and, if untreated, can hasten the progression of renal disease. Treatment of hypertensive type 2 diabetic patients who have microalbuminuria or clinical albuminuria with Angiotensin Converting Enzyme Inhibitors (ACEI) has been shown to delay progression from microalbuminuria to clinical albuminuria and to slow the decline in glomerular filtration rate in patients with clinical albuminuria (ADA). Data suggests that normotensive patients with albuminuria may also benefit from ACEIs (ADA).

Periodontal Disease

The Centers for Disease Control and Prevention has recognized periodontal disease as a complication of diabetes (Betschart & Betschart, 1997). Similar to other diabetes complications, the more frequent and more advanced periodontal disease states are found in patients with a longer duration of diabetes. Periodontal

breakdown has been associated with other complications of diabetes, including retinopathy and neuropathy.

There are reports in the literature that periodontal treatment could reduce the insulin requirements of patients with diabetes (Betschart & Betschart, 1997). In studies involving nonsurgical treatment and advanced peridontitis, investigators were able to demonstrate a marked improvement in metabolic control in about half of the participants with diabetes by controlling the periodontal inflammation (Betschart & Betschart). The periodontal status of individuals with poorly controlled type 1 diabetes was compared with that of individuals with well-controlled type 1 diabetes. All participants received appropriate periodontal treatment and maintained similar plaque control. $HbA_{1c}$ and mean blood glucose levels were used to assess glycemic control. The poorly controlled group had more gingivitis and periodontal breakdown than did the well-controlled group (Betschart & Betschart).

Irrespective of the type of diabetes, poor metabolic control and long duration of diabetes show the strongest association with the incidence, prevalence, and severity of periodontal disease. People with diabetes must maintain good oral hygiene practices, professional periodontal therapy, and good metabolic control to improve periodontal status (Betschart & Betschart, 1997).

Preconception Counseling

Because of the significant metabolic changes during pregnancy, the management of the pregnant diabetic patient differs from that of the nonpregnant

patient (DiPiro, Talbert, Yee, Matzke, Wells, & Posey, 1997). The diabetic mother faces an increased risk of ketoacidosis and hypoglycemia as well as acceleration of microvascular complications involving the kidneys, eyes, and nervous system, particularly if hypertension is present (ADA, 1989). The infant of a diabetic mother has an increased risk of death, prematurity, and morbidity (ADA, 1989). Prevention of these complications require that the patient be normoglycemic before conception and during the first trimester, because the congenital malformations associated with diabetes seem to be related to poor control during the first eight weeks of gestation (DiPiro, et al., 1997). For this reason, treatment of the diabetic patient must begin before gestation. Therefore any regular visit to the care provider by a reproductive-age woman should be considered a preconception visit (ADA, 1988). Pregnancy should be planned so that conception occurs when the patient has normal fasting, preprandial, and postprandial plasma glucose levels. After conception, treatment should not only continue to achieve proper control of glycemia, but also meet the nutritional requirements of the fetus (ADA, 1988).

Oral hypoglycemic agents are contraindicated during pregnancy because they cross the placenta and stimulate the fetal pancreas and can produce fetal and neonatal hypoglycemia (DiPiro, et al.). They may also cause some teratogenic effects and do not appear to have any advantage in the control of blood sugar in the pregnant patient over insulin. Therefore, oral hypoglycemic agents should be discontinued before conception and insulin therapy initiated.

Immunization

Immuniologic research had demonstrated several defects in host immune defense mechanism in diabetic subjects. Phagocytic capabilities of polymorphoneclear leukocytes (PMN) are believed to be adversely affected by hyperglycemia. Several PMN defects occur in diabetic subjects, including impaired migration, phagocytosis, intracellular killing, and chemotaxis (NIDDKD, 1995). Generalized defects such as these indicate the diabetic patient may be at an overall increased risk for infection.

Other complications of diabetes increase the patient's risk of untoward sequelae associated with some infections. Diabetes mellitus often is associated with cardiovascular and renal dysfunction, which increase the risk of severe pneumococcal illness. In a case-control study of male veterans, diabetics were 15.8-25.6 more likely to be hospitalized for pneumonia during the influenza season (NIDDKD, 1995). In a Wisconsin prospective population-based study subjects who had diabetes diagnosed at age ≥30 years were 1.7 times more likely to die from influenza and pneumonia over an average follow-up period of 8.5 years (NIDDKD).

The Advisory Committee on Immunization Practices (ACIP, 1997) recommends that all persons aged 2-64 years who are at increased risk for complications related to pneumococcal disease, if they become infected, should be vaccinated. Persons at increased risk for severe disease include those with chronic illness such as diabetes mellitus. Most persons considered at risk for pneumococcal infection also should

receive annual influenza vaccinations (ACIP). The pneumococcal vaccine should be administered every five years, and may be administered at the same time as influenza vaccine (ACIP).

Foot Inspection and Assessment

Diabetics have an approximate 15-fold higher rate of lower extremity amputation than nondiabetics (NIDDKD, 1995). More than half of lower limb amputations in the U.S. occur in diabetics, who represent approximately 3% of the U.S. population (NIDDKD). Approximately 59% of diabetes related amputations are preceded by an infected foot ulcer (NIDDKD). Multiple factors contribute to the development of infected foot ulcers in diabetics. Generalized impairments of immunity and other nonimmuniologic factors contribute to an increased infection risk in person with diabetes. Macrovascular and microvascular disease may result in decreased local circulation leading to delayed response to infection and impaired wound healing (NIDDKD, 1995). Unawareness of lower extremity trauma due to sensory neuropathy may result in inadequate attention to minor wounds and subsequent increased infection risk (NIDDKD, 1995).

The Population-Based Guidelines for Diabetes Mellitus address the risk of lower extremity amputations. The guidelines recommend every diabetic patient receive a brief visual inspection of the feet at every routine visit. Also, every patient should receive an annual foot examination that includes an assessment of risk factors for foot complications and categorization into a risk category. The guidelines also

recommend reassessment of metabolic control and reeducation about proper foot care accompany the annual foot examination.

Tobacco Cessation

Debra Haire-Joshu (1997) succinctly summarizes the multifactorial consequences associated with diabetes and tobacco use:

> The negative sequelae of smoking are heightened among people with diabetes. The combined cardiovascular risks of smoking and diabetes are as high as 14 times those of either smoking or diabetes alone. Diabetes has been found to increase the risk of hyperlipidemia and hypertension. The acceleration of macrovascular and microvascular disease present in diabetes is heightened by the vasoconstrictive effects of smoking, increasing the risk of peripheral vascular disease and amputations. Smoking is also associated with a heightened incidence of other diabetes complications, including retinopathy and neuropathy. (p. 99)

The Population-Based Guidelines for Diabetes Mellitus recommend every patient with diabetes be evaluated for current tobacco use. Users should be strongly advised to quit and helped to accomplish that goal. The assessment is to be repeated annually unless the patient is >25 years of age and has never been a tobacco user, in which case reassessments need only occur at five year intervals (OHD, 1997b).

## Summary

The Population-Based Guidelines for Diabetes Mellitus reflect current health care standards. The guidelines emphasize screening and prevention of microvascular, macrovascular, and immuniologic risk factors associated with diabetes. Care provider alignment with the guidelines will promote comprehensive prevention of the complications associated with both type 1 and 2 diabetes.

## Methods Used to Study Provider Practice Patterns

There are no studies regarding the practice patterns of nurse practitioners in relation to the screening for complications of diabetes; however, there are three studies of physician practice patterns pertinent to this study. These three methodologic studies comparing chart audit with physician and patient surveys were examined when determining the method to use for the identification of NP practice patterns in Lane County. The studies were selected by the investigator because of their effective research design, solid data collection method, substantial sample size, and effective data analysis method. The studies reveal the strengths and weaknesses of designs and methods of previous research attempts to identify primary care provider practice patterns. An outline of the studies' objectives, methods, sample, and findings are provided in Table 1.

Table 1

Three methodologic studies comparing chart audit with physician and patient surveys

| Author/Year | Purpose | Method | Sample | Findings |
|---|---|---|---|---|
| Leaf, Neighbor, Schaad, and Scott, 1995 | Examine relationship between physicians' perception of their preventive practices and chart audit of those documented services. | Compare self-report to chart audit on 7 targeted preventive activities. | 2nd and 3rd year family practice residents in 10 training sites in the NW region of the US. Resident physicians (n=72), charts audited (n=544). | Physicians overestimate the frequency of services provided. Concluded physician self-report is a poor tool for measurement of clinical behavior. |
| Montano & Phillips, 1995 | Compared physician self-report, chart audits, and patient survey of frequency of cancer screening services. | (1) Family physicians surveyed to obtain self-reported rates. (2) Patients surveyed from the practices of a subsample of these physicians. (3) Chart audits of a subsample of the patients surveyed. | Random sample of physicians in WA (n=67). Patient surveys (n=11005). Charts audited (n=3281). | Correlations between rates of services provided derived from chart audits and patient surveys were high. Correlations between rates from physician self-report and either patient survey or chart audit were much lower. Concluded studies of physicians' provision of prevention services should not rely on physician self-report, but on rates through patient surveys or chart audits. |
| Weiner, et al., 1995 | Measured the quality of office-based care provided to elderly patients with diabetes in three states. | Cross-sectional study based on 100% sample of Medicare claims submitted within a 1 year time period. | All primary care practices actively seeing Medicare patients with diabetes in AL, IA, & MD. Physicians sampled n=2980. All elderly Medicare patients seen by physicians and assigned a diagnosis of diabetes by any office-based physician during the year. Patient n=97,388. | Most diabetic patients do not receive the recommended screening services. Practice patterns vary considerably across the three states. Patients in rural areas are less likely to receive services than those in urban locations. |

Overestimated performance.

Leaf, Neighbor, Schaad, and Scott (1995) compared resident physicians' self-reported frequency of assessment of seven coronary artery disease (CAD) risk factors with the frequency of assessment as measured by medical record review. Their study was part of a larger project designed to evaluate the effect of an intervention aimed at improving resident practices in CAD risk factor assessment and counseling. Self-reported practices were measured by a mailed survey. The residents were asked to rate how frequently they assessed asymptomatic adult patients for blood pressure, cigarette smoking, blood cholesterol level, dietary fat and cholesterol intake, physical activity, body weight, and psychosocial stress. Medical records were then randomly selected and audited from all patient visits occurring in a defined three-month period. The findings of the study demonstrated a large discrepancy between the reported frequency and the documented frequency in which physicians assess CAD risk factors. The physicians consistently overestimated their performance of the targeted clinical activities. These findings by Leaf, Neighbor, Schaad, & Scott illuminate the problem associated with using self-report as a measure of practice behaviors.

A shortcoming of the study is that, although it identifies the dichotomy between self-report and chart audit findings, it does not address the problem of the potential omission of care provided in the documentation. Leaf, Neighbor, Schaad, and Scott concluded that the dichotomy between physician report and patient report was due to a lack of recognition of their own behavior on the part of the physicians. However,

another explanation of the dichotomy could be that physicians may fail to document many of their activities. Therefore, the use of chart audits may provide no better insight into practice patterns than physician self-report.

Chart Audit and Patient Report More Reliable

The study by Montano and Phillips (1995) gives credence to the use of chart audits to identify physician practice patterns. These investigators measured the cancer screening rates of family physicians and compared the measures obtained through physician self-reports, chart audits, and patient surveys. The measurement of physicians' rates of providing services followed three steps: (1) physician surveys from a random sample of family physicians in Washington State to obtain self-reported rates; (2) patient surveys from the practices of a subsample of these physicians, and (3) chart audits of a subsample of the patients surveyed.

As did Leaf, Neighbor, Schaad, and Scott; Montano and Phillips found large discrepancies between the rates measured by physician report and those measured by chart audit. Correlations between physicians' self-reported rates and rates based on chart audits and patient surveys were all quite low, indicating low reliability of physician self-report. Physicians overestimate their provision of screening services. By contrast, correlations between rates based on chart audits and rates based on patient survey were quite high (>.70). These findings suggest that research involving measurement of the rates at which physicians provide screening services should not rely on physician self-report. However, the high correlations between chart audit and

patient survey measures indicate that both methods are equally preferable over physician self-report.

Deficit in Diabetes Care

A study by Weiner, Parente, Garnick, Fowles, Lawthers, and Palmer (1995) had three objectives related to improving the quality of diabetic are in ambulatory settings. Those were (1) to demonstrate that claims data profiling can be used as an ongoing method to support ambulatory care quality improvement, (2) to measure the quality of office-based care provided to Medicare patients with diabetes, and (3) to identify physician and geographic related factors associated with higher or lower conformance to recommended criteria of care. To meet these objectives, the investigators studied all primary care practices actively seeing Medicare patients in Alabama, Iowa, and Maryland. Medicare claims were evaluated for services provided to aged beneficiaries residing in the three states during the 12 month period from July 1990 through June 1991. Medicare patients were assigned to their primary care source. To be included in the study, a practice had to be designated as the primary care source for at least 25 Medicare patients and located within the geographic boundaries of one of the three states for the entire study period. On average, each practice included in the study provided primary care to approximately 35 patients with diabetes. The procedures targeted to evaluate physician practice were hemoglobin A1c (glycosylated hemoglobin) measurement, ophthalmologic examination, total cholesterol measurement, and blood glucose measurement.

The study findings indicated there is considerable opportunity for improvement in the quality of care provided to diabetic patients. A significant proportion of the patients did not appear to receive $HbA_{1c}$, cholesterol, or blood glucose measurement, or ophthalmologic examination as recommended by the 1989 ADA guidelines. Furthermore, because of the large proportion of patients receiving a higher frequency blood glucose testing than is recommended, it appears some patients may be receiving costly, unneeded care.

The study by Weiner, et al., provides important information concerning the practice patterns of physician diabetic care, especially in light of the large sample size. However, the finding may have limited generalizabilty. The study only evaluated care given to the elderly and those with Medicare insurance coverage. Practice patterns may vary significantly depending upon the age of the patient cohort and level of insurance coverage.

In summary, the pertinent points gleaned from these three studies are; (1) physician self-report is not an accurate method by which to evaluate patient care, (2) chart audit and patient report are equally preferable over physician self-report, and (3) primary care provider practice patterns are not in alignment with the ADA guidelines.

## Conceptual Framework

In this study the Population-Based Guidelines for Diabetes Mellitus (1997) was the standard by which diabetic care was measured. Care delivered as described in the guidelines was considered good diabetic care. Because the guidelines serve as the standard of optimal diabetic care, this study described and evaluated NP behavior in comparison to the guidelines (Figure 1). The conceptual underpinning is that the closer the NP practice aligns with the guidelines, the greater the quality of care delivered to diabetic patients.

Figure 1 is a diagram of the conceptual basis of the study. Within the diagram a two-way arrow is drawn between NP behaviors and the guidelines. This two-way arrow symbolizes the interactive relationship between the guidelines and clinical practice behaviors. First, the guidelines influence clinician practice behaviors. Then, use of the guidelines by clinicians results in feedback to the OHD about the appropriateness of the guidelines for the evaluation of care. This feedback from the clinicians will then shape the development of future guidelines for diabetes management in the state of Oregon. In this manner, the guidelines have influence on the clinician while the clinician has influence on the future content of the guidelines. Because this study evaluated clinician behavior using the Population-Based Guidelines for Diabetes Mellitus, the results of this study are as pertinent to the guidelines as to the practitioners.

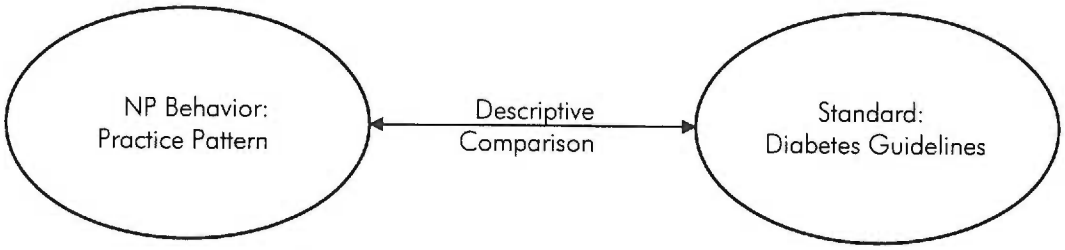


Figure 1. Conceptual framework: descriptive comparison of NP practice patterns to the Population-Based Guidelines for Diabetes Mellitus.

Using this conceptual framework, the clinical unit of analysis is the audit of the patient record, but the subject of interest is the NP. However, the conceptual focus extends beyond the sample to the larger NP community within Lane County (Weiner, et al., 1995). The reason for this conceptual approach is twofold. First, because of the potentially small number of patients with diabetes per practice, the results for individual NPs may be statistically unstable. Second, the goal of the study is to produce findings which may be used to assist local NPs in quality improvement efforts. Therefore, the data collected from the individual were analyzed and reported in aggregate form.

## Assumptions

This study of NP practice patterns was based on the assumption that the general findings related to physician behaviors discussed in the literature review extend to NPs.

Therefore, it is assumed that the discrepancy between perceived and actual clinical behavior is present among NPs as it is among physicians. Thus, as with physicians, chart audits were expected to provide a more accurate report of screening activities than self-reports. Another assumption is the finding that physicians do not tend to deliver care according to the ADA guidelines may extend to NPs. Finally, it was assumed that the degree of unwritten care (omission to document care) is the same for NPs as for physicians.

## Research Questions

The research questions addresses were: (1) how often do NPs perform each of the screening activities as recommended by the Population-Based Guidelines for Diabetes Mellitus?; and (2) to what extent are each of the screening activities performed as recommended by the Population-Based Guidelines for Diabetes Mellitus? The research questions were addressed by the chart audit method described in Chapter Three.

