

INTRODUCTION

Type 2 Diabetes Mellitus (DM2) is a disease that affects 30.3M Americans (9.4% of population), & another 84.1M are pre-diabetic (33.9%), per the CDC₂. The issue of DM2 is expanding & financially challenging, thus our health care systems have been working to identify ways to best & most cost-effectively achieve control of this condition.

In Jefferson County, IL: 64.5% of adults are overweight, 11.5% of adults have DM2 (higher than state avg), & the age-adjusted death rate due to diabetes is greater than national & state averages, according to SSM Health's Community Health Needs Assessment (CHNA). This lead to community health goals of decreasing the number of overweight/obese patients & increasing the number of DM2 patients with controlled Hemoglobin A1c, among many others; the SSM Health action plan includes increasing access to free/discounted A1c screening, nutritional consults, healthy foods by partnering with local markets, & local fitness center memberships.

Glycemic control decreases the risk of micro and macrovascular complications, thus considerable research has tried to identify socioeconomic, social, & personal factors contributing to glycemic control. For example, decreased health literacy has been identified as an independent association with poor A1c control, & is associated with worse outcomes (ex. Retinopathy); nearly 80% of DM2 patients in the U.S. have a high school education or less (12.8% of the Jefferson Co. population), & 66% of those patients have decreased health literacy.

Frequency of PCP appointments for DM2 patients has also been associated with glycemic control. One study suggests that increased duration between PCP appointments is associated with increased duration to achieve a goal A1c of 7%, & that the optimal frequency of PCP appointments is every 2 weeks₃.

Many DM2 patients also have difficulty with self-managing portions of their treatment, like the details of their prescription/injection regimens, diet, & knowing the long-term sequelae of DM2. One study explored the concept of weekly pharmacist-led prescription care in the outpatient setting, separate from the PCP, by means of a phone call; this study found better glycemic control in the patients in the group that received weekly calls vs the control group receiving traditional PCP visits alone₃.

Another intervention is Group Medical Appointments (GMAs). GMAs in one study include 8-15 DM2 patients receiving 90 minute interaction with a nurse practitioner, certified diabetic educator, pharmacist, health psychologist, & a licensed vocational nurse; this study found about 50% of the GMA patients reached a goal A1c of less than 8% (vs 19% of controls) & had a significantly better average A1c decrease per week₄. This intervention tries to address not only health literacy and self-management, but also issues of embarrassment and effects of chronic illness on compliance. Giving DM2 patients the opportunity to see other patients dealing with similar issues may have a positive effect on compliance and wellbeing.

METHODS

A 32 question survey drafted by the principal investigator was offered and distributed to patients that met inclusion criteria in the Emergency Department, inpatient, and outpatient settings (Family Medicine and Endocrinologist offices) at SSM Health Good Samaritan Hospital in Mt. Vernon, IL; all patients that filled out a survey came from the outpatient setting. Questions were derived from concepts from the resources listed, as well as SSM Health's CHNA for Jefferson County, IL.

Inclusion Criteria included: the patient must be an adult (18+ years old) with a diagnosis of Type 2 Diabetes Mellitus that has a Hemoglobin A1c value available to reference as a proxy for glycemic control; the patient must also be a competent medical decision-maker.

Exclusion criteria included: child subjects (patients less than 18 years old), pregnant women, presence of Chronic Kidney Disease (GFR < 60, due to altered RBC turnover compared to "healthy" patients), patients that have undergone blood transfusion(s) in the past 3 months due to an Hemoglobin A1c value that would be partially reflective of the donor's hemoglobin; also any patient that is not Alert and Oriented to person, place, time, and situation at the time of the survey.

The patient's age, insurance status and plan, previous 1-4 Hemoglobin A1c values and dates, mean Hemoglobin A1c value, time elapsed between PCP appointments, diabetic medication regimen, other diagnosed chronic illnesses, and the setting of the interaction was also recorded by the principal investigator via chart review. Subjects less than 45 years old with Hemoglobin A1c values less than 7.0, and subjects 45 years and older with Hemoglobin A1c values less than 8.0, will be considered to have "controlled" blood glucose.

Data from the survey was collected and analyzed. Answers from patients with "controlled" blood glucose were compared with patients with "uncontrolled" blood glucose. Comparisons were also made on the basis of insurance status: Medicaid, Medicare, and private insurance (including as a supplement to Medicare). Answers regarding utilization and awareness of SSM Health resources were also analyzed.

