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Decreasing Therapeutic Inertia in the Treatment of Type 2 Diabetes Mellitus

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Abstract

Objective:

Therapeutic inertia (TI) is the failure to initiate or make adjustments to the pharmacologic therapy of diabetic patients, when indicated, by generally recognized guidelines. It is an impediment to achieving A1C targets and ultimately a cause of poor patient outcomes. The purpose of this study is to determine if there are common characteristics among a health center's primary care providers (PCPs) with high levels of TI.

Study Design:

Observational retrospective and quantitative chart review.

Methods:

From a list of all providers with diabetic patients, PCPs were ranked by what percent of their diabetic patients had an A1C >9% and were not on either insulin or GLP-1. Three cohorts were then created: highest TI, moderate TI, lowest TI. Pre-determined characteristics of the members of these groups were compared to determine if there were correlations.

Results:

The cohort with the most TI had a panel average of 531.75 patients, 99.5 of which were diabetic, and with a mean TI percentage of 42.23. The cohort with the lowest amount of TI had a mean of 446.174 patients, 64.25 of which were diabetic, and a mean TI percentage of 9.82. Additionally, 50.00% of PCPs with a low level of TI have received state of Washington credentials in the past 1-5 years, compared to 25.00% of PCPs with a high level of TI.

Conclusions:

Individual characteristics do not have an undue influence on rates of TI; however, the best predictor of TI is a higher overall patient panel load. Recommendations to reduce TI include determining the optimum patient panel size, evenly distributing diabetic patients amongst PCPs, providing continuing education on new therapies such as GLP-1RAs, and an examination into whether PCP behaviors, when treating diabetic patients, are associated with higher levels of TI.

Decreasing Therapeutic Inertia in the Treatment of Type 2 Diabetes Mellitus

Adults with type 2 diabetes mellitus (T2DM) and uncontrolled hyperglycemia experience life-compromising microvascular and macrovascular complications that contribute to chronic kidney disease, cardiovascular disease, nerve damage, blindness and lower limb amputations (Andreozzi et al., 2020; Buttaro et al., 2021; Reach, 2017). T2DM limits quality of life, leads to a reduction in life expectancy and exacerbates comorbidities (Chaudhury et al., 2017; Leiter et al., 2019). Prompt pharmacological treatment for elevated Hemoglobin A1C levels reduces the consequences of hyperglycemia and improves health outcomes (Buttaro et al., 2021; Gabbay et al., 2020; Khunti et al., 2017; Kianmehr et al., 2022). The lack of timely adjustment to therapy when indicated is an impediment to achieving A1C targets, a phenomenon referred to as therapeutic inertia (TI) (American Diabetes Association (ADA), 2023; Andreozzi et al., 2020; Khunti et al., 2017; Reach et al., 2017). The primary causes of TI can be differentiated into the barriers related to patients, providers, and the healthcare system (Ali et al., 2020; Leiter et al., 2019; Polonsky et al., 2017; Reach et al., 2017; Wrzal et al., 2020). What is not clear is if there are correlations between PCP characteristics and high levels of TI. The purpose of this project, then, is to determine whether PCP characteristics are related to TI. In other words, are PCPs with certain characteristics associated with greater or less TI in the treatment of diabetic patients? By identifying these factors, future studies may investigate whether PCPs who have specific characteristics are more likely to adopt the most efficacious treatment therapies for diabetic patients. Before the study is described, background will be provided on generally accepted treatments of T2DM. In addition, PCP characteristics that impact T2DM treatment decisions, as well as barriers PCPs face in administering treatment, will be discussed.

Background

In the United States, 11.3% of the population has diabetes; it is the eighth-leading cause of death in the country, per the Centers for Disease Control (CDC), 2023. It is predicted that

33% of all Americans will develop diabetes at some point in their lifetimes. (Koyama, 2022). In Washington State, adults with diabetes are 4.6 times more likely to have kidney disease, 3.3 times more likely to have a stroke, and 2.7 times more likely to have heart disease compared to adults without diabetes (Kemple et al., 2019).

It is widely accepted that there is a strong social dimension to T2DM (ADA, 2018; CDC 2020; Haw et al., 2021; Mouri & Barireddy, 2020; Vaughn et al., 2017). For example, low socioeconomic status is associated with a higher prevalence of hyperglycemia (Mouri & Barireddy, 2020; Vaughn et al., 2017). In the US, rates of diabetes are significantly higher for racial and ethnic minorities (Haw et al., 2021). According to the CDC, diabetes rates for ethnic minorities are:14.7% of American Indian/Alaskan Native, 11.7% of non-Hispanic Blacks, 12.5% Hispanics, 9.2% of Asian Americans, and 7.5% of non-Hispanic Whites (CDC, 2020).