# CHAPTER III

## Methods

The purpose of the study was to describe Lane County nurse practitioner (NP) patterns of screening for complications of diabetes. This goal was accomplished by performing random chart audits of NPs in Lane County who provide primary care to adults with diabetes and who fit the inclusion criteria. From each NP practice five charts of adult diabetic patients who had been seen by the NP from July 1, 1996, to June 30, 1997, were randomly selected and audited. If a given NP has less than five charts for persons with diabetes, then the investigator audited all the charts the NP had for persons with diabetes. The NP practices were evaluated through analysis of activities occurring during patient visits recorded in the patient chart.

### Unit of Analysis

In this study the unit of analysis was the audit of the patient record and refers to the individual patient chart audit spanning the one year chart audit period. Nurse practitioner behaviors related to screening for diabetic complications were evaluated through analysis of activities occurring during patient visits via the patient chart. The term patient case also refers to the individual patient chart audit spanning the one year chart audit period. The study included audits of 43 cases drawn from the practices of 10 NPs.

## Sample Identification

There are 79 licensed NPs in Lane County (Oregon State Board of Nursing, personal communication, June, 1997). Of the 79, those who are likely to provide primary care to adults with diabetes have been identified by specialty. These specialties included Adult Nurse Practitioner (ANP), Family Nurse Practitioner (FNP), and Geriatric Nurse Practitioner (GNP). In Lane County there are 27 NPs who are licensed under one of these three specialties.

Two to four weeks before the initiation of the chart audits, a letter and questionnaire was sent to the NPs who were likely to provide primary care. The letter served to explain the study goals and design, invite participation, and request permission to audit the NP's medical charts for data concerning diabetic care recommended by the guidelines. The letter was accompanied by a questionnaire and a consent form. The questionnaire solicited information regarding inclusion criteria and general demographic data. The letter, questionnaire, and consent form are included in Appendixes A, B, and C. The NPs were invited to return the consent form and the demographic questionnaire in a pre-addressed, stamped envelope. Five to seven days after the letter, questionnaire, and consent forms were mailed to the NPs, the investigator called each of the NPs and offered to answer any questions they had. Mailings that had not been returned within two weeks were followed-up by a phone call to ascertain the status of each NP from whom there was no response (i.e. they do not wish to participate, they wish to participate but forgot to return the material, etc.),

and then follow-up was done accordingly. If a subject chose to decline, they were thanked and offered an abstract of the study.

Inclusion criteria required the NP's length of practice in their facility to be a minimum of one year. The other criterion was that the NP have at least two patients with diabetes within his or her practice for a minimum of one year. Of the NPs contacted by mail, all those who agreed to participate in the study and fit the inclusion criteria were included in the study.

## Chart Selection and Audit

After the sample selection was completed, the NPs not included in the study were sent a letter informing them of such and thanking them for their time and willingness to participate. The NPs included in the study were notified by telephone and an appointment for an introduction to the agency charting practices and chart audit was scheduled. The introduction to the charting practices of the agency preceded the chart audit. The goal of the introduction to the charting practices was that the investigator would gain a thorough understanding of the chart set-up and the charting practices of all persons who make entries into the patient chart. In this manner the investigator minimized the chance that critical data within the chart was missed or overlooked by the investigator. The person orienting the investigator to the chart varied from agency to agency. In some cases the orientation was done by the NP, but in other cases it was done by the office staff or medical records staff. All data were collected in the NP's agency by the investigator.

The manner in which diabetic charts were identified depended upon the data system within the particular agency. Some agencies were able to identify all diabetic charts by use of computer. Other agencies required that the NP identify all diabetic charts. After diabetic charts were identified, the investigator used computer generated random numbers to select five charts. Data were recorded during the time of the actual chart review using a prepared checklist for each of the indicators outlined by the Population-Based Guidelines for Diabetes Mellitus (Appendix D). First the investigator identified the initial chart entry occurring on or after July 1, 1996. Working forward from that point in the chart through June 30, 1997, the investigator read all clinical and lab entries for information related to the screening for, or treatment of, diabetic complications. Each time the investigator encountered any of the targeted procedures, the occurrence was recorded. Data that were recorded included (1) screening procedures ordered, recommended, or performed by the NP; (2) screening procedures ordered, recommended, or performed by another provider in the agency practice, or a provider outside the practice (i.e. student) (Montano & Phillips, 1995). In Appendix E there is a flow-chart of the research design.

In the Population-Based Guidelines for Diabetes Mellitus (1997) there are some differences between the recommendations for type 1 and type 2 diabetes. For type 1 diabetes, the $HbA_{1c}$ should be done semiannually; for type 2 diabetes, the $HbA_{1c}$ should be done annually. For type 1 diabetes, patient education should be initiated within one week of diagnosis; for type 2 diabetes, patient education should

be initiated within six weeks of diagnosis. For type 1 diabetes, the annual dilated eye exam should be initiated at five years from the time of diagnosis; for type 2 diabetes, the annual dilated eye exam should be initiated at the time of diagnosis. For type 1 diabetes, the annual screening for proteinuria should be initiated at five years from the time of diagnosis; for type 2 diabetes, the annual screen for microalbuminuria should be initiated at the time of diagnosis. A separate chart audit tool was developed for each type of diabetes to reflect these differences.

At the initiation of each chart audit the investigator determined the type of diabetes and used the audit tool corresponding to that type. Determination of the type of diabetes was based upon medications used to control blood sugar, age of patient at diagnosis, presence of obesity, history of diabetic ketoacidosis (DKA ), and the diagnosis on the chart. The criteria for type 1 diabetes were that the patient was treated with insulin as the primary method of glycemic control, the age at onset was less than 40, the patient was of normal body weight, and the patient had a history of DKA. The criteria used for type 2 diabetes were that the patient was treated with an oral agent or had a history of treatment with an oral agent, the age at onset was $\geq$40 years, the patient was obese (BMI $>$27 Kg/m$^2$), and the patient did not have a history of DKA. If the patient clearly met one of the two criteria, that diagnosis was used for that patient regardless of the diagnosis on the chart. If a discrepancy occurred between the diagnosis used by the investigator and the diagnosis on the chart, that

discrepancy was to be documented in the comment section of the research tool. No discrepancies in diagnosis occurred.

The diabetic guidelines contain recommendations specific to the comorbidities of hypertension, myocardial infarction, chronic obstructive pulmonary disease, cerebralvascular accident, peripheral vascular disease, nephropathy, neuropathy, and retinopathy, and the risk factors of obesity and smoking. Therefore, the presence of these comorbidities and risk factors were targeted during the chart audit process. If a comorbidity or risk factor was noted in the chart it was documented on the chart audit tool.

## Activities Targeted By the Chart Audit

Each recommendation within the Population-Based Guidelines for Diabetes Mellitus include both an assessment and intervention. The specific recommendations are outlined in Table 2. All women with diabetes of childbearing potential are to receive preconception counseling which includes: potential risks to mother and fetus; family planning method; education regarding the importance of meeting target blood glucose control prior to pregnancy; the need to change from oral diabetes therapy to insulin with pregnancy; the need to replace any use of ACEIs; and the importance of receiving health-care management early in pregnancy (OHD, 1997c). Preconception counseling should occur at the initial visit or upon reaching childbearing age and should be repeated when the patient indicates a change in pregnancy probability or when the need is identified with the annual assessment. The investigator audited

charts of diabetic women with childbearing potential for documentation of preconception counseling or effective family planning method.

Patient Education. The Population-Based Guidelines for Diabetes Mellitus provide clear criteria for initiation of diabetic education and referral to a Certified Diabetic Educator (CDE). Diabetic education should be initiated on every patient who is newly diagnosed with diabetes. If diagnosed with type 1 diabetes, patient education should be initiated within one week of diagnosis. If type 2, patient education should be initiated within six weeks of diagnosis. Further recommendations for diabetic education include educational assessment within one week of a hospital discharge or onset of new complications; and education regarding new therapy at the time of initiation of new therapy. Furthermore, self-management and behavioral goals must be individualized annually.

Foot screening. Foot screening should occur with each routine visit. A complete foot exam, assessment, and risk categorization using a specific assessment tool such as the "Carville Foot Risk Assessment" (OHD, 1997c) should occur annually. The investigator audited for documentation of the visual foot inspection at each visit, documentation of an annual risk categorization using a specific assessment tool, and if positive findings, documentation of self-care education and assessment of metabolic control.

Tobacco use. Tobacco use assessment should be done at the initial visit and on an annual basis if the patient is under 25 years of age or a past user. For those

categorized an nonusers tobacco use assessment should be done every five years. Current tobacco use is defined as any use, including smokeless, in the past 30 days. Based on this criteria, a patient was categorized as a user or a nonuser. If a patient is a user, counsel on tobacco cessation in accordance with AHCPR guidelines is recommended. The investigator audited for the documentation of tobacco use status at each visit and for evidence of cessation counseling or referral if the patient is a tobacco user.

Blood pressure screening. A blood pressure reading should be done at least semiannually. Unless contraindicated, persons with a systolic ≥130, or a diastolic ≥85 on three occasions should be treated with ACEI therapy. The investigator audited for documentation of semiannual blood pressure assessment and the initiation of an ACEI if the blood pressure is ≥130 systolic or ≥85 diastolic on three occasions, unless contraindicated.

Table 2

Recommended procedures of the Oregon 1997 Population-Based Guidelines for Diabetes Mellitus

| Schedule | Screening/Intervention |
|---|---|
| Initial visit & when indicated | Patient education<br>Preconception counseling<br>Pneumonia vaccination |
| Each routine visit | Visual foot inspection<br>Tobacco counseling and referral for users |
| Semiannually | $HbA_{1c}$ measurement and risk assessment (type 1)<br>Dilated eye exam<br>Microalbuminuria/protienuria screening<br>Tobacco use assessment if under 25 or past user<br>Oral screening<br>Influenza vaccination<br>Preconception counseling assessment<br>Self-management goal development<br>Fasting lipid profile and LDL risk categorization (unless low risk) |
| Annually & when indicated | Complete foot exam with risk categorization, education, and metabolic assessment |

Table 2, Continued

Recommended procedures of the Oregon 1997 Population-Based Guidelines for Diabetes Mellitus

| Schedule | Screening/Intervention |
|---|---|
| When $HbA_{1c} > 8$ | Behavioral/physiologic assessment and glucose management plan review |
| When indicated by positive findings | Ophthalmologist exam<br>Dental referral |
| Age 40 with vascular risk factors OR at onset of vascular disease | Aspirin prophylaxis |
| At onset of microalbuminuria or onset of hypertension | ACEI therapy |
| Per NCEP guidelines | Lipid treatment |

Oregon Health Division, 1997b

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Eye exam. At defined intervals each diabetic patient should receive a dilated eye exam by a provider who is fully trained in examining the interior of the eye. Patients should be referred to a retinal specialist if any positive findings are identified. Positive findings include any new or abnormal blood vessels on the optic nerve or elsewhere on the retina, any abnormality in or near the macula, any other abnormality of concern to the examiner, or if the examiner is unable to visualize the retina. The

investigator audited for documentation of a dilated eye exam, the findings of the exam, and a referral to an ophthalmologist if findings were positive.

Early nephropathy detection. For early nephropathy detection the Population-Based Guidelines for Diabetes Mellitus recommends annual screening for proteinuria. The guidelines recommend one of two practices; the first is to test for proteinuria via a standard urinalysis or dipstick to determine gross protein. If this test is negative for gross proteinuria, the clinician should test for microalbuminuria. The second practice option is to defer the urinalysis or dipstick method, and test only for microalbuminuria. Microalbuminuria is defined as three positive 24 hour urine tests for microalbuminuria (30-300 mg/24 hr) over a six-month period. Unless contraindicated, persons with microalbuminuria should be treated with an ACEI. The audit evaluated for evidence of annual screening for proteinuria or microalbuminuria and documentation of ACEI treatment when indicated.

Oral-dental screening. Every diabetic patient should receive an annual oral-dental screening with the recommendation that the patient visit a dentist at least annually, and an immediate referral if positive findings are noted on the oral exam. Findings that warrant immediate referral to a dentist include extensive caries, marked xerostomia, extensive periodontal disease, poorly fitting full or partial denture, or observable oral lesions (OHD, 1997b). The investigator audited for documentation of an oral screening and recommendation to visit a dentist annually or an immediate referral to a dentist when indicated.

Vaccination. The influenza and pneumococcal vaccine are recommended at predetermined intervals. The investigator audited for annual administration of the influenza vaccine and a history of, or administration of the pneumococcal vaccine within five years.

Aspirin prophylaxis. Unless contraindicated, aspirin prophylaxis is to be initiated on all persons who are hypertensive (systolic ≥130 and/or diastolic ≥85), tobacco users, or obese (>120% ideal body weight), or who have elevated blood lipids (per NCEP criteria), albuminuria (>30mg/24 hours), coronary artery disease, cerobrovascular disease, or peripheral vascular disease. The Population-Based Guidelines for Diabetes Mellitus define obesity as >120% of ideal body weight. Per the National Health and Nutrition Examination Survey, a BMI of >27.8 for men and >27.3 for women was considered obese (Seidel, Ball, Dains, & Benedict, 1995). For chart audit purposes the criteria for obesity was a BMI > 27, or a diagnosis of obesity in the patient record. Using a standardized BMI reference chart, the BMI was determined from the weight and height measurements in the patient chart. Because standardized BMI reference charts are specific only to the nearest whole number, the BMI cut-off for obesity was rounded to >27. The investigator audited for a vascular risk assessment that included the factors identified. If any of the above risk factors were present, the investigator audited for the initiation or continuation of aspirin prophylaxis, or of contraindication to its use.

Lipid screening. It is recommended that lipid screening be done at predetermined intervals. Those with higher-risk categories should receive a lipid management plan as defined by the National Cholesterol Education Program (NCEP) recommendations. The investigator audited for the documentation of a fasting lipid profile and a lipid management plan for those in higher-risk categories.

## Limitations of the Study

NPs play a self-selective role in their inclusion into the study in that they have the option to choose to not participate. There may exist a significant variation in practice patterns between the NPs who choose to participate and those who choose not to participate. Because those who choose not to participate were not studied, the heterogeneity of the population may not be adequately represented within the sample. To minimize this limitation the investigator encouraged participation through promotion of the benefits obtained by participation in the study. Those benefits were: professional and personal satisfaction in collaborating in a nursing research study; the opportunity to be part of an endeavor that may contribute information which will benefit patients in the future; the opportunity to contribute to the body of nursing knowledge, particularly in the area of diabetic care; and the opportunity to increase familiarity with the Population-Based Guidelines for Diabetes Mellitus. Participation was also enhanced by assuring confidentiality, thereby reducing the NPs' concern that findings about their personal practice would be available to others. Also, the study method was designed to minimize intrusion into the NP's schedule or practice in that

the chart audit was scheduled at a time most convenient to the NP. These benefits were communicated to the potential subjects in the correspondence inviting participation in the study (Appendix A). Each of these measures served to enhance NP participation, thereby minimizing the potential loss of sample heterogeneity through sample self-selection.

Chart auditing introduces two threats to the internal validity of the study. The first is the risk that what the investigator is measuring is an omission of documentation rather than an omission in practice. The second threat is that the investigator might miss relevant chart entries, or misinterpret data related to the specific variables of interest. The threat of measuring omission in documentation rather than omission in practice was addressed by Montano and Phillips (1995). Their findings demonstrate that chart audits accurately reflect provider practices. To address the threat of missed chart entries the investigator and a Master's Degree prepared RN independently audited three charts of patients with diabetes using the chart audit tool and the chart audit technique defined in the methods selection. The concurrence between the two auditors was 93%.

## Protection of Human Subjects

To protect the confidentiality of both the patient and the NP, no patient or NP identification was recorded. All patient records and NPs were referred to by a code so that identification of specific individuals or practices was prevented. All data collected were kept in a locked file located in the investigator's home office. All data were

pooled and reported as an aggregate summary of the combined practice patterns. The Oregon Health Sciences University Committee on Human Research granted exempt status for the study. A written copy of the exemption is provided in Appendix F. Approval was obtained from the Institutional Review Board of each agency included in the study. The written approvals are available on file.

## Data Analysis

The data gathered were gathered at the nominal and interval level (Appendix D). The screening activities were categorized as either done, not done, or not applicable. All the classifications were mutually exclusive in that each specific procedure falls into one of the defined categories available for that procedure.

Descriptive statistics were used to summarize and describe the data. The categories assigned to each procedure were enumerated. The frequency of occurrences of each procedure were described.

From the findings of the chart audits, frequencies and percentages were calculated to answer the research questions; (1) how often do NPs perform each of the screening activities as recommended by the Population-Based Guidelines for Diabetes Mellitus?; and (2) to what extent are each of the screening activities performed as recommended by the Population-Based Guidelines for Diabetes Mellitus?

The data and the descriptive statistics are presented in both narrative and graphic fashion. Graphs and tables are used to display data in a manner that best illuminates the findings and facilitates their interpretation.

## Internal Consistency

### Inter-Rater Reliability

A Master's prepared RN oriented to the chart audit tool and the investigator conducted independent chart audits on three charts from one agency using the chart audit tool developed for the study. The raters obtained agreement of 93% on whether performance of target procedures had been done. The seven percent disagreement came from an unfamiliarity with the charts. One participant was more familiar with the charting practices of the agency, thus was able to locate obscure data. The other participant, unable to locate the data, failed to credit the practitioner for performance of a targeted activity. Although the investigator attempted to become familiar with the charting practices of the NP prior to initiating the audit, the failure to locate targeted activities is an inherent threat to accuracy of findings. Although the threat is present, the strong agreement amongst participants of the pilot chart audit indicates the threat is minimal. However, as with any research project, in spite of the measures taken to assure reliability of the research method, the investigator recommends that caution be employed in the interpretation of findings based solely on this one research project.

