

**EFFICACY OF SELF-MANAGEMENT EDUCATION FOR DIABETIC MELLITUS
TYPE 2 PATIENTS AT AGASSIZ MEDICAL CENTRE**

By: Amanda C. Loscerbo & Erin N. McAndrew

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Supervisor(s): Dr. Adriana Botha and Dr. Jason Zhang

INTRODUCTION

Diabetes is a very prevalent disease in Canada and has a large impact on health care resources. In 2016 the prevalence of diabetes and pre-diabetes in Manitoba was estimate to be 28.1% of the population.¹ Diabetes contributes to 30% of strokes, 40% of heart attacks, 50% of kidney failure requiring dialysis, and 70% of nontraumatic lower limb amputations and is a leading cause of vision loss.¹

According to the 2018 Canadian Diabetes Association guidelines, diabetes self-management education (SME) improves health parameters for patients.² These guidelines suggest that SME should take a patient centered approach and teach behaviours, knowledge and problem-solving skills.² Based on these recommendations Regional Health Authorities (RHA) in Manitoba now have programs to help improve diabetes management for their patients. In fact, the Southern Health-Santé Sud RHA now has four My Health Teams that are integral members of diabetes management and provide SME for patients. In 2015 the Agassiz Medical Centre (AMC) initiated a My Health Team available to the patients to provide a holistic approach to patient care. Included in My Health Team at the AMC is a Chronic Disease Nurse and a Dietitian. These members of the AMC have become an invaluable resource to the Family Physicians as they have the ability to spend time with diabetic patients and provide SME.

One of the standard markers used to measure diabetes management is Hemoglobin A1C (HbA1c). HbA1c is a marker of blood glucose control over a 3-month period and encompasses both fasting and post-prandial blood glucose levels³. HbA1c levels over 7.0% are associated with a significant increase in microvascular and cardiovascular complications.³ The target HbA1c level for most people with Type 2 Diabetes is below 7.0%.³ Reaching target HbA1c is accomplished through diet and lifestyle as well as appropriate use of medications such as

metformin and insulin. Diabetes SME provided by dietitians and chronic disease nurses has been shown to reduce HbA1c compared to usual care, especially in patients over age 65.⁴

In addition to SME, oral antihyperglycemic agents like metformin play an important role in glycemic management in diabetes. Metformin is considered a first line therapy for type 2 diabetes because it is well tolerated by patients, has a good safety profile, and has a relatively low risk of hypoglycemia and weight gain.⁵ The mechanism of action is reduction of hepatic glucose production and decreased peripheral insulin resistance. The Canadian Diabetes Guidelines recommends that most patients start metformin after a diagnosis of diabetes if they are more than 1.5% above their target HbA1c level. Patients who are less than 1.5% above their target HbA1C may be given 3 months to attempt to reach target using lifestyle modifications alone.⁵ Metformin used as a monotherapy can be expected to lower HbA1c by approximately 1.0.⁵

CLINICAL QUESTION: How does self-management education affect HbA1c levels for Diabetes Mellitus Type 2 patients at the Agassiz Medical Centre?

MATERIALS AND METHODS

Patient Population

The Agassiz Medical Centre uses Accuro as an EMR system. This system has a built in filter features that can search the patient database for specific requirements. The specific filter criteria employed to identify the patient population for this study were: 1) patients who have the diagnostic code for diabetes mellitus type 2 entered into their chart and 2) patients who are on metformin.

We applied a further set of rules to separate our patient population to those that had been referred to a member of My Health Team and those who had not. There are two health care professionals (Chronic Disease Nurse and Dietitian) at the AMC that facilitate diabetes SME, therefore we searched for patients who had been referred to any of these individuals. The patients had to be referred to the members of the My Health Team during the time period of June 1, 2016 – June 1, 2018.

Chart Audit

After the patient population was separated into referred patients and not referred patients we performed a chart audit. The goal of the chart audit was to identify three different HbA1c values for each patient. For the referred patients the first HbA1c value we collected was prior to the appointment with the My Health Team member. The second and third HbA1c values for the referred group were the subsequent readings in the patients' chart after their referral appointment. For the patients who were not referred the first HbA1c value collected was the data point closest to our time period of June 2016.