RESULTS

This study yielded 30 patients (all from the outpatient setting) with a mean age of 58.8 years old, including 18 females, 12 males, 15 with uncontrolled glucose (UC), and 15 with controlled glucose (C). 18 patients had private insurance or supplemental insurance, 5 with medicare exclusively, 6 with Medicaid exclusively; no association of insurance status and glucose control. No significant difference between time elapsed between A1c checks, nor time elapsed between PCP appointments, for patients with controlled vs uncontrolled glucose.

There was a statistically significant (p= 0.0114) association between number of diabetic medications and glucose control (figure 1). 9/11 (81%) of patients taking 0-1 medications, 4/9 (44%) of patients taking 2 medications, and 2/10 (20%) of patients taking 3+ medications had controlled glucose.

11/30 patients reported feeling overwhelmed by managing their diabetes (7 UC, 4C), while 19/30 did not (8 UC, 11C), although no statistically significant association was present with regard to glucose control. Of the 11 patients that felt overwhelmed, 5 were taking 0-1 medications (5/11 [45%] of this group), 1 was taking 2 medications (1/9), and 5 were taking 3+ medications (5/10 [50%] of this group).

16/30 (7 UC, 9 C) patients reported never forgetting to take their medications, while 14/30 (8 UC, 6 C) report forgetting to take them at times; 7/14 that forget do so 1+ times per week (4 UC, 3C). No statistically significant association was identified, however some trends regarding number of medications and chance of forgetting to take medications were identified: 3/11 (27%) patients taking 0-1 medications, 5/9 (56%) patients taking 2 medications, and 6/10 (60%) of patients taking 3+ medications forget to take their medications at times (Figures 2 and 3).

No statistically significant association between glucose control and reported confidence in their ability to manage their medications was found. 25/30 felt confident (12 UC, 13 C), while 5/30 did not (3 UC, 2 C).

6/30 patients reported feeling embarrassed about having diabetes (4 UC, 2 C; 4 taking 3+ Rx, 1 taking 2 Rx, 1 taking 1 Rx). No statistically significant association between feelings of embarrassment and glucose control was established.

27/30 (14 UC, 13 C) patients had never been offered vouchers for free/cheap A1c screening that SSM offers, and 25/25 patients that responded said they would utilize this service if they were available.

No significant association between smoking status and glucose control was identified, as 27/30 do not smoke, however, all 3 smokers had uncontrolled glucose.

No statistically significant association between awareness of other chronic diseases and glucose control; all 30 patients had multiple other medical problems treated with medication, however 12 patients reported having no other medical problems (8 UC, 4 C).

Figure 4 shows that 27 (12 UC, 15 C) patients had 0-1 ED visits in the past year, while 3 (3 UC) had 2+ visits; this was not a statistically significant finding (p= 0.0996).

No statistically significant association between education status and glucose control was found: 13/30 with a high school education or less (7 UC, 6 C), and 17/30 had some college or more (8 UC, 9 C).

6/28 responding patients said they had no goal A1c they were trying to reach, and 5/6 had uncontrolled glucose; 22/28 (9 UC, 13 C) had a goal A1c of 8% or less. No statistically significant association was identified however.

25/28 (10 UC, 15 C) responding patients assess their feet for diabetic-related sequelae more than once per week, while all 3 patients that "rarely" or "never" check their feet had uncontrolled glucose (Figure 5). This was not a statistically significant finding (p= 0.0873).

There were no statistically significant associations with glucose control were identified regarding: confidence in knowing which foods to avoid, patients receiving nutrition consults, speaking to a pharmacist about medication management, frequency of 30+ minute workouts, reported access to healthy foods, frequency of capillary blood glucose checks at home, or taking medications at the same time or different times daily.



Figure 4.

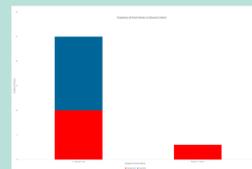


Figure 5.

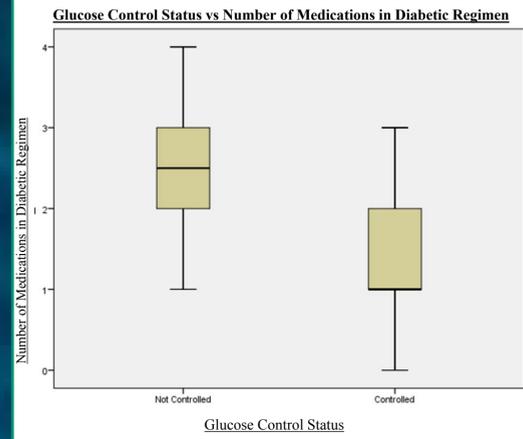


Figure 1.