# CHAPTER IV

## Results

### Nurse Practitioner Sample

Sample procurement. Twenty-seven of the 79 nurse practitioners in Lane County provide primary care. An invitation to participate in the study and a questionnaire was mailed to each of the 27 NPs. Twenty of the 27 (74 %) NPs returned the questionnaire providing demographic information. Eleven of the 20 respondents fit the inclusion criteria (55%). Nine respondents were not eligible for participation in the study because they did not deliver diabetic care. Of the 11 who fit the inclusion criteria, 10 agreed to participant in the study (91%). The one nonparticipant declined for personal reasons.

Adequacy of sample. A comparison was done to identity differences between those NPs who participated and those who did not fit the inclusion criteria. Comparators included age, years of NP experience, length of practice at current site, diabetic continuing education (CE) hours in past year, hours worked per week, and estimated number of diabetic patients in patient population (Figure 2). The major difference between those included and those excluded is that those excluded did not have enough diabetic patients to qualify for the study. Also, the sample included 91% of all Lane County NPs who fit the inclusion criteria. The accuracy of the research findings is enhanced by the limited variability between NPs included and those excluded, and the high degree of representation. It should be noted that the inclusion

criteria were based on self-report of the number diabetic patients per NP practice. Theoretically, NPs who choose not to participate in the study could exclude themselves by under-reporting the number of diabetic patients in their practice, thereby altering the adequacy of the sample.

Comparison of Participating and Excluded Nurse Practitioners

| | Participating n=10 | | Excluded NPs (n=9) | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Age | 46.44 | 7.07 | 42.88 | 8.06 |
| Years experience as NP | 12.43 | 5.81 | 9.67 | 7.21 |
| Length of practice at current site | 6.38 | 3.65 | 3.59 | 2.54 |
| Number of diabetic management CE hours in past year | 8.60 | 5.38 | 3.86 | 3.08 |
| Number of hours worked per week | 32.00 | 8.15 | 35.63 | 10.16 |
| Estimated number of diabetic patients | 31.70 | 33.35 | 0.33 | 1.00 |

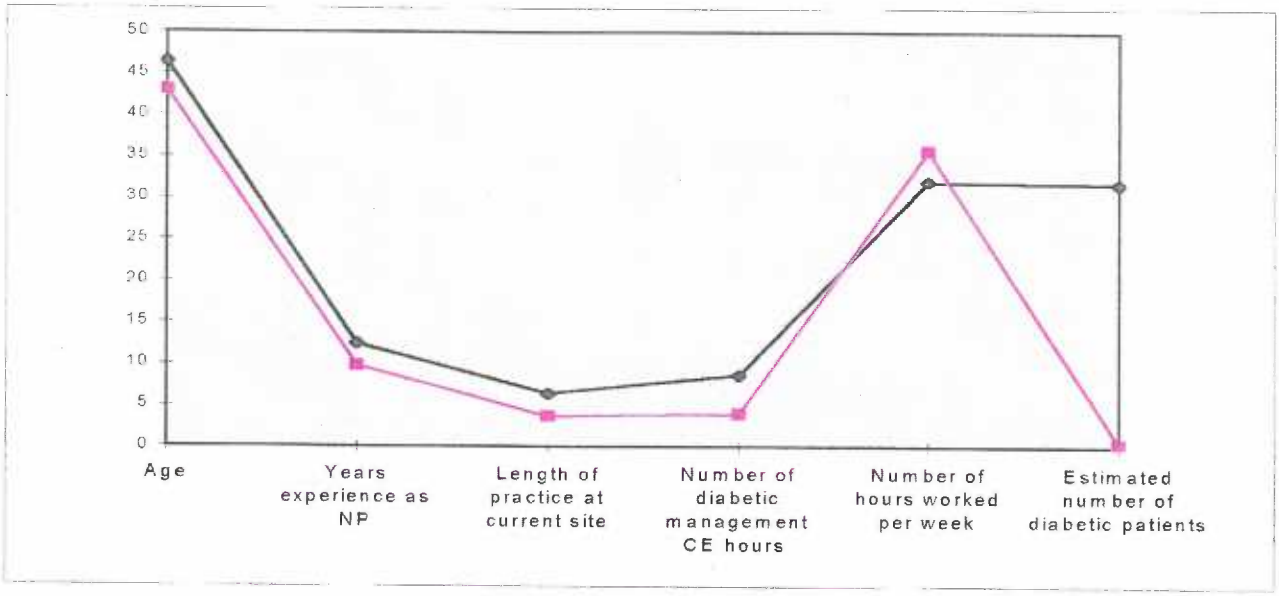


Figure 2. Comparison of participating and excluded NPs.

Key: black-participating NPs, pink-excluded NPs.

Description of Nurse Practitioner Sample

The NP sample was evaluated for 12 variables. The data for these variables were obtained by NP self report using the mailed demographic questionnaire. The variables considered included: specialty (ANP, FNP, or GNP); gender, age, and ethnicity; education level; type of employment; hours worked per week; population of community; years of experience; rating of nursing program diabetes education; familiarity with guidelines; interest in diabetic management; and expertise in diabetic management. Each of these variables are discussed below. These NP characteristics are summarized in Table 3.

Specialty. The sample (n=10) consists of 90% FNPs and 10% ANPs. This represents a higher mix of FNPs than exists in the state NP population, of which 25% are FNP (Burns, Cottet, LaPorte, Reilly, Siebold, & Woo, 1997). A contributory factor to the higher number of FNPs is that NPs who do not provide primary care to adults were excluded from the study, leaving only the FNP, ANP, and GNP specialties. However, this exclusion of other specialties still does not account for the large FNP representation of the sample. In 1996 Burns, et al., surveyed all NPs certified by the Oregon State Board of Nursing with addresses in Oregon (n=993). They obtained a survey response rate of 56.8%. Of the respondents Burns, et al., surveyed 57% were FNPs (n=144). The reason for the higher FNP mix found in the Lane County study sample is unknown. The higher FNP mix should be factored in when considering generalizability of the sample.

There were no GNPs in the sample. This is not an unexpected finding in that GNPs represent only 0.9% of Oregon NP population (Burns, et al, 1996). At the time of the study there were two licensed GNPs in Lane County.

Gender, age, and ethnicity. Ninety percent of the sample is female. This finding is representative of the state average of 93.2% (Burns, Cottet, LaPorte, Reilly, Siebold, & Woo, 1997), as well as the high number of females in the nursing profession as a whole. The mean age of the sample is 46.4 years (Figure 2). This age is representative of the Oregon NP population, whose mean age is 45.7 (Burns, et al.) All of the sample is Caucasian. This is an expected finding in that 92% of the population in the State of Oregon is Caucasian (OHD, 1997a).

Nursing Education. Eighty percent of the sample obtained a Master's Degree in Nursing. One NP is practicing with an Associate Degree, and one with a Post-Master's certificate. This finding is representative of the Oregon NP population, of whom 82.3% have a Master degree as their highest level of nursing education (Burns, et al., 1997).

Table 3

Nurse practitioner sample characteristics

| VARIABLE | NUMBER | PERCENT |
|---|---|---|
| FNP | 9 | 90 |
| ANP | 1 | 10 |
| GENDER | | |
| Male | 1 | 10 |
| Female | 9 | 90 |
| ETHNICITY | | |
| Caucasian | 10 | 100 |
| HIGHEST DEGREE IN NURSING | | |
| Associate | 1 | 10 |
| Diploma | | |
| Baccalaureate | | |
| Certificate | | |
| Master's | 8 | 80 |
| Post Master's | 1 | 10 |
| Doctoral | | |
| | | |
| | | |

| VARIABLE | NUMBER | PERCENT |
|---|---|---|
| EMPLOYMENT | | |
| MD office/clinic | 6 | 60 |
| Independent rural with MD available for consult | 4 | 40 |
| POPULATION OF COMMUNITY | | |
| > 25,000 | 8 | 80 |
| 25,000 – 49,999 | | |
| 50,000 – 74,000 | | |
| 75,000 – 999,999 | | |
| > 100,000 | 2 | 20 |
| RATING OF DIABETES MANAGEMENT EDUCATION | | |
| No significant education | 1 | 10 |
| Very little education | 2 | 20 |
| Moderate education | 6 | 60 |
| Fairly significant education | 1 | 10 |
| Very thorough education | | |

Table 3, Continued

Nurse practitioner sample characteristics

| VARIABLE | NUMBER | PERCENT |
|---|---|---|
| FAMILIARITY WITH GUIDELINES | | |
| None | 3 | 30 |
| Very little | 1 | 10 |
| Somewhat | 4 | 40 |
| Moderate | 2 | 20 |
| A great deal | | |
| INTEREST IN DIABETES | | |
| None | | |
| Very little | | |
| Somewhat | | |
| Moderate | 5 | 50 |
| A great deal | 5 | 50 |
| EXPERTISE | | |
| None | | |
| Very little | | |
| Somewhat | 2 | 20 |
| Moderate | 8 | 80 |
| A great deal | | |

| VARIABLE | NUMBER | PERCENT |
|---|---|---|
| TYPE OF CE RECEIVED | | |
| Reading | 9 | 90 |
| Conferences | 8 | 80 |
| Media/CD | 4 | 40 |
| Time with an expert | 2 | 20 |
| Consulting | 4 | 40 |
| Other | 2 | 20 |
| CE IN DIABETES MANAGEMENT | | |
| No | | |
| Yes | 10 | 100 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Characteristics Specific to Guidelines

Familiarity with guidelines. The 27 NPs who provide primary care were asked to rank their level of familiarity with the guidelines, interest in diabetic care, and expertise in diabetes management. An ordinal ranking system was used with each of the variables in which the respondents could choose between the descriptors of "not at all," "very little," "somewhat," "moderate," and "a great deal."

Eight of the ten NPs studied ranked themselves as having limited familiarity with the guidelines. There are two possible, and opposing, explanations for this lack of familiarity. The first explanation is that the low familiarity with the guidelines may due to a lack of dissemination of guidelines. This lack of familiarity with the guidelines may not be limited to Lane County. It may be worthwhile to evaluate familiarity with the guidelines among other counties in Oregon. Previous studies have demonstrated a relatively low level of primary care provider alignment with the guidelines (OHD, 1997c). If an evaluation of other counties finds that familiarity is low, then the generally low alignment with the guidelines may be due to inadequate dissemination of the guidelines. If that is the case, improving dissemination of the guidelines may increase provider alignment. It should be noted that the two NPs who gave themselves the highest ranking in familiarity with the guidelines practiced in a population of <25,000. Thus, it cannot be assumed that poor dissemination the guidelines is limited to rural providers.

The second possible explanation for the lack of familiarity may be that the questionnaire asked, "How would you rate your familiarity with the 1997 Population-Based Guidelines for Diabetes Mellitus?" It could be that the subject was well aquatinted with the 1995 guidelines, but did not feel comfortable transferring that familiarity to the 1997 guidelines. The 1997 guidelines were released in March, and the research questionnaire was mailed during the months of July and August, five months after the release of the guidelines. It is possible that the respondent had not yet received a copy of the 1997 guidelines, thus indicated a low familiarity with the 1997 guidelines in spite of being well-versed in the 1995 guidelines. This explanation would be supported, or ruled-out with closer examination of the dissemination of the guidelines.

Another point of interest is that the NPs who did not provide diabetic care to at least two patients throughout the audit year ranked themselves substantially higher in familiarity with the guidelines. Forty-four percent (n=9) of the excluded NPs considered themselves to have a moderate level of familiarity, whereas only 20% (n=10) of the sample considered themselves to have a moderate level of familiarity. The investigator expected the converse to be true. It was presumed that those who provide diabetic care would have the greatest familiarity. A possible explanation for this finding is that those who do not provide diabetic care may not understand the complexity of diabetic care, therefore may overestimated their comprehension of the issues involved in diabetic management.

Interest in diabetic care. All NPs included in the study ranked themselves as having moderate to great interest in diabetes. Thus the sample is likely to be knowledgeable about diabetic care because of their interest. The low self ranking in familiarity with the guidelines in light of the high level of interest in diabetic management could be another indicator of suboptimal guideline dissemination.

Expertise in diabetic care and CE. The NP sample ranked themselves fairly high in their level of expertise. This indicates that although they were not familiar with the guidelines, they believed themselves to be knowledgeable about diabetic management. Their self appraisal is supported by the fact that within the past year the NPs in the sample obtained a mean of 8.6 hours CE specific to diabetic management. Forms of diabetic CE obtained by the sample included reading, attending conferences, use of media/CDs, consulting with an expert, and lessons learned from patients. Of these avenues the majority of CE came from reading and conference attendance.

Summary of NP Sample. This sample represents a group of experienced NPs with a high level of interest and expertise in diabetic care. These are nurses who are interested in diabetic care and obtain substantial ongoing education in diabetes. Although they are not well versed in the 1997 guidelines, one would expect them to perform well in overall diabetic management.

## Description of Patient Sample

Procedure for sample selection. In each NP office the investigator used ICD-9 codes (250.1 and 250.2) to identify all patients treated for diabetes in the 12 months

prior to July, 1997. A list of diabetic patients was generated by the review of the billing records. Starting with the first patient listed each patient was assigned a number. The numbers (integers) were assigned in ascending order starting with the number one. Charts were then selected using computer generated random numbers. The random numbers generated by the computer were made specific to the number of charts within each practice through use of the following formula:

total number of diabetic charts in NP practice/100 = X

X * random number (rounded to nearest integer) = chart selected for audit

This procedure was repeated until five charts were selected. Patients that were not seen by the NP for the entire audit period were disqualified. In the event a chart was disqualified, the investigator used the random number procedure to select another chart. This process was continued until five charts were available for audit. In the event a NP had five or less diabetic charts, all charts were audited. Table 4 displays the number of cases for each NP in the sample.

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Table 4

Number of patient cases per NP

| | NP1 | NP2 | NP3 | NP4 | NP5 | NP6 | NP7 | NP8 | NP9 | NP10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of cases | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 2 | 5 | 5 | **total number cases = 43** |

The variance in number of cases between NPs is due to the discrepancy between the inclusion criteria and the study design. The inclusion criteria required that the NP have a minimum of two diabetic patients to whom they delivered primary care in the audit year. The study design was that the investigator would audit a sample of five diabetic charts from each NP; if the NP had less than five charts, the investigator would audit all diabetic charts the NP did have. Thus, some NPs had enough diabetic charts to meet the inclusion criteria, but not the full five the investigator had intended to audit. Therefore, some NP had five cases, while others had only two.

Adequacy of sample. Of all NPs combined, the total number of diabetic patients seen by the NPs within the audit year was 151. Of the 151, 43 were selected for chart audit (28%). Although sample size was limited by constraints of investigator time and resources, the sample is large enough to provide adequate representation of the diabetic care patients receive from Lane County NPs. Generalizability is limited to Lane County as population characteristics vary from county to county.

Characteristics of Patient Sample

Complete demographic data were not gathered on the patient sample. Age was gathered because of its role in differentiating type 1 and type 2 diabetes. Because the focus of the study was to evaluate NP alignment with the 1997 Population-Based Guidelines for Diabetes Mellitus, only data specific to that goal were gathered. Therefore, the patient sample is primarily described in terms of diabetic control, method of diabetic management, and presence of comorbidities.

Of the 43 patients only one was a type 1 diabetic. This is not an unexpected finding considering more than 90% of any given primary care provider's patients with diabetes have type 2 diabetes (Fore, 1995).

HbA1c. Thirty-six of the 43 patients had $HbA_{1c}$ levels drawn during the audit year. The mean last $HbA_{1c}$ of the audit year was 7.98 (SD =1.35). The last $HbA_{1c}$ levels of the audit year are displayed in Figure 3. The three $HbA_{1c}$ levels >10% were examined for variables contributing to the poor glycemic control. There were no identifiable factors, other than $HbA_{1c}$ level, making these patients different from others in the sample. Each of the three patients were managed by a different NP.

Sixty-one percent of the $HbA_{1c}$ levels were >8%. $HbA_{1c}$ is used to determine the level of diabetic control. An $HbA_{1c}$ of <8% is generally considered the minimum level of control needed to prevent, or delay, complications of diabetes (Krolewski, Warram, & Freire, 1996; OHD, 1997c). Multiple factors influence glycemic control. This multifactorial influence contributes to the complexity of diabetic management. Some factors influencing $HbA_{1c}$ levels are disease progression, efficacy of medication used to manage glycemia, patient compliance, psychological stress, infection, and other concomitant illnesses. The influence of the medication regime, patient education, and comorbidity on glycemic control is examined below.

