Diabetes Management in Urban African Americans: Review of a Public Hospital Experience

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Objective: To review characteristics of an urban (primarily African American) diabetes patient population and discuss experience with treatment strategies, we summarize key retrospective and prospective analyses conducted during 15 years.

Results: Severe socioeconomic and personal barriers to diabetes care were often seen in the population. An atypical presentation of diabetic ketoacidosis was observed and extensively studied. A structured diabetes care delivery program was implemented more than three decades ago. A better understanding of how to provide simpler but effective dietary education and factors that affect lipid levels were elucidated. The phenomenon of clinical inertia was described, and methods were developed to facilitate the intensification of diabetes therapy and improve glycemic control.

Conclusions: Structured diabetes care can be successfully introduced into a public health system and effective diabetes management can be provided to an under-served population that can result in improved metabolic outcomes. Lessons learned on diabetes management in this population can be extended to similar clinical settings. (*Ethn Dis*. 2008;18:336–341)

Key Words: African Americans, Diabetes Mellitus, Urban Health Services

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Introduction

Minority populations, such as African Americans, are at high risk for type 2 diabetes and its complications and tend to have poor glycemic control.[1–3] The potential for diabetes complications and worse outcomes in under-served populations is exacerbated by limitations to accessing medical care and poverty.[4–6] Lack of health insurance has been associated with reduced use of diabetes preventive services.[7–10] A disproportionate share of US minority patients receive medical care through public health systems—institutions that are increasingly experiencing constrained resources.[6]

Management of diabetes in a disadvantaged population, within a public health system that has limited resources, poses challenges not encountered in other practice settings.

Management of diabetes in a disadvantaged population, within a public health system that has limited resources, poses challenges not encountered in other practice settings. We review the experience of one outpatient diabetes care program that serves a population of predominately indigent African American patients. We summarize the characteristics of the population and what we have learned about how to improve care.

Overview of Outpatient Clinical Program

The diabetes clinic is an outpatient facility that is part of the Grady Health System, a large public system mandated to provide medical care for the uninsured and indigent residents of a two-county referral area. The Diabetes Clinic was founded in the early 1970s and used a team approach (eg, dietitians, nurse educators, endocrinologists, clinical pharmacologists, podiatrists) to diabetes care early in its history.[11,12] An intensive lifestyle intervention was offered to all patients attending the clinic. An electronic diabetes patient tracking system was developed in 1991 that captured demographic and disease characteristics, therapeutic information, and laboratory data on every patient from every visit, which permitted assessment of care outcomes.

Description of Patient Population

Demographic Characteristics

A recent review of 9555 diabetes clinic patients seen from 1992 through 2001 demonstrated that the average age was 52 years, with a mean diabetes duration of 5 years; 59% of the patients were women; 88% were African American; and 90% were classified as having type 2 diabetes.[13] Obesity was common (mean body mass index 31.9 kg/m^2), and glycemic control was poor (mean hemoglobin A1C [HbA1C] at time of first visit 9.3%). The proportion of patients who were African American did not change during this 10-year period; however, the percentage of Hispanic

patients increased, while the percentage of White patients decreased (Figure 1).