During the chart audit, further patients were excluded if they did not have a HbA1c above 6.5% at the time point closest to June 1, 2016. Furthermore, patients were excluded if they were referred to a member of the My Health Team but did not actually attend any appointments. Finally, during the chart audit we were collecting HbA1c values at 3 different times points, so if the patient did not have enough data in their chart they were also excluded.

Table 1: Exclusion Criteria Utilized during Chart Audit

HbA1c < 6.5% (does not meet the diagnostic criteria for Diabetes Mellitus Type 2 during the time period of our study)
Referred to a My Health Care team member but did not attend any appointments
Insufficient data (< 3 time points) during the time period of our study

Student's *t*-Test

Student's *t*-tests were employed throughout this project to identify statistically significant differences between two means that are assumed to follow a normal distribution and exhibit equal variance within each group. Unpaired Student's *t*-tests were calculated using Prism v7.0 (GraphPad) to determine if significant differences exist between patients who had been referred to a My Health Team professional and patients who had not. A *p*-value of <0.05 is considered to be statistically significant and is strongly suggestive of different means.

RESULTS

The original filter search identified a total of 460 patients, where 165 patients had been referred to a My Health Team member and 295 patients had not been referred. In the referral group the following patients were excluded: 21 patients for insufficient data, 15 patients for not attending appointments with My Health Team member and 11 patients because HbA1c < 6.5%. In the not referred group the following patients were excluded: 38 patients for insufficient data and 52 patients because HbA1C < 6.5%. This made the final patient population for the study to be 323, with 118 patient in the referred group and 205 in the not referred group (Figure 1). The referred group was then further subdivided into patients that met with the dietitian, those that met with the chronic disease nurse, and those that met with both. The demographics of each group are presented below in Table 2. Patients who were referred to a My Health Team professionals had a statistically significant younger age compared to the not referred patients (*p*-value = 0.0003).