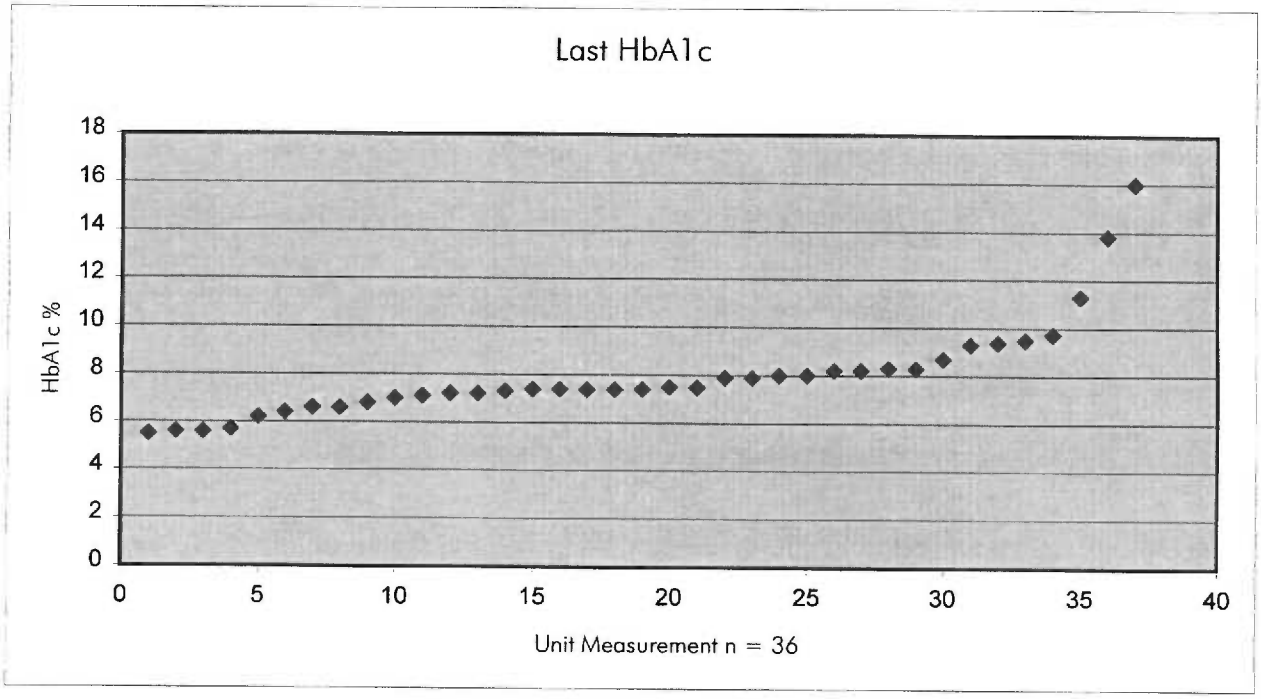
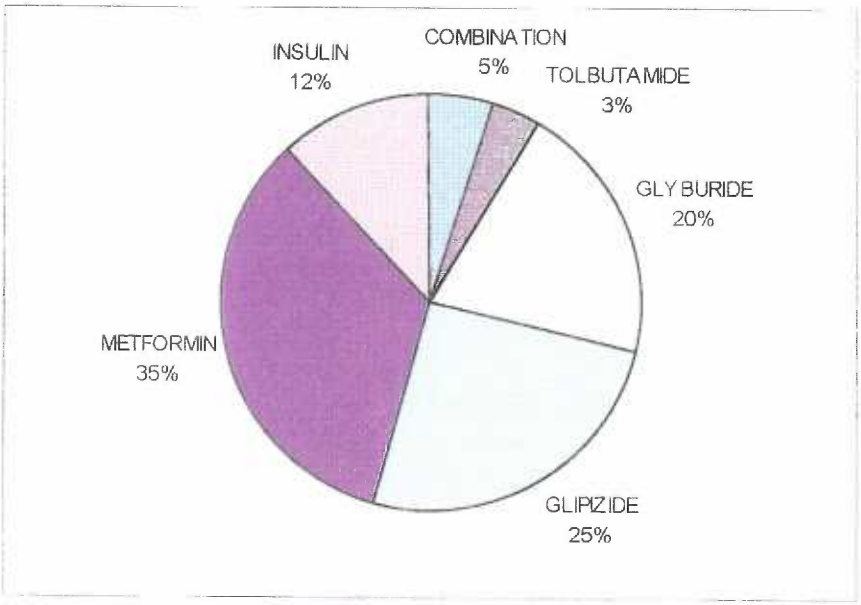



Figure 3. Last $HbA_{1c}$ level of audit year (n=36).

Method of diabetic management. Of the 43 patient records audited, three were managed by diet alone throughout the audit year. The remainder were managed by use of an oral agent, insulin, or a combination of the two. Greater detail of the type of management used is provided in Figure 4.




Combination = oral agent and insulin

Figure 4. Pharmacologic management of hyperglycemia observed in patient sample.

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Eighty-three percent of patients were managed by oral agent alone, Metformin being the most widely oral agent used. Metformin and Acarbose are both relatively new medications. Although Acarbose was released within a year after Metformin, no patients were on Acarbose. The reason for this is unknown.

Data related to the type of oral diabetic medication prescribed and $HbA_{1c}$ levels were collected by the investigator. However, because patient medications were often changed during the audit year, the method of data collection does not allow one to identify what the $HbA_{1c}$ level was at the time the patient was using a particular medication. Therefore, no correlations can be made between $HbA_{1c}$ level and type of medication used.

Concomitant comorbidity. Figure 5 displays the comorbidities present within the diabetic sample. Of the 43 patients, almost half were obese (BMI >27). Twenty-five patients had a coexisting diagnosis of hypertension. Another eight patients, who did not have a diagnosis of hypertension, were observed to be hypertensive (systolic ≥130 or diastolic ≥85 on three separate occasions). In all, 33 of the 43 (77%) patients were hypertensive by provider diagnosis or investigator observation. Because the hyperglycemia of type 2 diabetes is associated with other metabolic abnormalities such as obesity and hypertension, the prevalence of hypertension among the patient sample is an expected finding (Henry, 1996; Nathan, 1995).

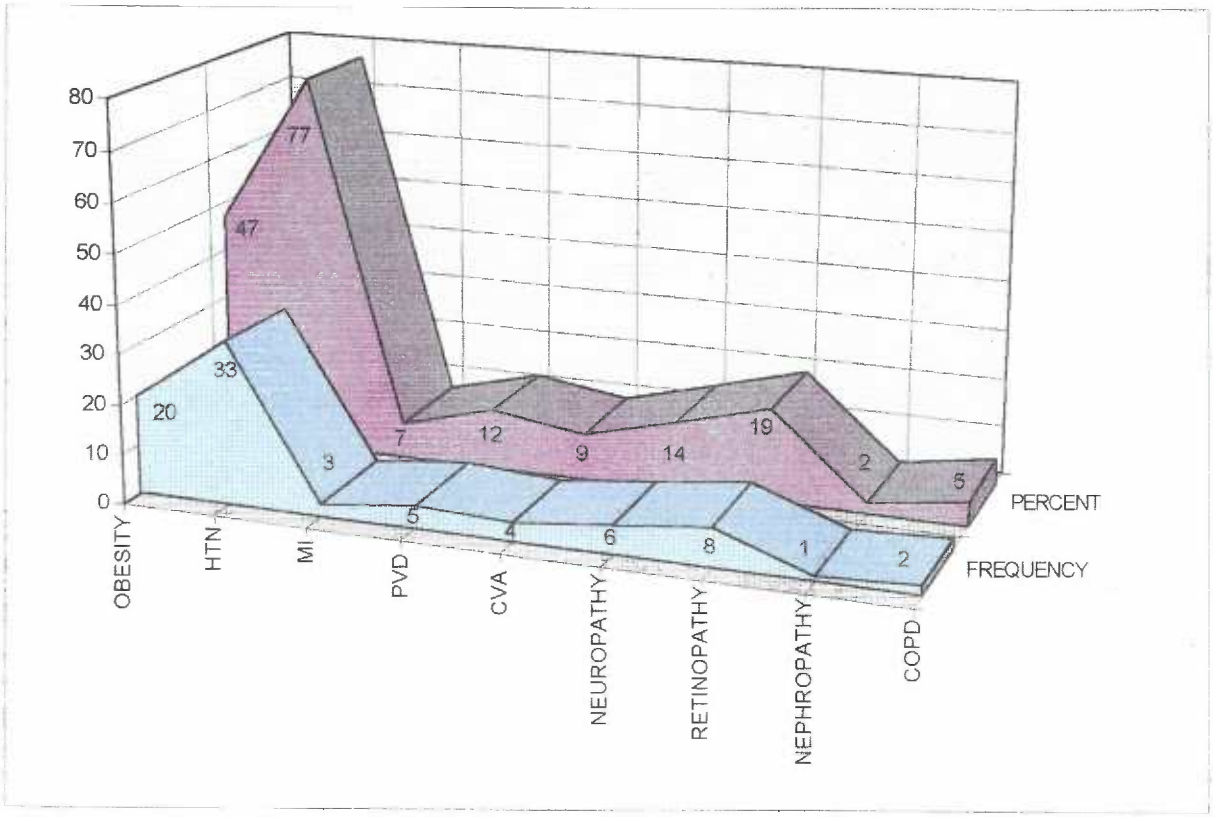


Figure 5. Concomitant comorbidity of diabetic sample (n=43).

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The data were examined for a relationship between the number of comorbidities per patient and $HbA_{1c}$ percent change using a two-tailed test ($n=20$, $r=.25$, $p \leq .05$) and to the last $HbA_{1c}$ level of the audit year using a one tailed-test ($n=36$, $r=.08$, $p \leq .05$). The following formula was used to calculate $HbA_{1c}$ percent change:

$$\% \text{ change} = [(\text{final } HbA_{1c} - \text{initial } HbA_{1c}) / \text{initial } HbA_{1c}] * 100$$

No correlation existed between $HbA_{1c}$ percent change and the number of comorbidites.

Hypertension. Of those patients who had both blood pressure measurements and $HbA_{1c}$s recorded in their chart, those diagnosed with hypertension tended to have higher $HbA_{1c}$s than those who were not diagnosed with hypertension. The mean $HbA_{1c}$ of those with hypertension was 8.15 (SD = 1.32, n=21), the mean $HbA_{1c}$ of those without hypertension was 7.61 (SD = 1.39, n=13). This is a clinically significant finding in light of the increased morbidity and mortality associated with both hypertension and elevated $HbA_{1c}$s. Those patients with poor control of both blood pressure and blood sugar are at greater risk of complications than those patients with only one factor in poor control.

The data were examined for a correlation between the diagnosis of hypertension and the $HbA_{1c}$ percent change using a two-tailed test ($n=20$, $r=.25$, $p \leq .05$). There was no correlation between $HbA_{1c}$ percent change and the presence of hypertension.

Smoking. Of the 43 patients studied, 15 (35%) were screened for current tobacco use. Of those 15, four (27%) currently used tobacco. Because tobacco use compounds the diabetic's risk for macrovascular complication, all diabetic patients should be screened for tobacco use. Then, those who smoke should receive cessation counseling.

Lane County has an estimated tobacco use rate of 22% (OHD, 1997a). The patient sample assessed for tobacco use had a higher percentage than the county at large. However, because only 35% of the sample were assessed for tobacco use it

cannot be determined if the sample population had a higher incidence of smoking than is seen in Lane County at large.

Obesity. Obese patients, for whom an $HbA_{1c}$ had been drawn, had an average $HbA_{1c}$ of 8.08 with a standard deviation of 2.12 (n=17). Nonobese patients, who had an $HbA_{1c}$ drawn, had an average $HbA_{1c}$ of 7.34 with a standard deviation of 1.44 (n=20). Because a $HbA_{1c} > 8$ is associated with a higher incidence of diabetic complications, the $HbA_{1c}$ difference among these obese and nonobese patients is clinically significant. The higher $HbA_{1c}$ observed among obese patients highlights the importance of aggressive treatment of obesity with lifestyle modification to incorporate regular exercise into the daily regimen. The sample did not provide sufficient data for further examination of trends or relationships related to BMI and $HbA_{1c}$.

Patient weight was documented in 36 of the 43 charts (84%); patient height was documented in only 11 charts (26%). Because both height and weight are needed to calculate BMI, it is likely the diagnosis of obesity was not based on BMI. This indicates NPs use other criteria than BMI to diagnose and monitor obesity.

Visit Frequency

As displayed in Table 5, there was a substantial difference in patient visit frequency from one NP to another. Factors that may influence frequency of diabetic patient visits include: whether or not the NP is in independent practice or works in an office with a physician; the NPs' comfort level in caring for patients with diabetes; the

presence of a chart tool reminding the NP of screening procedures; the presence and degree of comorbidity; the patient's diabetic status (i.e. controlled vs. uncontrolled); and payment method. A brief discussion of each of these factors follows.

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Table 5

Frequency of diabetic patient visits per NP's audited charts

| | NP1 | NP2 | NP3 | NP4 | NP5 | NP6 | NP7 | NP8 | NP9 | NP 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number pts | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 2 | 5 | 5 | 43 |
| Mean pt visits | 36.6 | 18.8 | 14.6 | 7.6 | 5.5 | 11.2 | 4.5 | 6 | 5 | 12 | 57.2 |

Independent practice vs. physician in office. A substantial difference in visit frequency was noted between the group of NPs who work without an physician and those who work with a physician. The mean of the mean patient visits of NPs who practice without a physician is 18.75 (SD = 12.76). The mean of the mean patient visits of NPs who practice with a physician is 7.80 (SD = 4.12). A t-test was not performed due to the small sample size (not recommended for samples with less than 10 subjects per group). But the difference between 18.75 and 7.80 average visits per year is substantial. This difference is heavily influenced by one NP with a mean frequency of 36.60 patient visits in the audit year. With that NP's visit frequency removed, the difference is smaller (12.80 vs. 7.80), but still substantial.

NPs practicing independently may have a higher visit frequency for diabetic patients than NPs who practice with a physician. For example, a NP practicing with a

physician may choose to refer complicated diabetic patients to the physician, whereas an NP practicing independently may tend to manage more complicated diabetic patients.

Comfort level in diabetic management. NPs uncomfortable in diabetic management may have the patient return to clinic more often for monitoring whereas NPs with a higher level of comfort in diabetic management may be less anxious, thus choose to have the patient engage in more self-monitoring and return to the clinic less often. For example, the guidelines recommend semiannual $HbA_{1c}$ levels for type 1 diabetics and annual $HbA_{1c}$ levels for type 2 diabetics. An NP less experienced in diabetic management may have the patient return to the clinic for $HbA_{1c}$ every three months, whereas an NP comfortable in diabetic management may perform the $HbA_{1c}$ at the minimal recommended intervals. The sample in this study does not support this hypothesis as all but one NP considered themselves to have a "moderate" level of expertise in diabetic management. The visit frequency of the one NP who ranked herself lower than the others was not as high as some who appraised themselves to be more experienced.

Presence of a chart tool. The presence of the chart audit tool assists the NP to take full advantage of each patient contact. A quick reference check sheet (chart tool), specific to diabetic management, on the front of the patient chart will remind the NP to perform the various tests and procedures that need to done at each visit, annually, and semiannually. Because the NP using a chart tool tends to provide more

comprehensive care at each visit, less visits are needed. Two of the NPs used a chart audit tool. One of the two used the tool on every case, the other used the tool on three of the five cases. Because of the small percentage of NPs using a chart audit tool, no inference can be made regarding the effects of tool use on NP practice.

Comorbidity. It seems reasonable that patients with comorbidity complicating their overall health status would require closer management, therefore more visits. However, when evaluating the data, the investigator found there was no correlation between comorbidity and visit frequency ($n=43$, $r= .09$, $p \leq .05$).

Status of diabetes (controlled vs. uncontrolled). It was expected that there would be a higher visit frequency in patients with poorly controlled diabetes than for those with good control. It seemed reasonable that patients with $HbA_{1c}$ levels above eight would require closer monitoring, education, and possibly medication adjustments, thus more visits. However, the correlation between $HbA_{1c}$ and visit frequency did not exist ($n=36$, $r=.03$, $p \leq .05$).

Patient determination of visit frequency played a significant role in visit frequency. Ten of the 43 patients did not attend scheduled follow-up visits and/or declined referrals for diabetic education. The mean $HbA_{1c}$ among those with missed visits was 8.35 (SD = 2.02). The mean $HbA_{1c}$ of those without missed appointments and/or declined continuing education was 7.31 (SD = 4.15). Complications of diabetes are significantly increased in patients whose $HbA_{1c}$ remains >8.0% (Krolewski, Warram, & Freire, 1996). It is significant to note that those who missed

appointments had a mean $HbA_{1c}$ >8.0. Therefore these patients are not only at increased risk for complications of diabetes, but also may be less likely to obtain early detection and treatment of those complications. Patients whose compliance with follow-up visits and education referrals is poor may suffer greater morbidity and mortality than those with optimal compliance.

Using a two-tailed test the investigator examined the correlation between $HbA_{1c}$ percent change for the audit year and visit frequency. The rationale was that an evaluation of upward or downward trends in $HbA_{1c}$ may be related to visit frequency. For example, a patient with a downward trend may be encouraged to continue with the current treatment regimen with quarterly $HbA_{1c}$s to evaluate progress. A patient with an upward trend in $HbA_{1c}$ however, may require more aggressive management, thus more frequent visits. To compute a $HbA_{1c}$ percent change only those patients who had more than one $HbA_{1c}$ drawn could be included in the sample. This reduced the sample size from 43 to 20. No correlation between hemoglobin percent change and visit frequency existed ($n=20$, $r=.10$, $p \leq .05$). Figure 6 displays the relationship between $HbA_{1c}$ percent change and visit frequency.