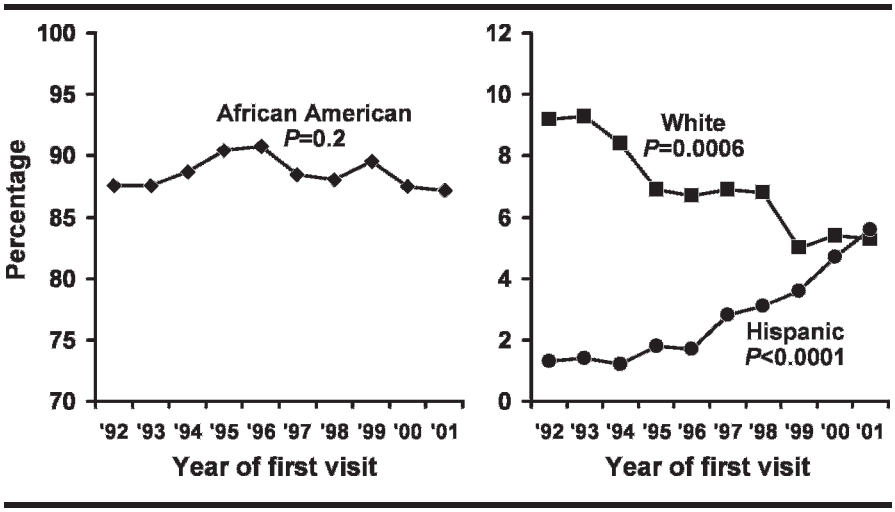

Fig 1. Changes in the ethnic profile of patients receiving care at the diabetes clinic, 1992–2001. Left, percentage of African American patients. Right, percentages of White and Hispanic patients. (From Dunbar et al.[13] Used with permission.)

Diabetic Ketoacidosis in African Americans

Diabetic ketoacidosis (DKA) was found in nearly 9% of African American patients who were hospitalized with a diagnosis of diabetes; overall mortality from DKA was 2%.[14] More than half of DKA patients were obese and experienced clinical, metabolic, and immunologic features of type 2 diabetes during followup. This variant of type 2 diabetes associated with DKA among African Americans has been referred to as idiopathic diabetes, atypical diabetes, and more recently, ketosis-prone type 2 diabetes.[15] These patients were usually obese and had a strong family history of both diabetes and a low prevalence of islet cell, GAD (glutamic acid decarboxylase), ICA512, and insulin autoantibodies.[16,17] African American patients in whom DKA developed demonstrated impaired insulin secretion and insulin action, but participation in the clinic's intensive diabetes management program resulted in significant improvement in β-cell function and insulin sensitivity that was sufficient to allow discontinuation of insulin therapy.[15,16] These patients who were able to discontinue insulin therapy were randomized to either diet plus glyburide or diet alone and followed for a mean of 16 months to determine which strategy was more effective in delaying recurrent severe hyperglycemia; analysis demonstrated that low-dose sulfonylurea therapy delayed the recurrence of hyperglycemia and DKA more effectively than diet alone.[15,18]

Socioeconomic Status

Early analyses from the diabetes clinic confirmed a severely disadvantaged population of patients with a high proportion of individuals whose income was below the federal poverty line, who were without health insurance, and who had a low literacy level.[19,20] A recent cross-sectional survey of 600 patients presenting for initial visits at the diabetes clinic reconfirmed that the population was underprivileged.[21] Just 31% of survey respondents indicated that they were employed. Health insurance coverage was reported by only 34% of survey respondents. More than 40% of patients reported difficulty obtaining medical care and medications during the 12 months before their first diabetes clinic visit, and 43% reported having no usual source of health care, such as a physician or clinic that they visited regularly.

This self-reported poor access to health care had implications for the degree of glycemic control observed among patients at their initial visit. Patients who reported difficulty obtaining medical care had higher HbA1C levels at their first visit compared with patients who did not report problems (mean HbA1C 9.4% vs 8.7%, $P=.001$). Patients who used acute-care facilities as their only source of medical care (mean HbA1C 10.3%) or who had no regular source of care (mean HbA1C 9.5%) each had worse glycemic control than did patients who had established care at a doctor's office or an outpatient clinic (mean HbA1C 8.6%).[21]

LESSONS LEARNED FOR DIABETES MANAGEMENT IN THE UNDER-SERVED POPULATION

Healthy Food Choice Program vs Dietary Exchange Program

Implementation of dietary changes is essential for a patient to achieve metabolic targets. One barrier to dietary therapy expressed by the clinic patients was the complexity of the traditional exchange program used in diabetes nutrition counseling.[22] A prospective trial was conducted to compare instruction in the exchange diet with training in a simpler program of healthy food choices.[23]

Patients in both the healthy food choice program and the dietary exchange approach had significant ($P<.0001$) but comparable reductions in HbA1C levels; HbA1C values decreased from 9.7% to 7.8% in the healthy food choice group and from 9.6% to 7.7% among patients who were in the dietary exchange plan (Figure 2). Because the simpler meal plan that emphasized healthy food choices was just as effective in achieving improvements in HbA1C levels as the more