Timely Treatment of Type 2 Diabetes Mellitus

Type 2 diabetes mellitus is an insidious disease: Symptoms are slow to develop, and complications are irreversible (Mouri & Barireddy, 2022). Delaying treatment may result in retinopathy, myocardial infarction, heart failure and stroke (Khunti et al., 2017; Kuritzky et al., 2019; Singh et al., 2021). There is no cure for T2DM, but proper treatment via glycemic control can slow illness progression, mitigate complications and manage disease symptoms (Buttaro et al., 2021; Chaudhury et al., 2017; Reach et al., 2021). And it is the role of PCPs to generate insights and options around managing glycemic control and timely course of treatment (CDC, 2023).

Assessing Treatment

Hemoglobin A1C is used to measure the average level of glucose in the blood over three months and is the gold standard diagnostic test for diabetes (Eyth & Naik, 2022; Mian et al., 2019). According to the ADA, A1C has a strong predictive value for diabetes complications and quarterly testing is the preferred method of assessing whether targets have been reached and maintained (ADA, 2023). The ADA classifies an A1C level below 5.7% as normal; levels

5.7%-6.5% are considered pre-diabetic and anything higher is classified as diabetic (ADA, 2023). For most patients with T2DM, 7% is a common A1C target (CDC, 2020; Reach et al., 2017); however, fewer than 65% of patients reach their target and less than 50% achieve an A1C of less than 7% (ADA, 2023). A1C levels above 9% increase the risk of blindness, heart attack, nerve damage and kidney failure (ADA, 2023).

Although treatment options have improved, the proportion of patients with T2DM above their A1C target is increasing (Okemah et al., 2018), and the proportion actually achieving their target declined from 52.2% in 2010 to 50.9% in 2014 (Carls et al., 2017). Because every 1% reduction in A1C leads to a 30-40% reduction in complications, the ADA advises PCPs to advance therapy if a patient does not reach their A1C goal within 3 to 6 months (ADA, 2023), and has generated stepwise guidance for treatment intensification (ADA, 2018). Researchers have found a "legacy effect" of timely glucose control; reaching A1C goals in the first year of treatment results in beneficial and sustained long-term outcomes (Ma et al., 2019; Reach et al., 2017). However, a 2016 systematic review found a median time of more than one year before treatment was initiated to address above-target A1Cs (Khunti et al., 2018). Further, due to T2DM's progressive nature, most patients require additional intensification in therapy to reach and maintain their glycemic goals (Chaudry et al., 2017; Karam, 2020; Reach et al., 2017).

Medication Management

The front-line approach to glycemic control is lifestyle changes vis-a-vis a low-carbohydrate diet and increased exercise (Davies et al., 2018; Wrzal et al., 2021). If lifestyle modifications alone are inadequate, pharmacologic therapy is indicated (ADA 2023; Mouri et al., 2022; Reach et al., 2017). Disease stage, life expectancy and comorbidities are often deciding factors for clinicians when determining which class of medications to use (Garber et al., 2020). Most patients start on oral antihyperglycemic medications such as biguanides (metformin), sulfonylureas (glipizide), SGLT2 inhibitors (dapagliflozin) and DPP-4 inhibitors

(sitagliptin) before using injectables like insulin and GLP-1 receptor agonists (GLP-1RA) (dulaglutide {Trulicity}, liraglutide {Victoza}, and semgalutide {Ozempic}). An A1C greater than 9% is a generally recognized indicator for initiating insulin or a GLP-1RA (ADA, 2023).

PCP Characteristics

Individual PCP characteristics impact care and contribute to TI; these include professional background and qualifications (Chew et al., 2022; Riordan et al., 2020), years of experience in practice (Andreozzi et al., 2020, Hidalgo-Rodrigues et al., 2022; Khunti et al., 2019), physical setting (urban vs. rural) or geographical location of where care is provided (Casanova, 2016; Riordan et al., 2020), number of diabetic patients, gender and age (Riordan et al., 2020). Interestingly, Riordan et al. (2020) found that female gender is positively associated with better care and older age is associated with poorer care. Riordan et al. do not offer a definition as to whom exactly gender refers, but it can be assumed that they mean cisgender women; heretofore, in this paper gender shall refer to cisgender women. LeBlanc et al. (2015) dispute the importance of provider characteristics and found no associations between provider characteristics and TI.