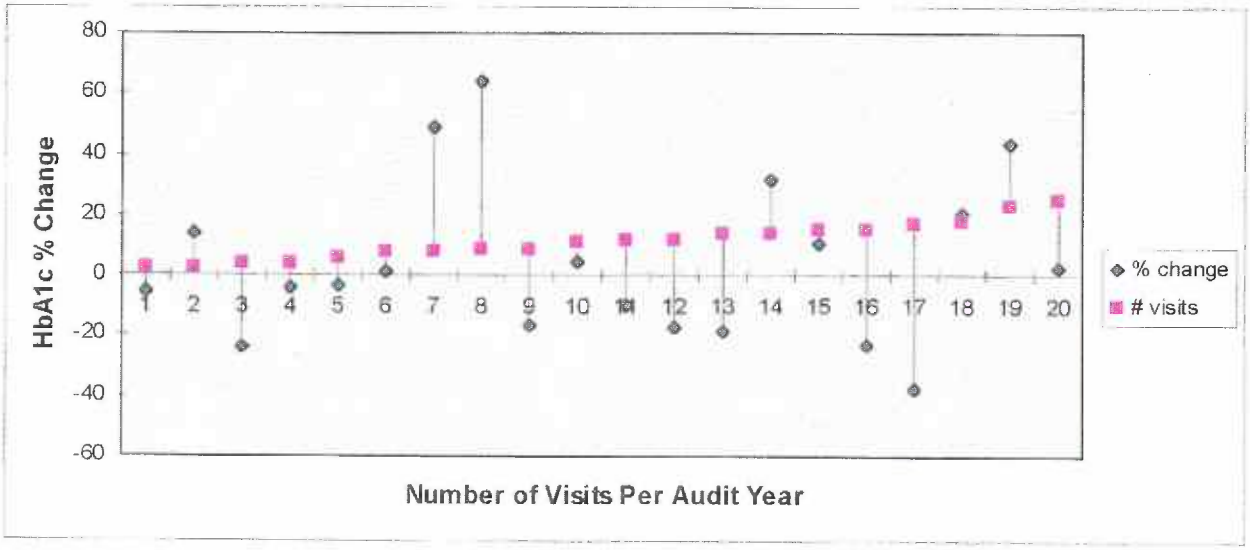



Figure 6. Comparison of visit frequency to $HbA_{1c}$ percent change (n=20).

Payment method. Constraints applied by a third party payor may limit the visit frequency through either capitation or limitations on the patient's number of reimbursable visits. Likewise, the patient without insurance, who is paying out-of-pocket, may choose to limit their visits regardless of the NPs recommended visit frequency. Patient whose status is fee for service may be scheduled for more visits because this directly affects NP income. Increased visit frequency to generate financial income is unethical and may occur in either solo or collaborative practice. No data related to these relationships were collected.

## Research Questions

The research questions are: (1) how often do NPs perform each of the screening activities as recommended by the Population-Based Guidelines for Diabetes Mellitus?; and (2) to what extent are each of the screening activities performed as recommended by the Population-Based Guidelines for Diabetes Mellitus? The following narrative provides response to the research questions.

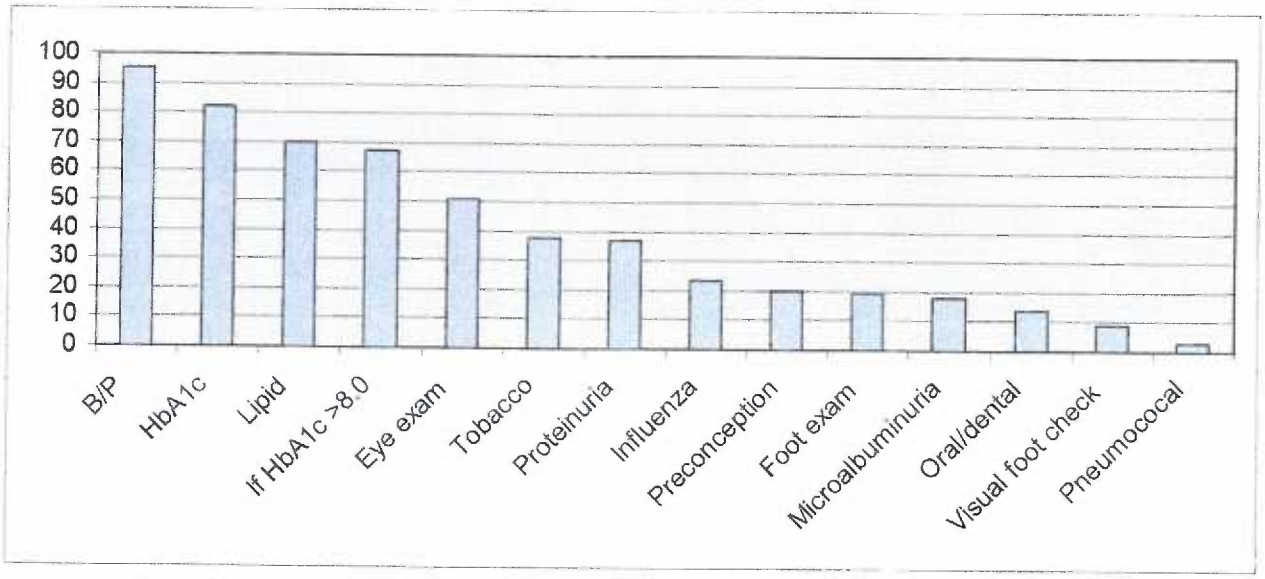
### Screening Activities

To answer the question, how often do NPs perform each of the screening activities, a frequency was obtained of the number of times each of the activities was performed. From this frequency, percentages were calculated and ranked in descending order of activities performed. These percentages were used to answer the question of to what extent are each of the screening activities performed. These percentages are displayed in Table 6. The differing sample size for performance of various activities is because some patients did not fit the criteria requiring the specific activity. For example, tobacco screening need only be done at the time of the initial visit and annually if <25 years of age and if a past user. Otherwise, tobacco screening should be done every five years. Of the 43 charts audited only 39 patients needed to be screened for tobacco use during the audit year.

Table 6

NP performance of screening activities as recommended by the 1997 Population-Based Guidelines for Diabetes Mellitus

| PERFORMANCE OF RECOMMENDED ACTIVITIES | PERCENT |
|---|---|
| Blood pressure screening (n=43) | 95 |
| Glycosylated Hemoglobin (n=43) | 82 |
| Lipid screening 9 (n=43) | 70 |
| If $HbA_{1c}$ >8.0 assessment done (n=19) | 67 |
| Dilated eye exam (n=43) | 51 |
| Tobacco use assessed (n=39) | 38 |
| Screening for proteinuria (n=43) | 37 |
| Influenza Vaccination (n=43) | 23 |
| Preconception Counseling (n=5) | 20 |
| Complete foot exam (n=43) | 19 |
| If UA negative for protienuria microalbuminuria done (n=11) | 18 |
| Oral/dental screening (n=43) | 14 |
| Visual foot inspection each visit (n=43) | 9 |
| Pneumococcal vaccination (n=21) | 3 |




n = number of patients for whom the criteria were relevant.

Of all screening activities, blood pressure assessment had the highest performance frequency (95%). Visual foot exams ranked the lowest at .09%. Criteria for acceptable performance were set by the investigator at ≥ 80%. Performance ≤70% is considered inadequate. Of the 11 recommended screening activities two were performed at a frequency > 80%, one activity was performed at a frequency of 70%, and the remaining eight activities were performed at a frequency < 70%. All procedures performed at <70% are in critical need of improvement.

Management Activities

For each of the screening activities, the guidelines recommend a set of procedures which, for the purposes of this study, are called management activities. These management activities, when performed as recommended, reduce the sequelae associated with the pathology of diabetes detected by the screening activities (ADA, 1994; OHD, 1997).

Although the research question is specific to screening activities, the procedure used to evaluate the performance of screening activities was also applied to management activities. A frequency was obtained of the number of times each of the activities were performed. From this frequency, percentages were calculated using the number of times a given activity was applicable as the denominator, as illustrated in Figure 7. The activity of "assessment" and "management plan" were applicable to only those 19 with $HbA_{1c}$ >8%. Thus, the NP needed to perform the activity of "assessment" and "management plan" with 19 of the patients. The number 19 was

used as the denominator when the percentages were calculated for these activities. The activities were then grouped into categories according to the screening activity with which they corresponded. These results are displayed in the figures and tables which follow.

HbA1c Related Management Activities. Lane County NPs performed $HbA_{1c}$ levels 82% of the time (Figure 7). Although this percent is compatible with the findings of previous studies, NPs would better serve their patients by improving this percent. Based on the NP practices audited, roughly two out of ten patients are not receiving $HbA_{1c}$ evaluations. Given the gravity of sequelae associated with chronic hyperglycemia, patients not optimally monitored may suffer significant morbidity or mortality (DCCT, 1993).

NPs lacked follow-through on those $HbA_{1c}$ levels requiring intervention. Fifty percent (n=19)of the $HbA_{1c}$ levels were >8%. Of that group of 19 patients, only 67% were assessed for behavioral and physiological reasons for unsatisfactory control such as undiagnosed infection, nonadherence, need for medication change, or knowledge deficit. Additionally, of the 19 patients with $HbA_{1c}$ levels >8%, only 56% had a documented management plan based on assessment, including a specific $HbA_{1c}$ target and a specific monitoring schedule.

$HbA_{1c}$ levels indicate average degree of diabetic control over the previous 120 days. The success of diabetic management is determined by levels and trends in $HbA_{1c}$. Research has linked lower $HbA_{1c}$ levels with a decrease in blindness, end-

stage renal disease, lower extremity amputations, and cardiovascular events (ADA, 1995). The goal of a successful management program is an increase in the percentage of the population with $HbA_{1c}$ levels < 8% (OHD, 1997c).

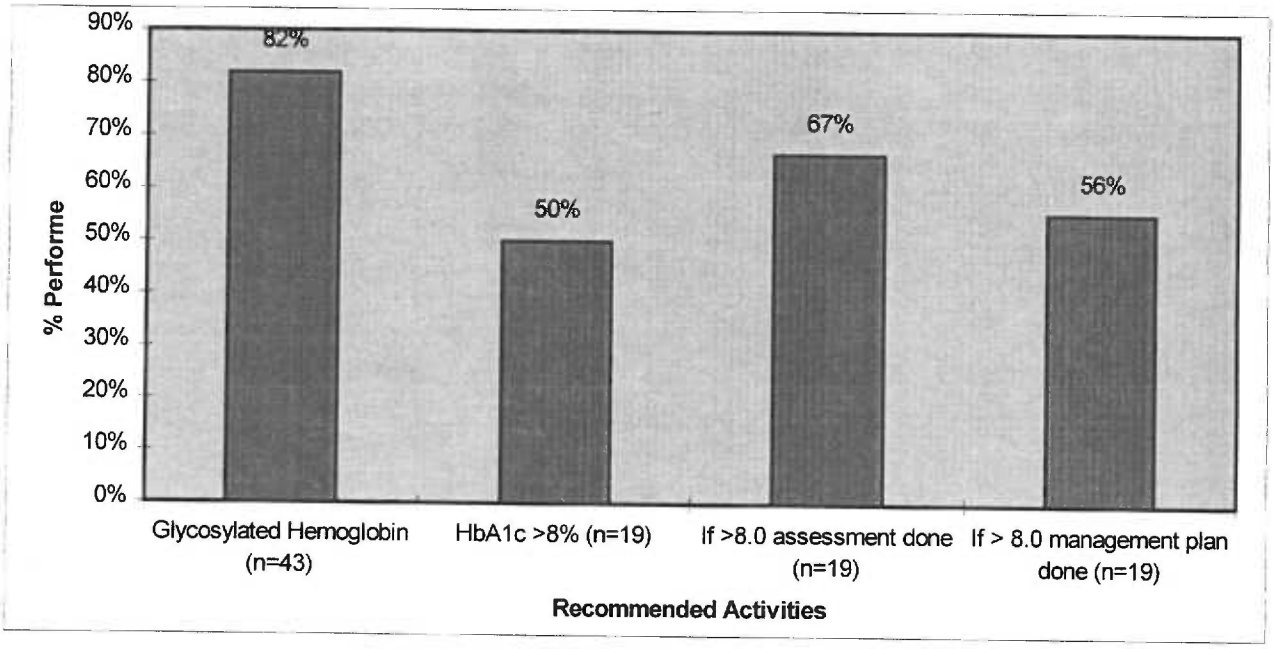



Figure 7. Lane county NP performance of recommended management activities based on $HbA_{1c}$

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For analysis of $HbA_{1c}$ trend, $HbA_{1c}$ percent change was calculated on all patients who had more than one $HbA_{1c}$ drawn during the audit year (n=20). The previously discussed formula was used to calculate $HbA_{1c}$ percent change.

During the audit year NP diabetic management resulted in an improvement in 50% of the patients' $HbA_{1c}$ levels. The other 50%; worsened, no $HbA_{1c}$ levels remained constant. The mean drop in $HbA_{1c}$ was 1.51 (SD = 1.29, n=10). The mean rise was 1.49 (SD = 1.26, n=10). An explanation for the significant rise in $HbA_{1c}$ levels may be linked to the patients who had no assessment or management plan in response to $HbA_{1c}$ levels >8%. A recommendation for future practice is that NPs develop a strategy to improve their follow-up on $HbA_{1c}$ levels >8%.

Patient Education. Diabetes education is an ongoing process. It requires the clear communication of complex, multifaceted concepts, and it must be individualized to the particular status of the patient. Optimal diabetic management requires a team approach. An important component of the team is the certified diabetic educator (CDE). Due to the time constraints in a typical primary care practice, the Population-Based Guidelines for Diabetes Mellitus recommend the use of a CDE when available. In Lane County 15 CDEs are available for patient education and consultation to the NP.

Table 7 displays the frequency with which the sample NPs performed the recommended educational activities. NPs performed better at providing education in their practice setting than they did at providing CDE referrals. Possible variables influencing the lack of CDE referral may be insurance reimbursement for CDE services, lack of patient transportation (especially in rural locations), and a lack of NP

understanding of the importance of the CDE role, or willingness to collaborate with CDEs in diabetic management.

Table 7

Lane County NP performance of recommended guidelines

CDE - Certified Diabetic Educator

| Recommended Education Activity | Frequency | Percent |
|---|---|---|
| Educated within 1 week of diagnosis if type 1; 6 weeks if type 2. (n=5) | 4 | 80 |
| CDE referral (n=5) | 2 | 40 |
| Self-management behavioral goals individualized annually. (n=38) | 25 | 66 |
| CDE referral (n=38) | 9 | 26 |
| Educational assessment within 1 week of hospital discharge or onset of new complication. (n=25) | 19 | 76 |
| CDE referral (n=25) | 8 | 32 |
| Education regarding new therapy at time of initiation of new therapy. (n=21) | 15 | 71 |
| CDE referral (n=21) | 5 | 24 |

n = number of patients for whom the criteria were relevant.

The day to day management of diabetes is largely a patient responsibility. It requires daily adherence by the patient to the therapeutic regimen. The patient's ability to adhere to the therapeutic regime is largely dependent upon initial and

ongoing self-care education. An uneducated patient cannot make good self-care decisions. NP performance in the area of patient education was between 60-80%, and between 12-40% in terms of CDE referrals. These education related percentages may contribute to the $HbA_{1c}$ percent change over the audit year (50% of the patient sample had an increase in $HbA_{1c}$ levels). As NP performance in diabetic education and CDE referral improve, $HbA_{1c}$ levels should also improve. Patient education has been shown to translate to increased self-management skills, including self-glucose monitoring, compliance with overall management, improved $HbA_{1c}$, and a reduction in complication incidence (NIDDKD, 1995).

Dilated eye exam. No NPs performed dilated eye exams. All exams were done via referral to an ophthalmologist. The ophthalmologist report of exam results in the patient chart was taken as evidence that the dilated eye exam was done. Of the 43 charts audited, 22 were referred for a dilated eye exam by an ophthalmologist in the audit period. Thirteen of the 22 patients (59%) were found to have eye changes requiring ongoing management by the ophthalmologist. Because the patient was in the care of an ophthalmologist at the time of diagnosis of eye pathology, all patients with positive findings received eye care. This system of referral is highly beneficial to the patient. Unfortunately 49% of the patient sample did not receive such care. The dilated eye exam is necessary for the detection and treatment of proliferative retinopathy and prevention of blindness. It is recommended that NPs develop

strategies to enhance their referral rate for annual dilated eye exams by an ophthalmologist.

Foot screening. Data were collected to assess the frequency with which the visual foot inspection and annual exam were performed. Foot inspection is recommended at each visit; complete foot exam, assessment and risk categorization should be done annually. If positive foot findings are present, the patient should be provided risk categorization, education for self-care of the feet, and an assessment of metabolic control.