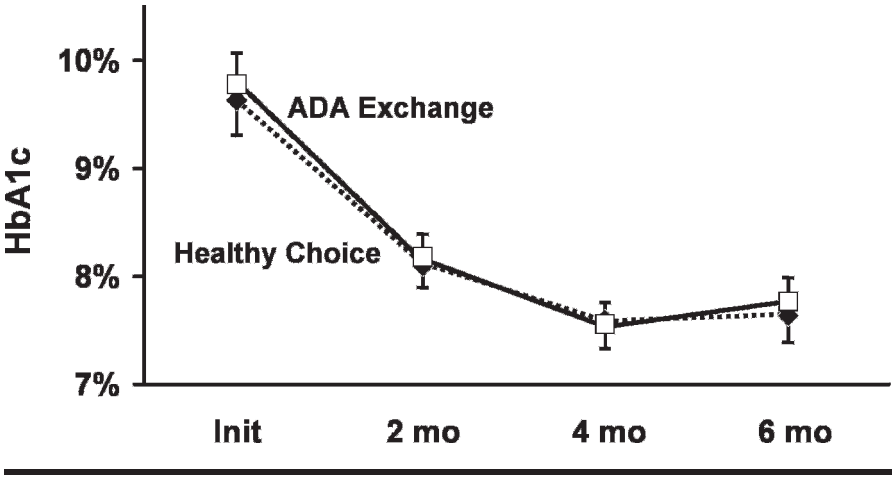

Fig 2. Change in hemoglobin A1C (HbA1C) levels in diabetes clinic patients according to diet. The comparison is made between an American Diabetes Association (ADA) exchange diet and a healthy food choice diet. (Modified from Ziemer et al.[23] Used with permission.)

complex, exchange-based meal plan often used during diabetes self-management training,[23] we subsequently adopted the use of the more simplified approach to dietary education in this population.

Clinical Decision Making

Clinicians need information on glycemic control at the point of care to make decisions about changing antidiabetic therapy. However, patients often may not have results of their home glucose measurements when they present for a clinic visit, and an HbA1C value may also not be available. Faced with the need to find some parameter to assist with decision making about whether to intensify antidiabetic therapy, we examined whether a single point-of-care blood glucose value (typically obtained at each visit) was sufficient to guide decisions about changing treatment.

Using receiver operating characteristics curve analyses, we found that both a fasting and a random glucose were useful in predicting a HbA1C level >8.0%, regardless of whether patients were on diet, sulfonylurea, or insulin therapy.[24,25] Having this readily available and simple point-of-care glucose level to intensify therapy was one of the earliest means of countering the problem of clinical inertia (described later in this article).[26]

In the late 1990s, a rapid, on-site HbA1C assay became available to the diabetes clinic practitioners, and we found that more intensification of therapy occurred when the rapid HbA1C level was available at the point of care, with greater reductions in HbA1C levels; in the rapid HbA1c group, levels fell from 8.4% to 8.1% (P=.04), compared with 8.1% to 8.0% in the routine HbA1C test group (P=.31).[27,28] We now had two measures that would allow us to guide therapy—a point-of-care blood glucose and an HbA1C value.

Early Introduction of Lipid Therapy Is Necessary to Achieve Targets

The diabetes clinic applied an intensive lifestyle intervention to all patients who attended the program from the time of their intial visit. While we had information about glycemic outcomes,[24] we did not know what effect our structured diabetes care program had on lipid outcomes. Thus, we conducted a retrospective analysis comparing lipid values from the initial patient visit with those obtained at one year of followup.[29] Stratification of analyses based on whether patients were receiving a lipid-lowering medication (typically a statin) revealed different outcomes. Among patients not taking dyslipidemia medications, the average concentrations of total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglycerides at one year were comparable to values from the intake visit. In patients for whom pharmacotherapy was prescribed to treat dyslipidemia, however, significant reductions in the values of total cholesterol and LDL-C occurred after 12 months of follow-up care, and triglyceride levels improved as well. The high-density lipoprotein cholesterol values improved regardless of whether pharmacotherapy was used.