Provider Barriers

Experts agree that providers face difficulties, both in identifying patients at high risk and in navigating the complexities accompanying diabetes care management (Ali et al., 2020; Andreozzi et al., 2020; Leiter et al., 2019; Rattleman et al., 2021; Wrazl et al., 2021). Specifically, management complexity includes difficulties interpreting guidelines and algorithms (Andreozzi et al., 2020; Chew et al., 2022; Khunti et al., 2019; Wrazl et al., 2020), lack of clear guidance or training (Andreozzi et al., 2020; Wrazl et al., 2020), patient comorbidities (Andreozzi et al., 2020; Chew et al., 2020), the large number of pharmacological options available (Ali et al., 2020; Reach et al., 2017; Wrazl et al., 2021), and a lack of confidence to intensify treatment with new classes of injectables (Andreozzi et al., 2020; Chew et al., 2022; Khunti & Cheng 2023; Rattleman, 2021). Additionally, the constraints imposed by short appointment times are

viewed by many PCPs as limiting their ability to consistently provide effective care (Andreozzi et al., 2020; Chew et al., 2022; Leiter et al., 2019). Fear of patients developing severe hypoglycemia is also concern (Ali et al., 2020; Khunti et al., 2017; Polonsky et al., 2017).

Table 1

Provider Level Barriers

Lack of, or difficulty in, interpreting guidelines and algorithms
Lack of guidance
Patient's comorbidities
Overwhelming number of pharmacological options
Unfamiliarity with new drug classes
Lack of time
Fear of hypoglycemia

Measurement and Indicators

TI is influenced by three distinct PCP-related conditions: Established clinical goals, acknowledged need for treatment, and an appropriate timeframe for the initiation and intensification of therapy (Reach et al., 2017). TI is generally described as the failure to modify treatment as indicated by clinical-based guidelines (ADA, 2023; Andreozzi et al., 2020; Gabbay et al., 2020; Khunti et al., 2017; Reach et al., 2017). However, there is an absence of a consistent unit of measurement. The ADA recommends modifying the treatment of diabetic patients whose A1C is > 7%; therefore a baseline definition could be: TI = A1C > 7% without a change in therapy.

There are no conclusive indicators of TI, but two methods that have been widely utilized are process indicators (evaluation of the appropriateness of the care processes in relation to recognized standards), and outcome indicators (evaluation of the effects of care) (Andreozzi et al., 2020; Campbell et al., 2019; Ruiz-Negron et al., 2019). The ADA suggests using the following process indicator method:

Figure 1

Formula to Determine TI

1- c/h

Where h is the number of visits with a high A1C, and c is the number of visits in which a therapy change was made.

For example: 1- 2/4 = 0.5

This represents a failure rate of 50% in intensifying treatment.

Monitoring Diabetes

Although TI may occur at any stage of therapy, it is particularly evident when A1C is >9%, the generally recognized indicator for initiating injectable medication such as insulin or a GLP-1RA (Inzucchi & Lupsa, 2023; Wrazl et al., 2020). For this reason, it is desirable for a particular clinic or institution to adopt a flexible scale of indicators for monitoring its progress in decreasing specific aspects of TI to reflect local realities (Andreozzi et al., 2020). For example: 46% of patients whose A1C is >7% have not been seen in the past 6 months, or 31% of patients with A1C >9% are not prescribed either insulin or a GLP-1RA.

Monitoring and coordinating treatment are two fundamentals for successful management of chronic disease (U.S. Department of Health and Human Services, 2023). Thus, monitoring the quality of diabetic care is essential in overcoming TI (Andreozzi et al., 2020; Campbell et al., 2019; Ruiz-Negron et al., 2019). To avoid TI, the 2018 European Association for the Study of Diabetes guidelines recommends assessment and treatment modification every 3-6 months (Davies et al., 2018). The ADA recommends that patients with A1C within the goal range should be monitored twice yearly; patients with A1C above the goal range should be monitored at least 4 times annually (ADA, 2023). Better adherence to guideline-recommended assessment is associated with better glycemic control (Imai, et al., 2021).

Method

Setting

This study was conducted at a primary healthcare center (hereby referred to as the center) that provides comprehensive care in nine neighborhood clinics throughout Seattle. It is a federally qualified health center (FQHC) serving people from a wide range of ethnicities and socio-economic backgrounds.