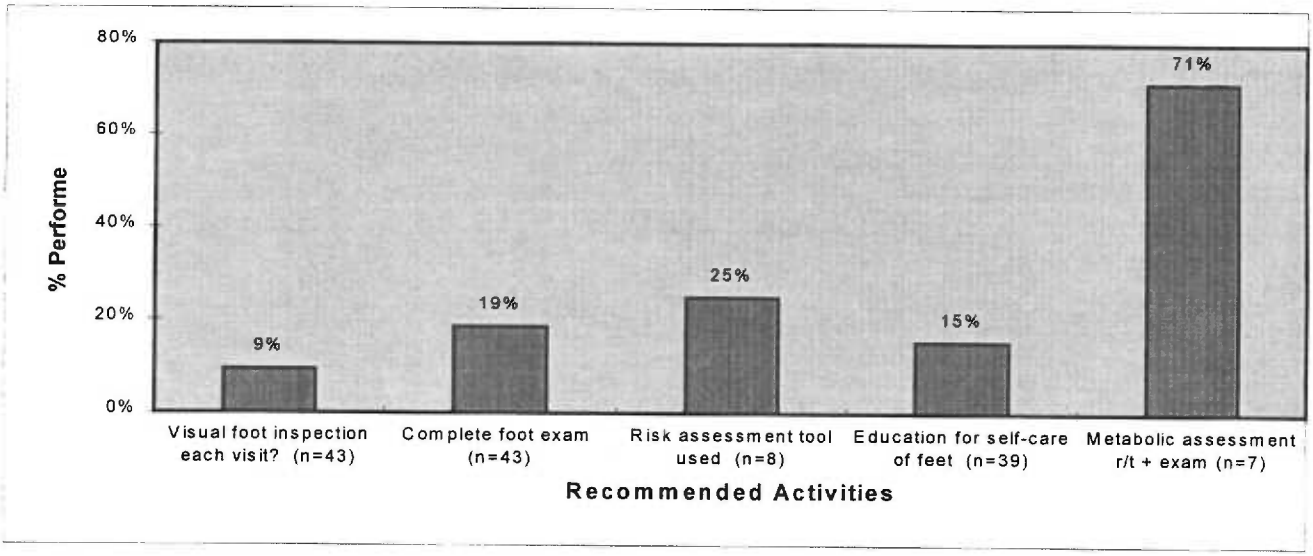


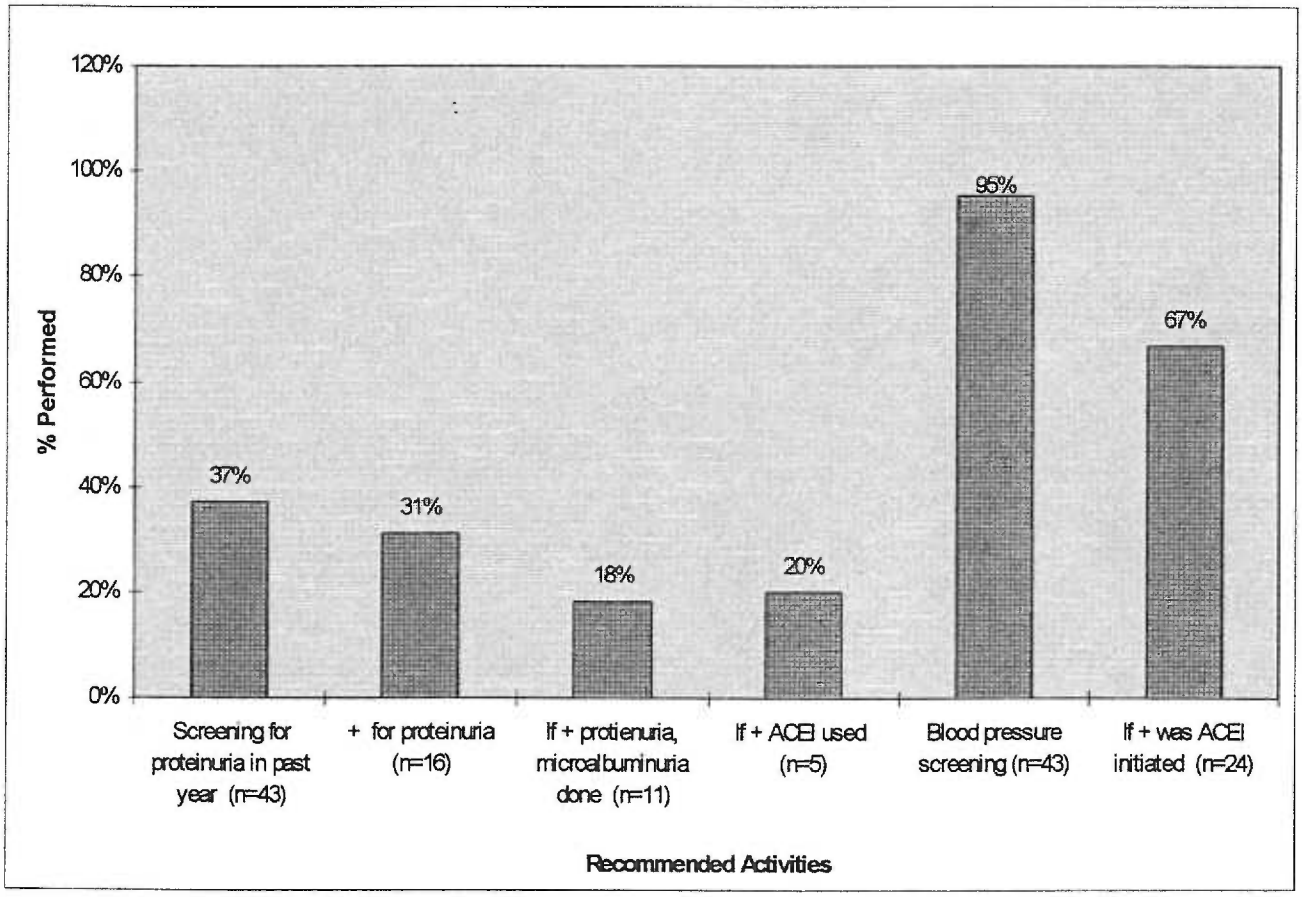

Figure 8. Lane County NP performance of foot screening activities per guideline recommendations.

n = number of patients for whom the criteria were relevant

NPs performed best in the area assessment of metabolic control when a foot assessment was positive (Figure 8). This indicates that NPs who do foot exams understand the relationship between metabolic control and diabetic related foot problems. However, the NP sample as a whole performed complete annual foot exams on only 16 of the 43 patients audited (19%); and visual foot inspection at each visit on only 4 of the 43 patients (9%). Audit results specific to foot screening are provided in Figure 9. Several factors may contribute to the lack of foot exams. There may exist a lack of understanding on the part of the NP of the importance of regular foot inspection and assessment by the primary care provider, and/or a lack of NP competence in foot risk assessment and categorization, or an NP perception that patients should be doing their own foot care, and/or a perceived lack of time to do foot assessments.

To facilitate foot inspection, the Diabetes Guidelines Advisory Group recommends that providers adopt the policy that the patient has shoes and socks off at every visit (OHD, 1997c). The advisory group also suggests that the primary care provider consider training other clinic staff to perform visual foot inspections. In this manner, the same assistant who does the routine vital sign check could also do the foot inspection. Lane County NPs would improve their alignment with the recommendations for foot inspections if these recommendations were adopted.

Early nephropathy detection and blood pressure screening. Nephropathy and blood pressure screening are discussed together because persistent hypertension is often a manifestation of diabetic nephropathy, as indicated by concomitant elevated levels of urinary albumin (ADA, 1994). The percentages at which nephropathy and blood pressure activities were performed are displayed in Figure 9.




n = number of patients for whom the criteria were relevant.

Figure 9. Lane County NP performance of early nephropathy detection and blood pressure screening activities per guideline recommendations.

The NPs performed blood pressure checks at a frequency of 95%. This is probably due to the practice of having the office assistant check the patient's vital signs when taking the patient to the exam room, a typical procedure in most primary care practices.

It should be noted that although blood pressures were assessed they were not necessarily attended to. Of the 24 patients who were found to have blood pressures meeting the criteria for management with an ACEI, only 16 were treated per the recommendations. Although NPs did a good job of gathering blood pressures, they did not adequately treat elevated blood pressures.

Of the 43 patient charts audited, 16 (37%) patients were screened for proteinuria and 27 (63%) were not screened for proteinuria. Of the 16 screened, five (31%) were positive for proteinuria. If the percent positive for proteinuria were to hold true for those not tested, then eight patients positive for proteinuria went undetected. The use of the reagent strip for the screening of proteinuria is quick, easy, and inexpensive. The cost is approximately 60 cents per test ($60 for a canister of 100 reagent strips). Screening for microalbuminuria, however, is more complex and costly. A single screen requires the acquisition of a 24 hour urine specimen at the cost $53.02 if billed to the patient, or $34.43 if billed to the provider, through Oregon Medical Laboratories, the only local laboratory in Lane County. It is possible, although not justified, that there may be a reluctance to screen for microalbuminuria

because of its encumbrance and cost. However, there was no indication in the chart notes that this possible reluctance was the reason for the lack of microalbuminuria screening observed in the study.

Early nephropathy detection is critical to the prevention of overt nephropathy and end-stage renal disease. Improvement in screening for proteinuria and microalbuminuria should be a priority when considering strategies to improve screening for complications of diabetes. The activities of screening for microalbuminuria and initiation of an ACEI were performed at less than optimal percentages; however, the small sample size limits generalizations.

Lipid screening, tobacco use assessment, and aspirin (ASA) prophylaxis. Lipid screening, tobacco use assessment, and aspirin prophylaxis target risk factors specific to myocardial infarction (MI), cerebrovascular accidents (CVA), and other vascular diseases (OHD, 1997b). NP performance in these three areas are outlined in Table 8.

The Population-Based Guidelines for Diabetes Mellitus recommend all diabetic patients over age 18 be provided an annual fasting lipid profile with LDL risk categorization. If the LDL is <130 mg/dL on two consecutive values, the screening may be decreased to every one to five years. If the LDL is >130 mg/dL, the primary care provider is to provide intervention per the National Cholesterol Education Program (NCEP) guidelines.

The sample NPs performed lipid screening at a 70% frequency. Of those screened, 82% who were found to have a LDL ≥ 130mg/dL were provided dyslipidemia management per NCEP guidelines. This indicates that NPs who screen for dyslipidemia are likely to follow-up and treat. Of the ten NPs included in the sample, eight performed almost all of the lipid screening, six performed lipid screening on all of their charts audited. Thus, two of the NPs in the sample were primarily responsible for the 30% of patients who were not provided lipid screening. The lack of screening may be due to a knowledge gap in specific NPs rather than the NP group as a whole. If this assumption is accurate, peer review and consultation may be useful in improving overall NP performance.

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Table 8

Lane County NP performance of lipid screening, tobacco use assessment, and aspirin prophylaxis

| Recommended Activity | Count | Percent |
|---|---|---|
| Lipid screening in past year unless <130 mg on 2 consecutive occasions (n=43) | 30 | 70% |
| LDL >129 mg/dL (n=30) | 17 | 57% |
| If + follow-up per NCEP guidelines (n=17) | 14 | 82% |
| Tobacco use assessed in last year (n=39) | 15 | 38% |
| If + was counsel on tobacco cessation done each visit (n=4) | 3 | 75% |
| Aspirin prophylaxis (n=39) | 15 | 38% |

Of the 43 patient charts audited, 39 fit the guideline criteria requiring annual tobacco use assessment. Of those 39, 15 were assessed for tobacco use (38%). Of those 15, four used tobacco (27%). Of those four, three were provided tobacco cessation counseling as recommend by the AHCPR (75%). Because of the small sample size of patients assessed for tobacco use, and the small percent of those found to use, generalizations are limited. However, the findings do indicate Lane County NPs who provide primary care to persons with diabetes could improve their frequency in screening for tobacco use. It is estimated 22% of adults in Lane County use tobacco (Oregon Heath Division, 1997a), therefore it is important that screening is provided so that those who use are offered intervention. Many clinics are including tobacco use assessment with their routine vital sign check. Adopting this practice would improve the local NPs performance in routine tobacco use screening.

There were no NPs who consistently provided ASA prophylaxis. This indicates all Lane County primary care NP practices would benefit from education and efforts to improve performance in this area. The reason for the lack of ASA prophylasis use is unknown.

Oral/dental screening, immunizations, and preconception counseling. The NP sample performance in the area of oral/dental screening, immunizations, and preconception counseling are outlined in Table 9. The performance of oral/dental screening was very low. Of the four patients with findings warranting dental care, only one was referred to a dentist. One possible explanation is that lack of third party

payor coverage for dental care may contribute to the low screening and referral rate. However, if this were the case, it seems reasonable that this would be documented in the chart as a health care problem. Another more likely explanation is that this recommendation is quite new. It was not included in the 1995 provisional guidelines. The frequency of oral/dental screening may improve with thorough dissemination of the 1997 guidelines.

| Recommended Activity | Frequency | Percent |
|---|---|---|
| Oral/dental screening (n=43) | 6 | 14 |
| If + referral to dentist done (n=4) | 1 | 25 |
| Influenza vaccine in past year (n=43) | 10 | 23 |
| Pneumococal vaccine if indicated (n=32) | 1 | 3 |
| Preconception counseling if indicated (n=5) | 1 | 20 |

Table 9

Lane County NP performance of oral/dental screening, immunizations, and preconception counseling

Both influenza and pneumococcal vaccination were performed at very low rates. This possibly is due to immunizations being offered through Lane County health programs for less cost than what is offered by most clinics and primary care provider offices. For example, it was observed in one office that the charge for influenza

vaccination was $16.00. Through a local county agency the same vaccination was available for only $2.00. Thus patients could be choosing to go to sources other than their primary care provider for routine vaccinations, and if not documented, this could go undetected by the investigator.

Preconception counseling is recommended at the initial visit or upon reaching childbearing age with additional counseling if there is indication of change in pregnancy probability. Within the patient sample five females fit the criteria for preconception counseling. Of this five, the recommended service was documented for one patient (20%). This subset of the sample is too small in number to have significant application to the sample group. However, Lane County NPs should consider preconception counseling when implementing strategies to improve their performance of the diabetic guidelines.

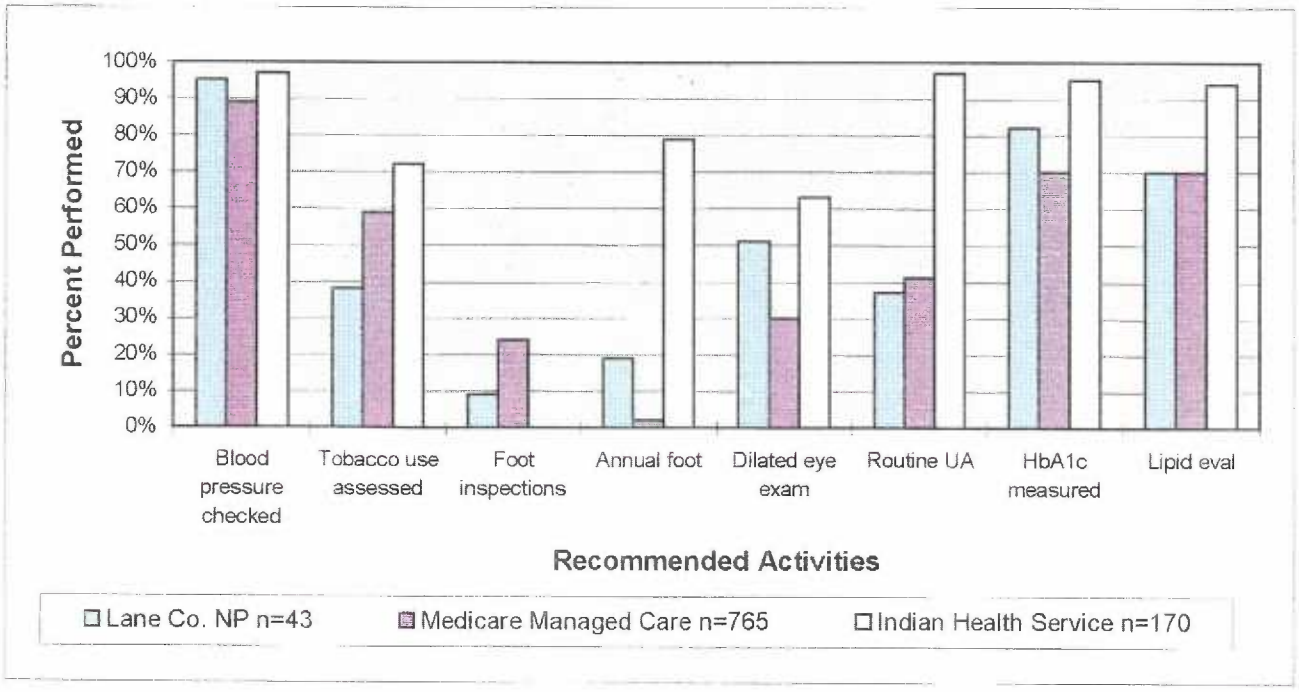
Nurse Practitioner Performance In Relation to Other Care Providers

Three previous studies have evaluated medical record reviews to examine the quality of diabetes care in Oregon (OHD, 1997b). The first of these studies, the Medicare Risk Managed Care Outpatient Diabetes Review, conducted by the Oregon Medical Professional Review Organization, gathered data from July 1, 1993, through June 30, 1995. They evaluated 765 charts for indicators of physician diabetic care. The second study, entitled the Health Status of Diabetic Patients, was conducted by the Indian Health Service. This study evaluated 170 charts from October 1, 1995 through September 30, 1996 for indicators of diabetic care. The third study, entitled

The Behavioral Risk Factor Surveillance System (BRFSS), by the OHD, audited 481 charts for indicators of diabetic care. These three studies vary in samples evaluated and methodologies of the audits.

The findings of this study were compared to findings of the three previous studies of diabetic screening in primary care settings. The previous studies did not evaluate all twelve activities recommended by the 1997 Oregon Diabetic Guidelines. Thus, of the twelve procedures evaluated by this study, only eight could be compared with findings of the previous studies of primary care provider practice. Figure 10 displays the comparison of Lane County NP practice to the three previous studies evaluating provider practice of screening for diabetic complications. This comparison sheds light on how Lane County NPs are doing in relation to other health care providers in Oregon. Information concerning foot inspection visit were not available from the BRFSS and Indian Health Service study, thus that information is not displayed in the graph.

Figure 10. Comparison of diabetic screening activities of Lane County NPs to other Oregon providers




The Indian Health Services performed four of the targeted activities at >90% frequency. Only one of the activities, dilated eye exams, was performed at <70% frequency. No data was available on the Indian Health Service frequency of foot inspections. All three groups of providers performed blood pressure checks at a >90% frequency. Both the Lane County NPs and Medicare primary care providers performed tobacco use assessment, foot inspections, annual foot evaluations, dilated eye exams, and routine UAs at a <70% frequency, indicating a need for improvement in these areas.

In the 1980s the Indian Health Service recognized their need to attend to the rapidly increasing incidence of diabetes among the American Indian population (Stracqualursi, Gohdes, Rith-Najarian, Hosey, & Lundgren, 1993). In order to improve the delivery of care to persons with diabetes, the Indian Health Service established a coordinated, multidisciplinary diabetes team with regular meetings, acceptance of standards of care by the medical staff, use of flow sheet by multiple providers, and diabetes-related professional and patient education sessions (Acton, Valway, Helgerson, Huy, Smith, Chapman, & Gohdes, 1993). This effort has since been supported with annual standardized chart audits designed to evaluate the delivery of diabetic care and the screening for complications of diabetes. As demonstrated in Figure 7, the Indian Health Service has made substantial advances in improving care to their diabetic patients, the above figure demonstrates the results of their efforts. They have set a good example for other health care providers in Oregon to follow. It is recommended that Lane County NPs consult with the Indian Health Service when planning strategies to improve NP screening for complications of diabetes.