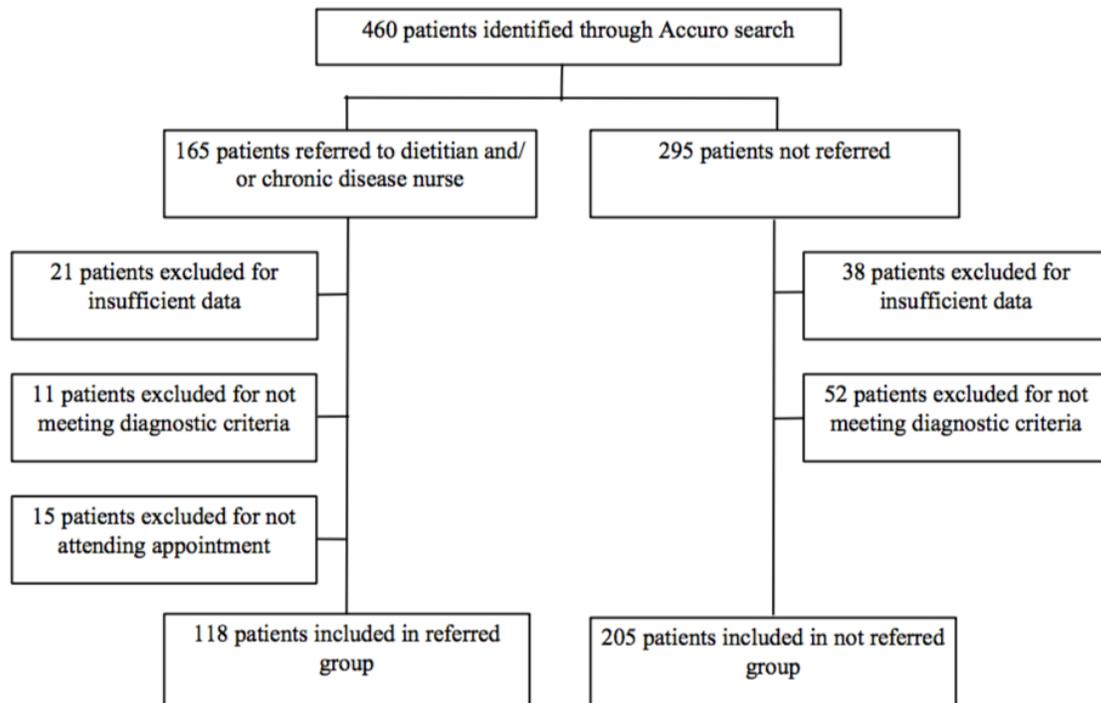


Figure 1: Flowchart of the Study Patient Population

A schematic representation of the patient population included in this study. The original search identified 460 patients. In the referred group 165 patients were identified, however 21 were excluded for insufficient data, 15 for not attending appointment and 11 for not meeting diabetes diagnostic criteria. In the not referred group 295 patients were identified, however 38 were excluded for insufficient data and 52 for not meeting diabetes diagnostic criteria.

Table 2: Age and Gender of Study Population

	Age (years) \pm SD^A	Percent Female	Percent Male
Study Population (n = 323)	65.85 \pm 11.79	41.5%	58.5%
Not Referred (n = 205)	68.37 \pm 11.85	43.4%	56.6%
Referred (n = 118)	63.32 \pm 11.73	38.1%	61.9%
Referred to Dietitian and Nurse (n = 41)	63.51 \pm 11.07	46.4%	53.6%
Referred to Dietitian (n = 25)	60.40 \pm 12.72	48.0%	52.0%
Referred to Nurse (n = 52)	64.58 \pm 11.73	26.9%	73.1%

^ASD; standard deviation

Having identified the two patient population groups for our study a chart audit was performed. During the chart audit three different time points were collected. The first HbA1c data point for referred patients was prior to the appointment with the My Health Team member, and then the following two HbA1c after the appointment. For the not referred group the data point closest to June 2016 was collected. The mean HbA1C was then calculated for each patient population. The referred patients had a statistically significant higher HbA1c percentage at time points 1 and 2 relative to the not referred group (Figure 2, Table S1 appendix).

After identifying the difference between the referred and not referred patients, we were interested to investigate if there was difference between those that referred to just the Chronic Disease Nurse, Dietitian or both. Overall, the trend of HbA1c upon those referred to any My Health Care team professional was similar. However, there was slight statistically significant increase in those that were referred to the chronic disease nurse or both professionals at time point 2 compared to the dietitian only (Figures 3-5, Tables S2-4).