A recent quality review indicated a prevalence of therapeutic inertia across the center's nine clinics. The leadership team recognized that in order to effectively decrease incidence of TI, it must develop and implement a comprehensive strategy that offers solutions at all three levels: patient, system, and provider. At the patient level, high-risk populations have been identified and appointments are currently being scheduled with both providers and certified diabetes care and education specialists (CDCES). At the system level,1) ADA treatment guidelines have been adopted (Appendix 1), 2) utilization of a "multi-disciplinary team" approach has been enacted, which empowers registered nurses to initiate and intensify treatment based on standing orders, and 3) existing technology has been leveraged to assist PCPs in recognizing when their patients may be at risk.

A significant provider-level issue is inconsistent adherence to the ADA guidelines that outline care of diabetic patients with elevated A1C levels. Specifically, providers are not routinely initiating or intensifying the pharmacological treatments when indicated. And, although a program is under development in which RNs will provide targeted, ongoing follow-up with high-risk patients, piloting the identification of TI causes and trends related to PCPs has only recently been suggested.

An internal survey of provider-recognized causes of TI found a lack of confidence in initiating and managing insulin, a reluctance to prescribe new classes of drugs, a lack of time allotted for patient visits, and difficulties managing comorbidities. Consequently, the center

created a "diabetes dashboard" that can be used to identify patients potentially at risk of therapeutic inertia and that will assist providers in adjusting care plans accordingly.

The diabetes dashboard has revealed that nearly one-third of patients at the center suffer the consequences of TI. The center has endeavored to implement the recommendations outlined in the ADA's 2020 Overcoming Therapeutic Inertia (OTI) initiative (Appendix 1). Of the six action items proposed, three have yet to be put into practice: Action Item 1) Identify high-risk patients with type 2 diabetes who are not at target goals; Action Item 2) Identify and prioritize reasons for not achieving goals; and Action Item 5) Leverage technology into practice. This project will specifically address provider-level barriers and Action Item 2. Future quality improvement projects may consider patient-level barriers with respect to Action Item 1 and address system- level barriers via Action Item 5.

This project is intended to identify relationships between providers and their patients with high levels of TI. It will analyze whether there are similarities among PCPs with patients who have high levels of TI by using the diabetes dashboard to compare provider characteristics. A retrospective chart review will be performed to determine if there are identifiable PCP characteristics related to TI. The effective timeframe was January 1, 2023 to January 1, 2024. As the project was a chart review, there was no interaction or intervention with subjects; recruitment and informed consent were unnecessary. The Seattle University Institutional Review Board (IRB) determined the study to be exempt from IRB review.

Data Collection and Storage

PCP characteristic data, as determined by literature review and in collaboration with CDCES, were pulled from the center's internal diabetes data visualization tool. Data was inputted into Microsoft Excel by the center's information technology department and provided to the researcher via the center’s internal electronic communication network.

Variables and Definitions

Variable	Definition
Highest Amount of TI	Top 25% cohort
Moderate Amount of TI	Middle 50% cohort
Lowest Amount of TI	Bottom 25% cohort
Therapeutic Inertia	Total patients with A1C >9% who are not on insulin and/or GLP1-RA divided by total patients with A1C >9%
T2DM diagnosis	A1C >6.5%
Clinic	Specific geographical location in Seattle
Qualifications	Medical Doctor (MD), Doctor of Nursing Practice (DNP) Nurse Practitioner (ARNP), Physician's Assistant (PA-C), Doctor of Osteopathic Medicine (DO)
Professional Experience	Years since qualification granted by state of Washington
Gender	Cisgender woman, cisgender man as self-reported
Diabetes Volume	# of patients with T2DM diagnosis
Age	Years since birth
Employment Status	Primary or locum

Approach to Analysis

Data was analyzed using descriptive statistics and evaluated by correlational analysis of data distribution. PCP and cohort characteristics were examined as detailed below.

PCP characteristics

A list of all PCPs who cared for patients with a diagnosis of T2DM was compiled. Locum were eliminated except for one who had their own patient panel. In total, 43 providers were included. PCP personal identifiers, including name and date of birth were replaced with random numbers. Next, these random numbers were entered into a Microsoft Excel spreadsheet that included predetermined PCP characteristics: 1) professional experience, 2) employment status, 3) clinic location, 4) gender, 5) age, 6) number of diabetic patients, and 7) total number of

patients. Then, the TI of each PCP was calculated by dividing total patients with A1C >9% who were not prescribed either insulin or GLP1-RA by total number of patients with A1C >9%. Once the TI of each PCP was calculated, the list was then ranked from highest to lowest according to level of TI. Finally, the list was separated into three distinct cohorts: The lowest amount of TI was assigned the bottom 25% cohort, a moderate amount of TI was assigned the middle 50%, and the highest amount of TI was classified at the top 25%.