## Conclusion

The Population-Based Guidelines for Diabetes Mellitus provide a set of recommendations for screening and management of diabetic complications, that if implemented, would substantially decrease the morbidity, mortality, and financial expense association with complications of diabetes. The study was based on assumptions suggesting that chart audits provide an accurate report of screening activities, and that the tendency for low physician alignment with diabetic guidelines could also apply to NPs. The conceptual framework for the study was that the Population-Based Guidelines for Diabetes Mellitus will be the Oregon standard by which diabetic care is measured. The closer NP practice aligns with the guidelines, the greater the quality of care being delivered to diabetic patients. Finally, it was believed the research findings would be of interest to both the NPs and the OHD in evaluation of the efficacy of the guidelines.

Through the application of descriptive statistics the data provided answers to the two research question (1) how often do NPs perform each of the screening activities as recommended by the Population-Based Guidelines for Diabetes Mellitus?; and (2) to what extent are each of the screening activities performed as recommended by the Population-Based Guidelines for Diabetes Mellitus?

An assumption at the onset of the study was that the lack of physician alignment with diabetic guidelines may extend to NPs. The data suggest that NPs are in fact similar to physicians in their performance of the diabetic guidelines. In

comparison to research findings of Oregon physician practices (OHD, 1997c), NPs demonstrated comparable alignment, with the exception of the providers in the Indian Health Service system. The Indian Health Service providers performed far better than other groups.

NPs demonstrated the best alignment with the guidelines in the area of blood pressure screening (95%). NPs demonstrated good alignment with annual and semiannual $HbA_{1c}$ levels (82%). NPs demonstrated the lowest level of alignment in the areas of visual foot inspection (9%) and oral/dental screening (14%). Activities performed less than 70% were considered to be in need of improvement. Those areas include activities related to patient education, eye examination, foot screening, early nephropathy detection, lipid screening, tobacco use assessment, aspirin prophylaxis, oral/dental screening, immunizations, and preconception counseling. A lower level of alignment with the guidelines was expected in those areas that are relatively newer recommendations, such as aspirin and ACEI recommendations for diabetics. However, recommendations regarding vaccinations, foot care, and eye care have been well established for several years. Thus, a higher level of alignment was expected in those areas. All areas where alignment is <70% should be attended to in a manner that improves the delivery of health care to persons with diabetes.

The data suggest the generally low NP alignment with the guidelines may be due to a lack of familiarity with the guidelines and a lack of NP preparation for diabetic management on the part of advanced practice nursing education programs.

NPs in independent practice were found to have a higher visit frequency than those who practiced with a physician. The higher visit frequency did not correlate with improvements in $HbA_{1c}$ levels or presence of comorbidity.

This study provided a baseline of NP practice patterns of screening for diabetic complications shortly after the printing of the Population-Based Guidelines for Diabetes Mellitus. The study identifies many areas in need of improvement. Lane County NPs can use the study findings for the development of strategies to improve practice patterns. A reevaluation of practice patterns after increased dissemination and showcasing of the guidelines would be useful for evaluation of the effectiveness of those strategies.

## Recommendations for Practice

### Visit Frequency

The NP sample had a high level of variability in frequency of patient visits. Chart documentation did not generally justify the frequency. Nor did an increased frequency of visits correlate with improved patient outcomes as indicated by $HbA_{1c}$ levels. The investigator recommends that NPs reevaluate practice patterns related to visit frequency and adjust the frequency to the need of the patient. In general, diabetic patients require a high level of management. The cost associated with closer observation and management is far less than the cost of morbidity associated with inadequate management and control.

In today's outcome conscious practice environment, it is necessary that NPs adequately articulate reasons for visit frequency and care delivered. NPs should be careful to document their plan of care, treatment goals, and patient outcomes in a manner that provides clear justification of care delivered. NPs may benefit from engaging in peer review and reflective practice using $HbA_{1c}$ and blood glucose levels to evaluate the effectiveness of the service they provide their diabetic patients.

Immunizations

Influenza and pneumococcal vaccination has long been recommended for all persons aged 2-64 years of age who are at increased risk of complications related to pneumococcal and/or influenza infection. To prevent doubt that the NP is providing care according to standards, the investigator suggests the NP document in the patient record any vaccinations that are obtained from sources other than the NP.

Strategies to Improve Alignment with Diabetic Guidelines

The study findings indicate that a local collaborative effort to improve diabetic screening and management would benefit diabetic patients in Lane County. The investigator recommends that local NPs develop and engage in a cooperative project with the goal of improving care to diabetic patients. Evaluation of the project should be both outcome (i.e. $HbA_{1c}$) and performance based (i.e. percent compliant). Project design could be facilitated by seeking advice from agencies experienced in program implementation targeted at diabetic care improvement. Such agencies include the Indian Health Service, the OHD, and local CDEs.

Strategies that assist the provider to attend to the needs of the diabetic patient could be incorporated into each of the clinic settings studied. One such strategy is the development and use a chart tool to track screening and management services. Standardization of the chart tool throughout the county and/or the State would greatly facilitate peer review. Another strategy is the adoption of the policy that diabetic patients remove shoes and socks at every clinic visit. This action will serve to prompt the NP and the patient to examine feet at every clinic visit.

The use of peer review and consultation could serve as a powerful tool to motivate and improve overall NP performance in diabetic care. Peer review should be done in a manner that encourages collaborative support, acceptance of standards of care for diabetes management, and ongoing professional development through the sharing of expertise. The peer review should occur on a regular basis, such as biannually or annually. The standardization of the chart audit tool would simplify peer review.

A program to improve diabetic management should include formal continuing NP education specific to diabetes. The education content should include information that will increase familiarity with the Population-Based Guidelines for Diabetes Mellitus and rationale for the recommendations. An example of how this could be achieved is to offer continuing education of diabetic management in primary care at the annual Oregon Nurse Practitioner Organization meeting. Similar education programs could

also be made available at local and regional NP educational functions. The findings of this and subsequent studies should be used to target NP educational needs.

Finally, the investigator recommends the OHD use the findings of this and other similar studies to evaluate the efficacy the Population-Based Guidelines for Diabetes Mellitus. Thought should be given to possible causes of gaps between guideline recommendations and actual practice patterns. Barriers to provider implementation of the guidelines should be identified, and if possible, attended to. In order for the guidelines to be useful, the clinician must be provided a practice environment that supports the use of the guidelines. The implementation of population based recommendations require support of the recommendations at all levels of the patient care system. The entire system's infrastructure must be designed to support population based care recommendations in a manner that allows the clinician at the bedside to implement those recommendations.

## Recommendations for Future Research and Education

Examination of advanced practice nursing education specific to preparing NPs for diabetes management needs to occur. Most of the NPs in this study graduated more than 10 years ago. It is possible that more recent graduates may rate the quality of diabetes management education received in their NP preparation program very differently than earlier graduates. This is an important possibility to explore before making any judgments on current NP education preparation.

The lack of NP familiarity with the guidelines indicates there may be benefit from research that identifies the effectiveness of the dissemination of the 1997 guidelines. The guidelines were disseminated to primary care providers, state wide, from March through September, 1997. The investigator gathered data from mid-July through mid-September, 1997. Because data were gathered during the guideline dissemination process, it may be that the lack of NP familiarity with the guidelines was due to the little amount of time they had to review the guidelines before the initiation of this study. An evaluation of NP familiarly with the guidelines 3-6 months after their dissemination would provide a better appraisal of the effectiveness of the dissemination process.

Diabetic patients may benefit from research that identifies barriers to improvement in NP alignment with diabetic guidelines. Possible barriers to alignment may include provider time constraints; financial constrains on the part of the patient or the third party payor; institutional barriers within the place of NP employment; and lack of NP knowledge of the pathology of diabetes and management of the disease process.

Other investigators wanting to use this study design and chart audit tool may want to consider some modifications to the study. First, the investigator recommends the collection of $HbA_{1c}$ data in a manner that allows for correlation of diabetic control to method of diabetic management. Although this topic is not specific to evaluation of alignment with the guidelines, it is useful data that can easily be collected during

the chart audit process. Second, subsequent investigators should increase chart sample (case) size. The investigator recommends a minimum of 10 cases per primary care provider. The larger sample will improve statistical analysis and allow for identification of trends and differences in study findings.

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# Appendix A

Nurse Practitioner Patterns

IRB # _____
August 15, 1997

Dear _____,

I am a student in the master's program at Oregon Health Sciences University (OHSU)School of Nursing studying to become a Family Nurse Practitioner. For my research project, I have chosen to study the screening for complications of diabetes mellitus by nurse practitioners in Lane county. The study will be conducted under the supervision of Katherine Crabtree, DNSc., ANP, Associate Professor at OHSU School of Nursing, (503) 494-3828.

The purpose of this letter is to invite your participation in the study. Your participation is voluntary and would entail granting me permission to perform a chart audit of randomly selected patients with diabetes mellitus to whom you have provided care during the past year. I will ask you to complete a demographic questionnaire two pages in length and I will need your assistance in identifying the charts for audit. I will also ask you, or a designate, to briefly orient me to your record system. The total time required for your participation is expected to be 30 minutes. The chart audit will occur during the month of September. The time spent in your agency is expected to be less than four hours. I will schedule the audit at a time most conducive to your schedule, and in a manner that does not interrupt your office practice. The entire chart audit will be conducted in one setting and no charts will be removed from your agency. While performing the audit I will occupy a desk in your agency which will be designated by yourself or your agency personnel.

The study has been approved by the Committee on Human Research, the Institutional Review Board, for OHSU. Approval will be obtained from your agency's Institutional Review Board before initiation of the chart audit. The study is designed to protect confidentiality for all nurse practitioner participants, their agencies, and their patients. There will be no link between the findings of the study and any specific nurse practitioner, agency, or patient. Subjects will be assigned code numbers and data will be reported in aggregate form. Data will be kept a locked file to which only the investigator has access. Results will not be disclosed to an employer about any individual. Results will be available only in aggregate form.

Please feel free to contact me at (541) 896-3760 if you have any questions. I am available at that number at most times; however, in the event I am not there at the time of your call, there is a message machine at that number and I will return your call as soon as possible. I can also be reached by e-mail at blasej@aol.com. I check my e-mail daily and will promptly respond to your message.

Please complete and return the enclosed questionnaire and consent form no later than August 30. Thank you for your cooperation with this study. I look forward to hearing from you.

Sincerely,

Jody Blase RN

PO Box 370
Walterville, OR 97489
(541) 896-3760
blasej@aol.com

Appendix B

# NP Sample Demographics

**Inclusion Criteria**

1. Length of Practice at current site _____

2. Estimated number of current diabetic patients who have been under your care for a minimum of one year _____

**Demographics**

1. Years of experience as a Nurse Practitioner _____

2. Average hours worked each week (include all paid and volunteer work) _____

3. Specialty _____ FNP _____ ANP _____ GNP _____ Other, please specify _____

4. Population size of community in which majority of your practice occurs:
   - _____ < 25,000
   - _____ 25,000 - 49,999
   - _____ 50,000 - 74,999
   - _____ 75,000 - 99,999
   - _____ > 100,000

5. How would you rate your **familiarity** with 1997 Population-Based Guidelines for Diabetes Mellitus:
   - _____ Not at all familiar
   - _____ Very little familiarity
   - _____ Somewhat familiar
   - _____ Moderate amount of familiarity
   - _____ A great deal of familiarity

6. How would you rate your **interest** in diabetes care and management?
   - _____ Not at all interested
   - _____ Very little interest
   - _____ Somewhat interested
   - _____ Moderate amount of interest
   - _____ A great deal of interest

7. How would you rate your level of **expertise** in diabetes care and management?
   - _____ No expertise
   - _____ Very little expertise
   - _____ Somewhat of an expert
   - _____ Moderate expertise
   - _____ A great deal of expertise

8. Have you received **continuing education in diabetes management** in the past year? ___No ___Yes
   If yes, approximately how many hours? _____
   Which type of education did you receive? (mark all that apply)
   - _____ Reading journal articles and/or books
   - _____ Attended conferences
   - _____ Media/CD learning
   - _____ Spending time with an expert
   - _____ Consulting with knowledgeable peer over a particular case
   - _____ Other, please explain _____

9. Highest degree in Nursing:
   - _____ Associate
   - _____ Diploma
   - _____ Baccalaureate
   - _____ Certificate
   - _____ Master's
   - _____ Post Master's
   - _____ Doctoral

10. How would you rate the diabetes management education you received in your NP preparation program?
   - _____ No significant diabetic management education
   - _____ Very little diabetic management education
   - _____ Moderate amount of diabetic management education
   - _____ Fairly significant amount of diabetic management education
   - _____ Very thorough diabetic management education

11. Gender: _____ Male _____ Female

12. Age _____

13. Optional: Ethnicity
   - _____ Asian-American
   - _____ African - American
   - _____ Caucasian
   - _____ Hispanic - American
   - _____ Native - American
   - _____ Other, please specify _____

# Appendix C

IRB #4568
Date Approved: 8/6/1997

OREGON HEALTH SCIENCES UNIVERSITY
Consent Form

TITLE.

Nurse Practitioner Patterns of Screening for Diabetic Complications.

PRINCIPAL INVESTIGATOR.

Jody Blase RN, (541) 896-3760

PURPOSE.

You have been invited to participate in this research study because you are a Nurse Practitioner who delivers primary care to persons with diabetes in Lane County. The purpose of this study is to describe and evaluate the practice patterns of nurse practitioners in Lane County in relation to the screening of persons with diabetes for complications of diabetes. The data for this study will be gathered via chart audit and a two page demographic questionnaire. The expected amount of time required of the subjects is 35 minutes.

PROCEDURES.

The first step is to complete and return the demographic questionnaire and consent form. There is a pre-addressed, stamped envelope enclosed that you may use for the return mailing. From the information provided in the demographic questionnaire the investigator will determine whether or not you fit the inclusion criteria for the study. To be included in the study you must have worked in your current place of employment for one year and have provided primary care to at least two persons with diabetes during the past year. If you are not included in the study, I will send you a letter informing you. If you are included in the study, I will notify you by telephone, and schedule a time to do the chart audits.

You will be asked to identify and collect all of your diabetic charts, from those charts a random sample of five charts will selected and audited. At the time of the chart audits either yourself, or another designated individual, will be asked to provide a brief introduction to the charting procedures of the agency. The goal of the introduction to the charting practices is to gain a thorough understanding of the chart set-up and the charting practices of all persons who make entries into the chart. This will minimize the chance that critical data within the chart will be missed or overlooked.

The chart audit will be completed in your office or medical records area using a prepared chart audit tool. No identifying patient information will be reported. The audit time is expected to take approximately one-half hour per chart. The chart audit will span the time period from July 1, 1996 to June 30, 1997. The investigator will read all clinical and lab entries for information related to the screening for diabetic complications. Each time the investigator encounters any of the targeted procedures, the occurrence will be recorded. Data that will be recorded include (1) screening procedures ordered, recommended, or performed by yourself; (2) screening procedures ordered by another provider in the agency practice, or a provider outside the practice (i.e., a student).

The data collected from your practice will be compiled with the data collected from all the other practices studied. All findings will be pooled and reported in aggregates, so no individual nurse practitioner's findings will be identified.

RISKS AND DISCOMFORTS.

There are no risks or discomforts to participation in this study.

BENEFITS.

Potential benefits are:

1) You may derive professional and personal satisfaction in collaborating in a nursing research study.

2) By serving as a subject you may contribute new information which may benefit the future deliver of health care to patients with diabetes.

3) The study will contribute to the body of nursing knowledge, particularly in the area of diabetic.

4) Participation may increase your familiarity of the 1997 Oregon diabetic guidelines.

CONFIDENTIALITY.

Neither your name nor your identity will be used for publication or publicity purposes.

According to Oregon law, suspected child or elder abuse must be reported to appropriate authorities.

COSTS.

There are no costs or compensation for participation in this study.

LIABILITY.

Participation in this study does not involve treatment or compensation. However, you have not waived your legal rights by signing this form.

The Oregon Health Sciences University, as a public institution, is subject to the Oregon Tort Claims Act, and is self-insured for liability claims. If you suffer any injury from this research project, compensation would be available to you only if you establish that the injury occurred through the fault of the University, its officers, or employees. If you have further questions, please call the Medical Services Director at (503) 494-8014.

PARTICIPATION.

Jody Blase, (541) 896-3760, is available to answer any questions you may have about this study. If you have any questions regarding your rights as a research subject, you may contact the Oregon Health Sciences University Institutional Review Board at (503) 494-7887. You may refuse to participate, or you may withdraw from this study at any time without affecting your relationship with or treatment at the Oregon Health Sciences University. At the investigator's discretion, you may be removed from the study prior to the study conclusion.

Your signature below indicates that you have read the foregoing and agree to participate in this study. You will receive a copy of the signed consent form.