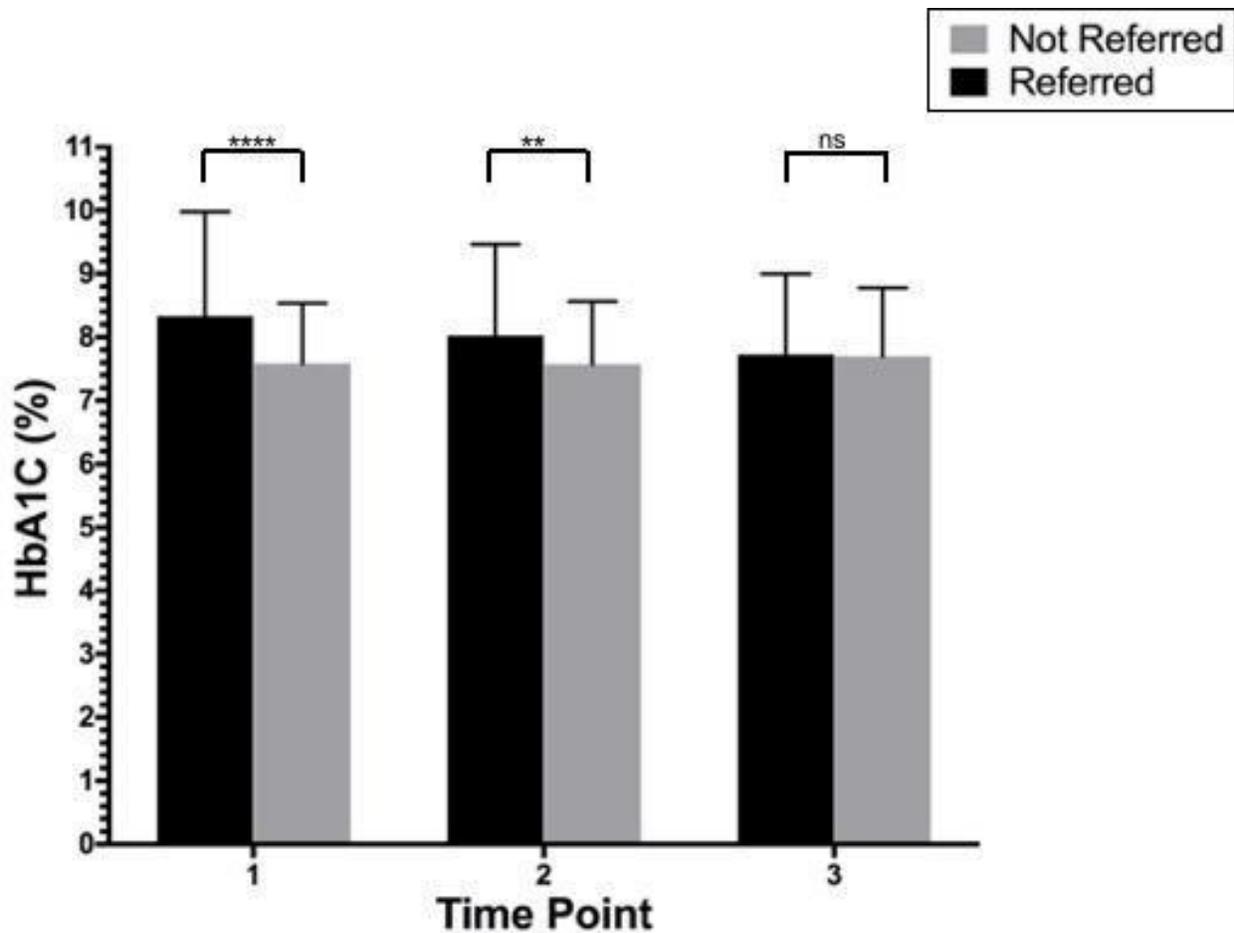


Figure 2: Patients who are Referred to My Health Team have Worse Control of Diabetes Initially

Bar graph depicting the mean HbA1C percentage for patients who were not referred to a My Health Team member (grey) and patients who were referred to a My Health Team member (black). Student's *t*-test reveal a statistically significant higher average of HbA1C percentage for the referred patients at time point 1 and 2 relative to not referred patients. There is no statistical significant difference between the two groups of patients at time point 3. (*****P*-value <0.0001; ***P*-value <0.01; ns = not significant).