After adjustment for patient characteristics, diabetes duration, weight changes, and changes in HbA1C, a decrease in concentration of LDL-C was associated only with use of medications to treat hyperlipidemia; factors such as glycemic control and weight changes had no independent effect on LDL-C level. Given the importance of LDL-C reduction in diabetes, the lesson learned from this analysis was that initiation of pharmacologic therapy to treat high LDL-C levels should be considered early in diabetes management for this population of patients, rather than awaiting the effects of lifestyle modification or improvement in hyperglycemia.[29]

Use of a Glucose Algorithm to Direct Diabetes Therapy

We developed a written algorithm that recommended individualized changes in pharmacotherapy for hyperglycemia. The algorithm used a stepped-care approach that required escalated doses and combinations of medical therapies based on a patient's current medication profile and the severity of glycemic control at the time of the visit. Based on a review of the literature, the amount of medication required to lower HbA1C levels by one

percentage point or plasma glucose by 50 mg/dL was estimated. A table was constructed with glucose levels across the top and current diabetes therapy down the side; these medications only included those that were available through the health system (insulin, sulfonylureas, metformin). For each category of glucose level and corresponding medications, specific recommendations were provided for changes in therapy.[30]

The algorithm was examined prospectively in >1200 patients; data after the introduction of the algorithm into the practice were compared to a seven-month baseline period. The outcomes of interest were the changes in frequency of intensification of therapy and the proportion of patients attaining HbA1C levels <7.0%. Results demonstrated that healthcare providers were 45% more likely to intensify therapy when the algorithm was present and increased therapy by 20% more. In addition, the HbA1C level was 90% more likely to decrease to a target value of <7.0% when the algorithm was used, even after controlling for patient characteristics.[30]

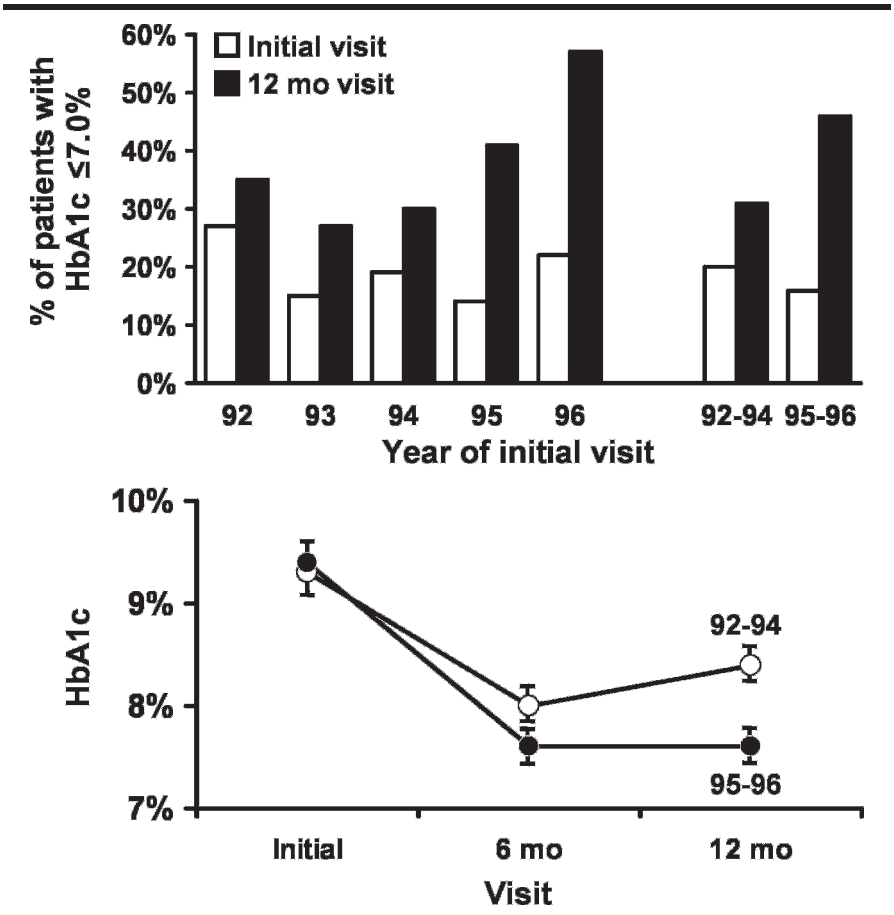

Fig 3. Initiative undertaken in 1995 was directed toward overcoming clinical inertia and improving glycemic control. Top, proportion of patients achieving hemoglobin A1C (HbA1C) ≤7.0% after 12 months of care increased progressively from 1992 to 1996. Bottom, HbA1C levels after 12 months of care were lower after initiative (1995–1996) than levels before the initiative (1992–1994). (Modified from Cook et al.[24] Used with permission.)