Subject Signature _____ Date _____

Witness Signature _____ Date _____

Investigator Signature _____ Date _____

# Appendix D

Assessment of Diabetes Care: Audit Tool for **Type 1 Diabetes**

Audit Date: _____ Chart Code: _____ Nurse Practitioner Code: _____

Diabetes Diagnosed (year): _____ Agency tool in use?: _____

**Instructions: Circle all conditions that apply. Circle provider: NP = Nurse Practitioner , OP = other provider**

History of comorbidity? HTN MI COPD CVA PVD Nephropathy Neuropathy Retinopathy Smoking Obesity

Treatment: Diet alone Insulin Oral agent Oral agent & insulin Patient height _____ weight _____

List all diabetic medications _____

**1. Glycosylated Hemoglobin ($HbA_{1c}$)** or Fructosamine semiannually in past year?
**No**
**Yes**, findings of > 8.0% ? + - results _____
NP OP _____
If + assessment of behavioral and physiologic reasons for unsatisfactory control?
**No**
**Yes** NP OP
Specific management plan based on assessment including a specific $HbA_{1c}$ target, and a specific monitoring schedule?
**No**
**Yes** NP OP

**2. Patient Education**
Within 1 week of diagnosis (if diagnosed within the past year)?
**No**
**Yes** NP OP
**NA** CDE referral? + -
Self-management behavioral goals individualized annually?
**No**
**Yes** NP OP
CDE referral? + -
Educational assessment within 1 week of hospital discharge or onset of new complication?
**No**
**Yes** NP OP
**NA** CDE referral? + -

Education regarding new therapy at time in initiation of new therapy?
**No**
**Yes** NP OP
**NA** CDE referral? + -
If + referral to ophthalmologist?
**No**
**Yes** NP OP

**3. Early Nephropathy Detection** : Screening for proteinuria in past year if 5 years from date of diagnosis?
**Urinalysis?** **Proteinuria?**
**No** **No**
**Yes** NP OP **Yes** NP OP
**If - for proteinuria 24 hr Microalbuminuria?**
**No**
**Yes NP OP**
**Microalbuminuria** findings of 30-300 mg/hr? + - results _____
ACEI use if 3 + 24 hour urine in 6 mo? _____
**No** Drug used _____ _____
**Yes** NP OP

**4. Foot Screening** Visual foot inspection each visit?
**No**
**Yes**, findings of new abnormality noted on visual foot inspection.
+ - Risk assessment tool used _____
NP OP If + note finding _____
Complete foot exam, assessment, & risk categorization done annually or if + visual exam?
**No**
**Yes**
Education/reeducation for patient self-care of feet?
**No**
**Yes** CDE referral? + - NP OP
Reassessment of metabolic control?
**No**
**Yes** test used _____ result _____ NP OP

**5. Blood Pressure Screening** semiannually in past year?
**No**
**Yes**, findings of 3 readings of systolic > 129 or diastolic >84?
+ - results _____, _____, _____ If + ACEI initiated?
**No**
**Yes** NP OP
Drug used _____

Assessment of Diabetes Care: Audit Tool for **Type 1 Diabetes**

Audit Date: _____ Chart Code: _____ Nurse Practitioner Code: _____

Diabetes Diagnosed (year): _____ Agency tool in use?: _____

**Instructions: Circle all conditions that apply. Circle provider: NP = Nurse Practitioner , OP = other provider**

History of comorbidity? HTN MI COPD CVA PVD Nephropathy Neuropathy Retinopathy Smoking Obesity

Treatment: Diet alone Insulin Oral agent Oral agent & insulin Patient height _____ weight _____

List all diabetic medications _____

**1. Glycosylated Hemoglobin ($HbA_{1c}$)** or Fructosamine semiannually in past year?
**No**
**Yes**, findings of > 8.0% ? + - results _____
NP OP _____
If + assessment of behavioral and physiologic reasons for unsatisfactory control?
**No**
**Yes** NP OP
Specific management plan based on assessment including a specific $HbA_{1c}$ target, and a specific monitoring schedule?
**No**
**Yes** NP OP

**2. Patient Education**
Within 1 week of diagnosis (if diagnosed within the past year)?
**No**
**Yes** NP OP
**NA** CDE referral? + -
Self-management behavioral goals individualized annually?
**No**
**Yes** NP OP
CDE referral? + -
Educational assessment within 1 week of hospital discharge or onset of new complication?
**No**
**Yes** NP OP
**NA** CDE referral? + -

Education regarding new therapy at time in initiation of new therapy?
**No**
**Yes** NP OP
**NA** CDE referral? + -
If + referral to ophthalmologist?
**No**
**Yes** NP OP

**3. Early Nephropathy Detection** : Screening for proteinuria in past year if 5 years from date of diagnosis?
**Urinalysis?** **Proteinuria?**
**No** **No**
**Yes** NP OP **Yes** NP OP
**If - for proteinuria 24 hr Microalbuminuria?**
**No**
**Yes NP OP**
**Microalbuminuria** findings of 30-300 mg/hr? + - results _____
ACEI use if 3 + 24 hour urine in 6 mo? _____
**No** Drug used _____ _____
**Yes** NP OP

**4. Foot Screening** Visual foot inspection each visit?
**No**
**Yes**, findings of new abnormality noted on visual foot inspection.
+ - Risk assessment tool used _____
NP OP If + note finding _____
Complete foot exam, assessment, & risk categorization done annually or if + visual exam?
**No**
**Yes**
Education/reeducation for patient self-care of feet?
**No**
**Yes** CDE referral? + - NP OP
Reassessment of metabolic control?
**No**
**Yes** test used _____ result _____ NP OP

**5. Blood Pressure Screening** semiannually in past year?
**No**
**Yes**, findings of 3 readings of systolic > 129 or diastolic >84?
+ - results _____, _____, _____ If + ACEI initiated?
**No**
**Yes** NP OP
Drug used _____

**Type 1 Diabetes**

Chart Code: _____Nurse Practitioner Code: _____

**6. Eye Examination**
Dilated eye exam in past year if 5 years from time of diagnosis?
**No**
**Yes**, findings + -
Done by NP OP
If + referral to ophthalmologist?
**No**
**Yes**

**7. Tobacco Use Assessment** in last year (unless < 25 years old or past user)?
**No**
**Yes**, findings for tobacco use + -
If + counsel on tobacco cessation per AHCPR guidelines done each visit?
**No**
**Yes** NP OP

**8. Lipid Screening** in past year (unless <130 mg/dL on two consecutive occasions)?
**No**
**Yes**, findings of LDL > 129 mg/dL? + -
NP OP
Results: LDL _____, _____, _____
HDL _____, _____, _____
trigly_____, _____, _____
If + follow-up per NCEP Guidelines? (Primary prevention: LDL < 130 provide diet, exercise, and risk factor ed., 130-159 provide ed, repeat LDL in 1 year, 130-159 eval. & initiate dietary therapy, >159 eval. & diet therapy. Secondary prevention: LDL < 100 diet & exercise ed., repeat LDL in 1 year, > 100 eval, initiate therapy)
**No**
**Yes** NP OP

**9. Aspirin Prophylaxis** if presence of HTN, tobacco use, > 120% ideal body weight, hyperlipidemia, abluminuria > 30 mg/24 hours, coronary artery disease, cerebrovascular disease, or peripheral vascular disease?
**No**
**Yes** NP OP

**10. Oral/Dental Screening** in past year with recommendation the patient visit a dentist at least annually?
**No**
**Yes,** findings of extensive caries, marked xerostomia, extensive periodontal disease, poorly fitting denture or observable oral lesions? + -
NP OP
If + referral to dentist done?
**No**
**Yes** NP OP

**11. Immunizations**
Influenza vaccine in past year?
**No**
**Yes** NP OP
History of pneumococal vaccine with revaccination if at high risk for illness and not vaccinated in past 5 years or if age 65 and not vaccinated in the past 5 years?
**No**
**Yes** NP OP
**NA**

**12. Preconception Counseling** at initial visit or upon reaching childbearing age with additional counseling if indication of change in pregnancy probability?
**No**
**Yes** NP OP
**NA**

Assessment of understanding and need for additional conception counseling and reminders in past year?
**No**
**Yes** NP OP
**NA**

**Total number of patient visits in past year** _____ **Number of hospital/ER visits in past year** _____
**Visits/Procedures recommended by NP in which pt did not, or could not comply** _____
**List all procedures done or ordered by health care provider other than the NP:**
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
**Comments:**

Assessment of Diabetes Care: Audit Tool for **Type 2 Diabetes**

Audit Date: _____Chart Code: _____Nurse Practitioner Code: _____

Diabetes Diagnosed (year): _____ Agency tool in use?: _____

**Instructions: Circle all conditions that apply. Circle provider: NP = Nurse Practitioner , OP = other provider**

History of comorbidity? HTN MI COPD CVA PVD Nephropathy Neuropathy Retinopathy Smoking Obesity

Treatment: Diet alone Insulin Oral agent Oral agent & insulin Patient height _____, weight _____

List all Diabetic Medications _____

**1. Glycosylated Hemoglobin ($HbA_{1c}$)** or Fructosamine in past year?
**No** results_____
**Yes**, findings of > 8.0% ? + - NP OP

If + assessment of behavioral and physiologic reasons for unsatisfactory control?
**No**
**Yes** NP OP
Specific management plan based on assessment including a specific $HbA_{1c}$ target and a specific monitoring schedule?
**No**
**Yes** NP OP

**2. Patient Education**
Within 6 weeks of diagnosis (if diagnosed within the past year)?
**No**
**Yes** NP OP
**NA** CDE referral? + -

Self-management behavioral goals individualized annually?
**No**
**Yes** NP OP
CDE referral? + -
Educational assessment within 1 week of hospital discharge or onset of new complication?
**No**
**Yes** NP OP
**NA** CDE referral? + -

Education regarding new therapy at time in initiation of new therapy?
**No**
**Yes** NP OP
**NA** CDE referral? + -

**3. Early Nephropathy Detection** : Screening for proteinuria in past year:
**Urinalysis?** **Proteinuria?**
**No** **No**
**Yes** NP OP **Yes** NP OP
**If - for proteinuria 24 hr Microalbuminuria?**
**No**
**Yes NP OP**
**Microalbuminuria** findings of 30-300 mg/hr? + - results _____
ACEI use if 3 + 24 hour urine in 6 mo? _____
**No** Drug used _____ _____
**Yes** NP OP

**4. Foot Screening**
Visual foot inspection each visit?
**No**
**Yes**, findings of new abnormality noted on visual foot inspection.
+ - Risk assessment tool used _____
NP OP
If + note finding _____
Complete foot exam, assessment, & risk categorization done annually or if + visual exam?
**No**
**Yes** NP OP
Education/reeducation for patient self-care of feet?
**No**
**Yes** CDE referral? + -
NP OP
Reassessment of metabolic control?
**No**
**Yes** test used _____ result _____
NP OP

**5. Blood Pressure Screening** semiannually in past year?
**No**
**Yes**, findings of 3 readings of systolic > 129 or diastolic >84?
+ - results _____, _____, _____
If + ACEI initiated?
**No**
**Yes** NP OP
Drug used _____

**Type 2 Diabetes**

Chart Code: _____Nurse Practitioner Code: _____

**6. Eye Examination**
Dilated eye exam in past year?
**No**
**Yes**, findings + - NP OP

If + referral to ophthalmologist?
**No**
**Yes** NP OP

**7. Tobacco Use Assessment** in last year (unless < 25 years old or past user)?
**No**
**Yes**, findings for tobacco use + -
NP OP
If + counsel on tobacco cessation per AHCPR guidelines done each visit?
**No**
**Yes** NP OP

**Aspirin Prophylaxis** if presence of HTN, tobacco use, > 120% ideal body weight, hyperlipidemia, abluminuria > 30 mg/24 hours, coronary artery disease, cerebrovascular disease, or peripheral vascular disease?
**No**
**Yes** NP OP

**9. Lipid Screening** in past year (unless <130 mg/dL on two consecutive occasions)?
**No**
**Yes**, findings of LDL > 129 mg/dL? + -
Results: LDL _____, _____, _____
HDL _____, _____, _____
trigly_____, _____, _____
If + follow-up per NCEP Guidelines? (Primary prevention: LDL < 130 provide diet, exercise, and risk factor ed., 130-159 provide ed, repeat LDL in 1 year, 130-159 eval. & initiate dietary therapy, >159 eval. & diet therapy. Secondary prevention: LDL < 100 diet & exercise ed., repeat LDL in 1 year, > 100 eval, initiate therapy)
**No**
**Yes** NP OP

**10. Oral/Dental Screening** in past year with recommendation the patient visit a dentist at least annually?
**No**
**Yes,** findings of extensive caries, marked xerostomia, extensive periodontal disease, poorly fitting denture or observable oral lesions? + -
If + referral to dentist done?
**No**
**Yes** NP OP

**11. Immunizations**
Influenza vaccine in past year?
**No**
**Yes** NP OP

History of pneumococcal vaccine with revaccination if at high risk for illness and not vaccinated in past 5 years or if age 65 and not vaccinated in the past 5 years?
**No**
**Yes**
**NA** NP OP

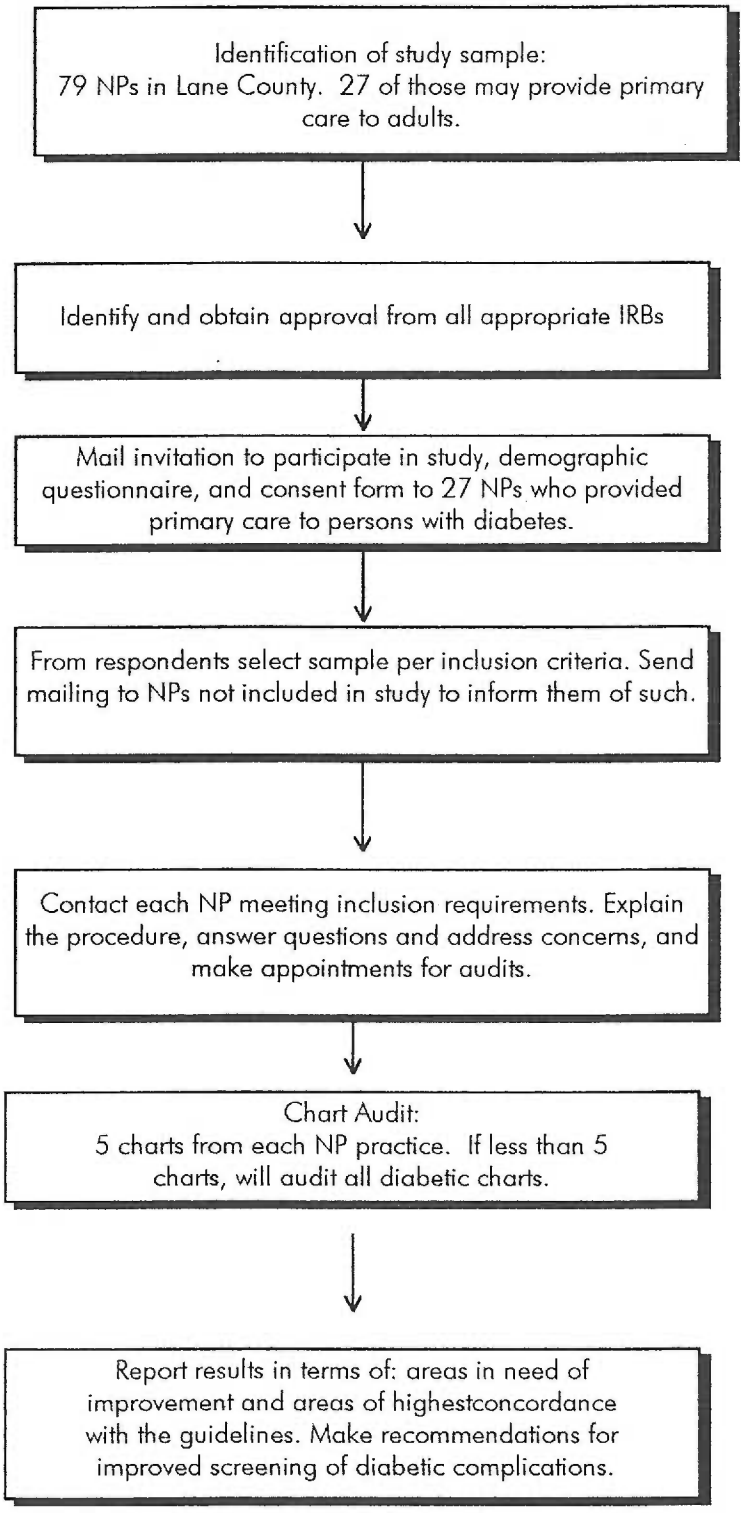
**12. Preconception Counseling** at initial visit or upon reaching childbearing age with additional counseling if indication of change in pregnancy probability?
**No**
**Yes**
**NA** NP OP

Assessment of understanding and need for additional conception counseling and reminders in past year?
**No**
**Yes**
**NA** NP OP

**Total number of patient visits in past year _____ Number of hospital/ER visits in past year _____**
**Visits/Procedures recommended by NP in which pt did not, or could not comply _____**
**List all procedures done or ordered by health care provider other than the NP:**
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
Procedure _____ Title of heath care provider _____ Date _____
**Comments:**

# Appendix E

Sample Selection and Study Design



OREGON HEALTH SCIENCES UNIVERSITY
Research Support Office (RSO), L106 (503) 494-7887

# MEMO

**Date:** August 6, 1997

**To:** *Jody Blase,BSN Box 370, Walterville, OR 97489*

**From:** Robert D. Koler, MD, Chair Institutional Review Board, L106
Leslie Bevan, PhD, Director Research Support Office, L106

**Subject:** *4568* [redacted]
*Nurse Practitioner Patterns of Screening for Diabetic Complications*

## Special Communication

☐ The RSO has not received a response to the request made on _____ for revisions of the above protocol/consent form. These were due in the RSO on _____.

☐ The attached advertisement has been approved as presented. Any changes to this advertisement must be submitted to the RSO for IRB approval.

☐ The IRB reviewed the attached advertisement on _____ . The following changes will need to be made before approval is given. [1]

☐ The above study involves only discarded tissues/samples that do not include *identifiable private data/information obtained in a form associable with an individual.* Therefore, the study does not require IRB review.

☐ The above study meets the criteria for waiver of consent.

✖ This study is exempt based on criteria category # 4 .

[1] see appended copy for suggested editing