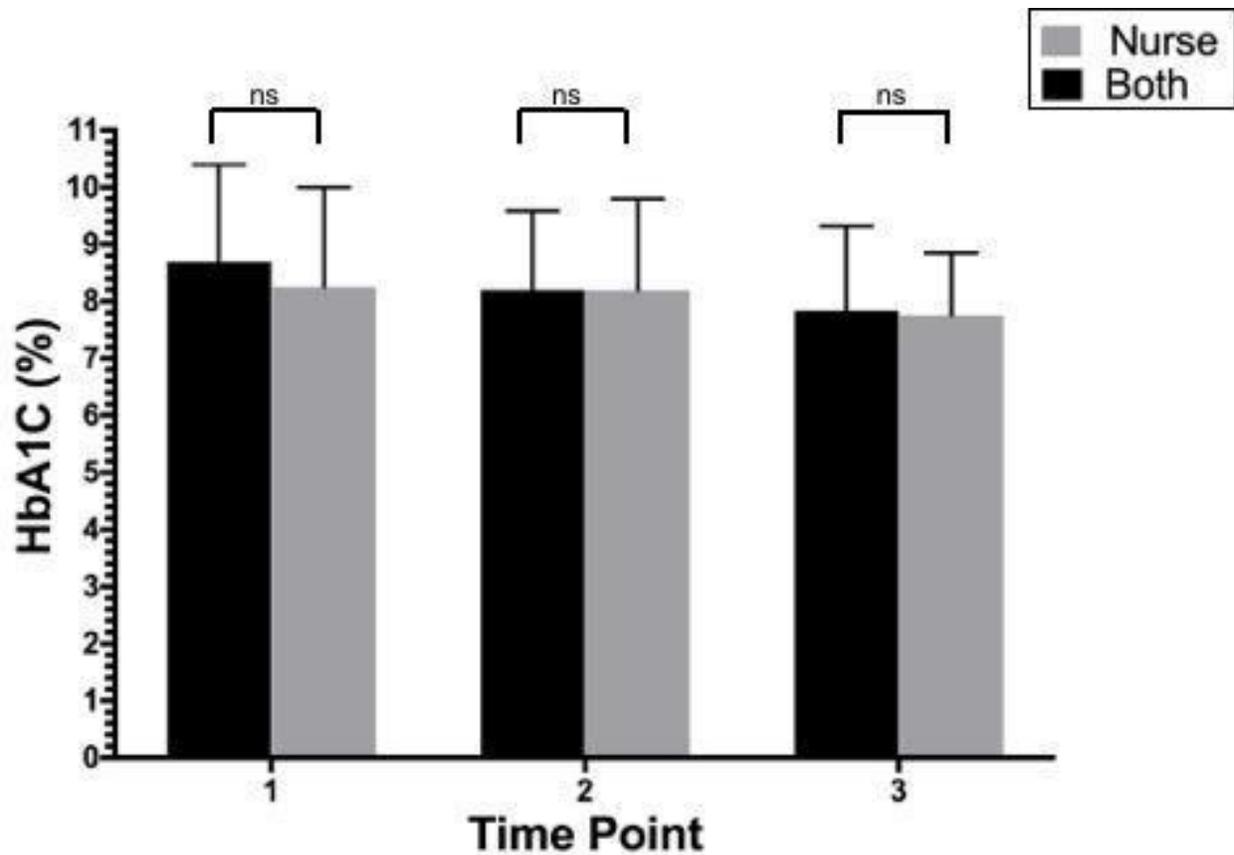


Figure 3: Patients who are Referred to Nurse versus Referred to Both have Similar Diabetes Control

Bar graph depicting the mean HbA1C percentage for patients who were referred to the Chronic Disease nurse (grey) and patients who were referred to a both the Chronic Disease Nurse and Dietitian (black). Student's *t*-test reveal no statistical difference between the average of HbA1C percentage between these groups of patients (ns = not significant).