Overcoming Clinical Inertia Improves Glycemic Control in the Diabetes Clinic

We first used the term clinical inertia to describe the failure of practitioners to intensify treatment when needed.[26,31] In 1995, personnel of the diabetes clinic implemented an effort to educate healthcare providers on the need to intensify diabetes treatment (ie, overcome clinical inertia). We examined the effect of the educational initiative by comparing 12-month HbA1C levels from the period after the initiative (1995–1996) with historical controls from the period before the initiative (1992–1994). The percentage of patients who achieved a target HbA1C value of ≤7.0% improved progressively from 1992 to 1996 (Figure 3, top). After patients received 12 months of care, their mean HbA1C value was 7.6%—significantly improved from the level of 8.4% achieved during the period before the initiative ($P<.001$) (Figure 3, bottom).[26]

Overcoming Clinical Inertia Improves Glycemic Control in Primary Care

As part of ongoing efforts to improve diabetes care throughout the Grady Health System, we next conducted a three-year randomized controlled clinical trial to translate the concepts of overcoming clinical inertia that were pioneered in the diabetes clinic to one of the system's primary care sites.[32] The site chosen for the study was the resident physician-staffed general medical clinic based on the Grady Health System hospital campus. Previous work demonstrated a need to improve diabetes care delivery by resident physicians in internal medicine at this site.[33–35]

Resident physicians were randomly assigned to one of four study arms: a control group, a group that received computerized reminders listing recommendations about care, an arm in which resident physicians received individual feedback on performance from endocrinology faculty, and a group that received computerized reminders plus feedback. The intent of the study was to determine which type of intervention

was best at improving intensification of therapy (overcoming clinical inertia) and improving HbA1C values.[32] Intensification of therapy was defined both as "did anything" (any intensification of therapy) or "did enough" (intensification met recommendations). In addition to the standard lectures on diabetes routinely provided to residents, all residents received basic information about the study as well as a review of treatment principles before the intervention began. Residents who were in the feedback arms received periodic reinforcement of these principles during their feedback sessions.

Data were accrued on 4138 patients with type 2 diabetes who had been seen by 345 resident physicians. After adjustment for other variables, results showed that feedback on performance was independently associated with intensification of therapy. Among the feedback alone and feedback plus reminders group, "did anything" increased from 35% to 52% and "did enough" increased from 21% to 30% (both $P<.001$ vs the reminder only and control groups); this tendency to intensify therapy was sustained over the three-year study period. Multiple linear regression analysis demonstrated that feedback alone contributed to intensification of therapy (coefficient .48, $P<.001$), and that this intensification led to significant reductions in HbA1C (coefficient -0.24, $P=.003$).[36,37]

SUMMARY

We have provided both an overview of several key features of the population of patients with diabetes who were served through a large public hospital system and a brief review of the studies undertaken to improve the care delivered. The structured approach to diabetes care can work in a public health setting. Strategies such as simplified dietary instruction, early introduction of pharmacotherapy to reduce LDL-C levels, application of an algorithm to guide intensification of hyperglycemia therapy, and an emphasis on overcoming clinical inertia are some of the key methods we used to achieve metabolic targets. Many of the lessons we learned about diabetes care may be successfully exported to other clinical settings. Investigations must continue to better understand the foundation for suboptimal outcomes in this population, and initiatives must continue to develop mechanisms to ensure quality diabetes care for these vulnerable patients who are at high risk for diabetes complications.

Strategies such as simplified dietary instruction, early introduction of pharmacotherapy to reduce LDL-C levels, application of an algorithm to guide intensification of hyperglycemia therapy, and an emphasis on overcoming clinical inertia are some of the key methods we used to achieve metabolic targets.

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