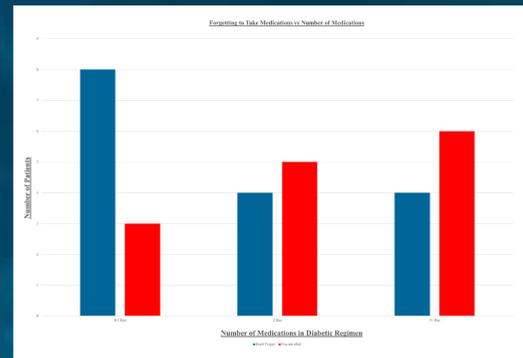


Figure 2.

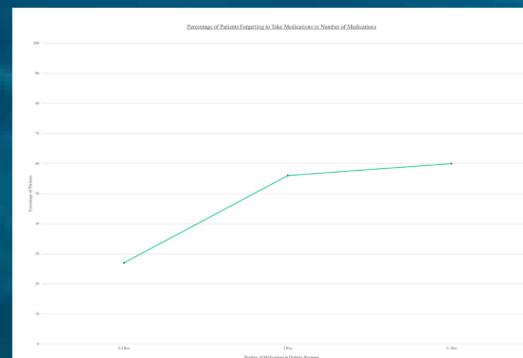


Figure 3.

CONCLUSIONS

This study's findings were predominantly not statistically significant, and some associations were limited by the small sample size. This study found no difference in glucose control for differing insurance plans, frequency of PCP appointments, or frequency of A1c checks.

The lone statistically significant finding was the increased likelihood of uncontrolled glucose with increased number of medications in their diabetic regimen. This likely is affected by the fact that patients with more significant disease or longstanding uncontrolled glucose require more aggressive treatment.

However, this study did identify that patients taking more medications were more likely to forget to take their medications as well, although no statistical significance was found with regard to glucose control. Increased sample size would better assess this trend. Nonetheless, this finding may tell of the difficulty in self-managing more complicated regimens or regimens requiring 3+ medications. Though no significant association was found regarding glucose control and feeling overwhelmed with the regimen, 5/10 patients taking 3+ medications did feel overwhelmed with their regimen. Further investigation regarding medication number and perception of patients' treatment plans may be more telling.

Despite the above findings, only 5/30 patients did not feel confident in managing their treatment plans. This conflicts with the fact that 11/30 patients felt overwhelmed by their regimens. This discrepancy may be due to the nature of the semantics of the question regarding feeling overwhelmed ("Do you ever feel overwhelmed."), as the patients may have confidence in their ability to manage the plans in general, but still have occasional periods of feeling overwhelmed. Fine-tuning this question format may better assess this issue.

There was a statistically insignificant association between increased number of ED visits in the past year and glucose control. The p value was 0.0996, thus no significant, however, this may be reflective of the small sample size. The 3 patients with 2+ ED visits had uncontrolled glucose. This finding could represent the effects of acute illness upon glycemic control. This finding also may reflect the severity or duration of disease, which would increase the chance of the patient having more significant sequelae of DM2.

CONCLUSIONS

There was also a statistically insignificant association between frequency of a patient checking their feet, a common basic method of surveillance of DM2 changes, and glucose control. This p value was 0.0873, but may be limited by the small sample size. Nonetheless, this finding may inform the level of involvement and consistency of self-assessment of patients regarding their disease. This also may suggest that foot checks occurring at least once weekly has a benefit for these patients, possibly by increasing a patient's cognizance of their management needs.

Patients with uncontrolled glucose were also more likely to deny having other medical problems besides DM2, though clinically insignificant. This may speak to lower health literacy, as they may not consider issues like hypertension and hyperlipidemia (the most common comorbidities) to be abnormal or medical "problems."

Patients without a goal A1c to achieve in their DM2 treatment plans were more likely to have uncontrolled glucose (5/6 patients), though this was also statistically insignificant. This may also function similarly to foot checks, as patients without a goal may be less consistent with or cognizant of their self-management plans. This may also reflect poor health literacy due to lack of understanding of the significance or consequences of A1c values.

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