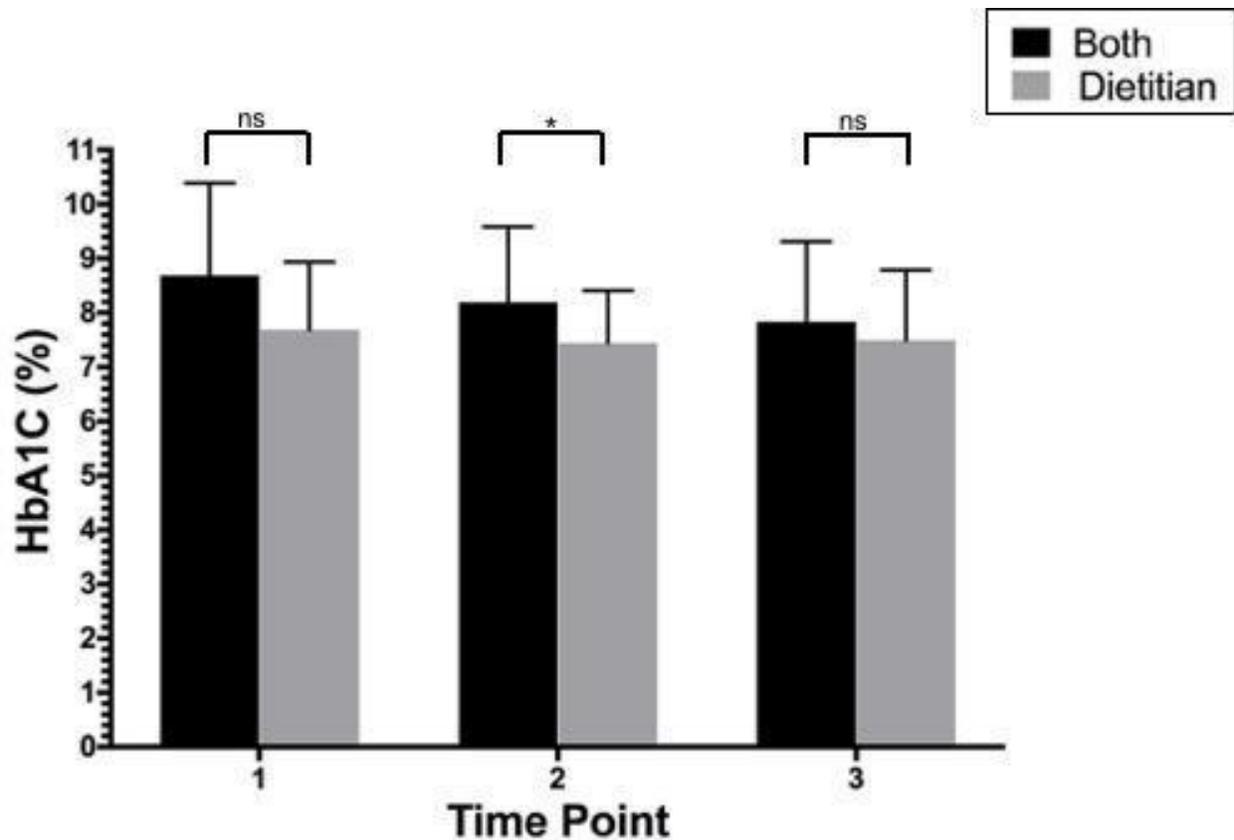


Figure 4: Patients who are Referred to Dietitian versus Referred to Both have Similar Diabetes Control

Bar graph depicting the mean HbA1C percentage for patients who were referred to the Dietitian (grey) and patients who were referred to a both the Chronic Disease Nurse and Dietitian (black). Student's *t*-test reveal no statistical difference between the average of HbA1C percentage between these groups of patients at time point 1 and 3. Patients who were referred to both professionals had a statistically significant higher mean HbA1C percentage at time point 2. (**P*-value <0.05; ns = not significant).