Cohort Characteristics

Cohort statistics, utilizing data pulled from the electronic medical record (EMR), were calculated using total number of patients and mean per provider (Chart 2). Data were divided into multiple categories: 1) diabetic patients per cohort and the mean, 2) patients with A1C <9%, what percentage that was of total diabetic patients, and the mean, 3) patients with A1C >9%, what percentage that was of total diabetic patients, and the mean, 4) patients with A1C >9% who were prescribed insulin or a GLP1-RA, what percentage that was of total diabetic patients and the mean, 5) patients with A1C >9% who were not prescribed insulin or a GLP1-RA, what percentage that was of total diabetic patients, and the mean. Finally the level of TI was calculated by dividing total patients with A1C >9% who were not prescribed either insulin or GLP1-RA by total number of patients with A1C >9%.

Data Cleansing

Due to a discrepancy in the original data source, some data cleansing was necessary. Specifically, there were multiple outliers in each cohort. Surprisingly, there was the same relative number of outliers per group. Therefore, two were eliminated from the group with the highest level of TI and the lowest level of TI; four were removed from the group with moderate TI.

Results

Table 2

PCP Characteristics

All providers N= 43	**Highest TI N= 12**	**Lowest TI N= 12**	**Moderate TI N= 19**
Gender	**Gender**	**Gender**	**Gender**
F= 69.77% (30)	F= 58.33% (7)	F= 66.67% (8)	F= 73.68% (14)
M= 30.23% (13)	M= 41.67% (5)	M= 33.33% (4)	M= 26.32% (5)
Qualification	**Qualification**	**Qualification**	**Qualification**
MD= 46.51% (20)	MD= 58.33% (7)	MD= 50.00% (6)	MD= 36.84% (7)
ARNP= 32.56% (14)	ARNP= 25.00% (3)	ARNP= 8.33% (1)	ARNP= 52.63% (10)
PA-C= 11.63% (5)	PA-C= 16.67% (2)	PA-C= 16.67% (2)	PA-C= 5.26% (1)
DNP= 4.65% (2)	DNP= 0.00% (0)	DNP= 8.33% (1)	DNP= 5.26% (1)
DO= 4.65% (2)	DO= 0.00% (0)	DO= 16.67% (2)	DO= 0.00% (0)
Age range in years	**Age range in years**	**Age range in years**	**Age range in years**
31-40= 41.86% (18)	31-40= 25.00% (3)	31-40= 42.86% (6)	31-40= 47.37% (9)
41-50= 23.26% (10)	41-50= 33.33% (4)	41-50= 21.42% (3)	41-50= 21.05% (4)
51-60= 20.93% (9)	51-60= 25.00% (3)	51-60= 35.71% (5)	51-60= 10.53% (2)
61+= 13.95% (6)	61+= 16.67% (2)	61+=0.00% (0)	61+= 21.05% (4)
Years since credentialed in WA	**Years since credentialed in WA**	**Years since credentialed in WA**	**Years since credentialed in WA**
1-5= 41.86% (18)	1-5= 25.00% (3)	1-5= 50.00% (6)	1-5= 47.3 % (9)
6-10= 25.58% (11)	6-10= 25.00% (3)	6-10= 16.67% (2)	6-10= 31.58% (6)
11-15= 6.98% (3)	11-15= 8.33% (1)	11-15= 8.33% (1)	11-15= 5.26% (1)
16-20= 6.98% (3)	16-20= 16.67% (2)	16-20= 8.33% (1)	16-20= 0% (0)
21+= 18.60% (8)	21+= 25.00% (3)	21+= 16.672% (2)	21+= 15.79% (3)
Status	**Status**	**Status**	**Status**
Primary= 97.67% (42)	Primary= 92.86% (11)	Primary= 100% (12)	Primary= 100% (19)
Locum= 3.32% (1)	Locum= 7.14% (1)	Locum= 0.00% (0)	Locum= 0.00% (0)
Location	**Location**	**Location**	**Location**
#1= 4.65% (2)	#1= 0.00% (0)	#1= 8.33 (1)	#1= 5.26% (1)
#2= 11.63% (5)	#2= 16.67% (2)	#2= 0.00% (0)	#2=15.29% (3)
#3= 16.28% (7)	#3= 8.33% (1)	#3= 16.67% (2)	#3=21.05% (4)
#4= 6.98% (3)	#4= 8.33% (1)	#4= 0% (0)	#4= 10.53% (2)
#5= 16.28% (7)	#5= 8.33% (1)	#5= 25.00% (3)	#5= 13.04% (3)
#6= 20.93% (9)	#6= 33.33% (4)	#6= 8.33% (1)	#6= 21.05% (4)
#7= 4.65% (2)	#7= 8.33% (1)	#7= 16.67% (2)	#7= 0.00 % (0)
#8= 18.60% (8)	#8= 16.67% (2)	#8= 33.33% (4)	#8= 10.53% (2)