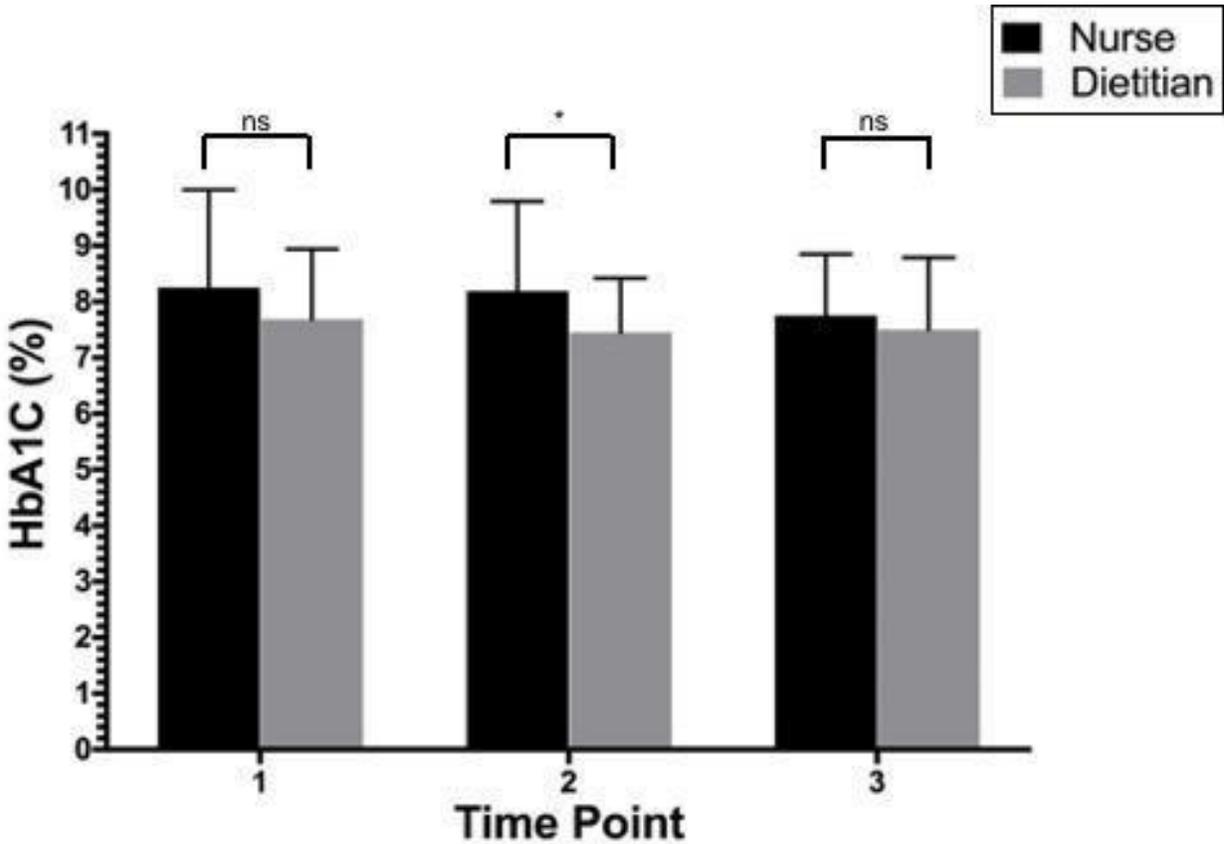


Figure 5: Patients who are Referred to Dietitian versus Nurse have Similar Diabetes Control

Bar graph depicting the mean HbA1C percentage for patients who were referred to the Dietitian (grey) and patients who were referred to a both the Chronic Disease Nurse (black). Student's *t*-test reveal no statistical difference between the average of HbA1C percentage between these groups of patients at time point 1 and 3. Patients who were referred to the nurse had a statistically significant higher mean HbA1C percentage at time point 2. (**P*-value <0.05; ns = not significant).

DISCUSSION

This study sought to identify if SME for diabetes delivered through My Health Team professionals at AMC is an effective modality for management of HbA1c levels. Through a retrospective chart review using the Accuro EMR filter search, exclusion criteria and a chart audit we determined that patients at AMC who are referred to a My Health Team professional on average, have a statistically significant higher HbA1c than those who are not referred. More specifically, patients who were referred to a My Health Team professional had an average initial HbA1c of 8.33 ± 1.65 , compared to not referred patients' 7.59 ± 0.95 (Figure 2, Table S1). This suggests that a higher HbA1c may prompt physicians at AMC to use SME resources for diabetes management. The acquirement of three different time points for HbA1c levels identified that after SME patients in the referred group converge to similar HbA1c levels as the not referred group. Additionally, we determined there was similar HbA1c levels between patients who are referred to the Chronic Disease Nurse, Dietitian or both (Figures 3-5, Tables S2-S4). Finally, we noted that patients who are referred for SME are on average younger compared to the not referred patients (Table 2).

Although we have identified patients who are referred for SME with a My Health Team professional are more likely to have higher HbA1c compared to those who were not, there are some potential limitations and biases inherent in our project. First, we decided to define a time from of June 1, 2016 – June 1, 2018 for this project to help streamline data collection. Because of this timeframe, we may have included patients who were in the not referred group who have had years to establish control on their diabetes. For our inclusion criteria we ensured that every patient was on metformin, however due to the limited scope of this project we did not monitor any other medications the patient was on. Therefore, it is impossible to comment on whether the

referred or not referred group have more antihyperglycemic medications compared to the other. However, during our time as medical students at AMC we both anecdotally noted that patients who were on insulin were more likely to be referred to the Chronic Disease Nurse. This could be because insulin titration requires more hands-on teaching and is difficult for physicians to do in short appointments. Some future directions for similar research could include further investigations on the antihyperglycemic medications patients are on, expanding the timeframe for the study or monitoring patients from the initial diagnoses of diabetes.

Similar to our study, other large scale studies have shown that SME in diabetes management can have clinically and statistically significant impact on HbA1c levels.^{2,6,7} More specifically, the Project IMPACT: Diabetes that had 1,836 patients and showed that Pharmacist patient centered services showed a significant improvement in patients' clinical outcomes.⁷ A randomized control trial showed that intervention with multidisciplinary outpatient diabetes care delivered by diabetes nurse education, a psychologist, a nutritionist and a pharmacist improved HbA1c levels, patient satisfaction and reduced health care utilization after the program.⁶ A decrease in health care utilization is an important outcome to consider, especially in Manitoba since the economic burden of Diabetes is estimated to be at \$639 million by 2020.⁸

In conclusion, our study identified that patients referred to My Health Team professionals were more likely to have higher HbA1c levels compared to those not referred. However, additional HbA1c levels after the SME showed that referred patients converge to similar glycaemic control as those not referred. The results of this study signify that My Health Team professionals at the AMC are a valuable tool to help manage Diabetes Mellitus Type 2. Since Southern Health – Santé Sud has recently initiated My Health Team within the region, the results

of this chart audit indicated that in conjunction with other modalities, SME is an effective intervention for diabetic patients.

References

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APPENDIX

Table S1: Student's *t*-tests Identifying Statistical Differences in mean HbA1C levels between Referred and Not Referred Patients at Time Points 1 and 2

	Mean HbA1C (%) \pm SD ^A		
Data Point	Referred Group (n = 118)	Not Referred (n = 205)	<i>p</i> -value
1 st HbA1C (\pm SD)	8.33 \pm 1.65	7.59 \pm 0.95	<0.0001
2 nd HbA1C (\pm SD)	8.03 \pm 1.44	7.58 \pm 0.99	0.0010
3 rd HbA1C (\pm SD)	7.73 \pm 1.27	7.70 \pm 1.08	0.8220

^ASD; standard deviation

Table S2: Student's *t*-tests Identifying Statistical Differences in mean HbA1C levels between patients referred to Both or Dietitian at Time Point 2

	Mean HbA1C (%) \pm SD ^A		
Data Point	Both (n = 41)	Dietitian (n = 25)	<i>p</i> -value
1 st HbA1C (\pm SD)	8.69 \pm 1.71	7.96 \pm 1.25	0.0687
2 nd HbA1C (\pm SD)	8.20 \pm 1.39	7.45 \pm 0.97	0.0210
3 rd HbA1C (\pm SD)	7.84 \pm 1.48	7.50 \pm 1.29	0.6739

^ASD; standard deviation

Table S3: Student's *t*-tests Identifying No Statistical Differences in mean HbA1C levels between patients referred to Both or Nurse

	Mean HbA1C (%) \pm SD ^A		
Data Point	Both (n = 41)	Nurse (n = 52)	<i>p</i> -value
1 st HbA1C (\pm SD)	8.69 \pm 1.71	8.25 \pm 1.75	0.2271
2 nd HbA1C (\pm SD)	8.20 \pm 1.39	8.19 \pm 1.61	0.9749
3 rd HbA1C (\pm SD)	7.84 \pm 1.48	7.76 \pm 1.09	0.7648

^ASD; standard deviation

Table S4: Student's *t*-tests Identifying Statistical Differences in mean HbA1C levels between patients referred to Nurse or Dietitian at Time Point 2

	Mean HbA1C (%) ± SD^A		
Data Point	Nurse (n = 52)	Dietitian (n = 25)	<i>p</i>-value
1 st HbA1C (± SD)	8.25 ± 1.75	7.96 ± 1.25	0.1563
2 nd HbA1C (± SD)	8.19 ± 1.61	7.45 ± 0.97	0.0376
3 rd HbA1C (± SD)	7.76 ± 1.09	7.50 ± 1.29	0.3591

^ASD; standard deviation