PCP Characteristics

Among the 43 PCPs practicing at the health center, 69.77% were female and 30.23% were male. 32.56% were ARNPs, 46.51% were MDs, 11.63% were PA-Cs, 4.65% were DNPs and 4.65% were DOs. 41.86% were 31-40 years old, 23.26% were 41-50 years old, 20.93%

were 51-60 years old and 13.95% were 61 or older. 41.86% had been credentialed in Washington State between 1-5 years, 25.58% 6-10 years, 6.98%11-15 years, 6.98%16-20 years, and 18.60% for 21 or more years. 97.67% had an employment status of primary and 3.32% were classified as locum. They were respectively based at: Clinic #1 4.65%, Clinic #2 11.63%, Clinic #3 16.28%, Clinic #4 6.98%, Clinic #5 16.26%, Clinic #6 20.93%, Clinic #7 4.65% and Clinic #8 18.60%.

Among the 12 PCPs with the highest level of TI, 58.33% were female and 41.67% were male. 25.00% were ARNPs, 58.33% were MDs and 16.67% were PA-Cs. 25.00% were 31-40 years old, 33.33% were 41-50 years old, 25.00% were 51-60 years old and 16.67% were 61 or older. 25.00% had been credentialed in Washington State between 1-5 years, 25.00% between 6-10 years, 8.33% between 11-15 years, 16.67% between 16-20 years, and 25.00% for 21 or more years. 92.86% had an employment status of primary and 7.14% were classified as locum. They were respectively based at: Clinic #1 0%, Clinic #2 16.67%, Clinic #3 8.33%, Clinic #4 8.33%, Clinic #5 8.33%, Clinic #6 33.33%, Clinic #7 8.33% and Clinic #8 16.67%.

Among the 12 PCPs with the lowest level of TI, 66.67% were female and 33.33% were male. 8.33% were ARNPs, 50.00% were MDs, 16.67% were PA-Cs, 8.33% were DNPs and 16.67% were DOs. 42.86% were 31-40 years old, 21.42% were 41-50 years old, 35.71% were 51-60 years old and 0% were 61 or older. 50.00% had been credentialed in Washington State between 1-5 years, 16.67% between 6-10 years, 8.33% between 11-15 years, 8.33% between 16-20 years, and 16.67% for 21 or more years. 100% had an employment status of primary and 0% were classified as locum. They were respectively based at: Clinic #1 8.33%, Clinic #2 0%, Clinic #3 16.67%, Clinic #4 0%, Clinic #5 25.00%, Clinic #6 8.33%, Clinic #7 16.67% and Clinic #8 33.33%.

Table 3

Cohort Characteristics

All providers **N= 43**	**Highest TI** **N= 12**	**Lowest TI** **N= 12**	**Moderate TI** **N= 19**
Total patients= 21,893 Mean= 509.14	Total patients= 6,381 Mean= 531.75	Total patients= 5,354 Mean= 446.17	Total patients= 10,158 Mean= 534.63
Diabetic patients Total= 3750 % of provider's total patients= 17.13	**Diabetic patients** Total= 1194 % of provider's total patients= 18.71	**Diabetic patients** Total= 771 % of provider's total patients= 14.40	**Diabetic patients** Total= 1785 % of provider's total patients= 17.57
Diabetic patients per provider Mean=87.21	**Diabetic patients per provider** Mean= 99.5	**Total diabetic patients per provider** Mean= 64.25	**Diabetic patients per provider** Mean= 74.00
Patients A1C<9 Total = 2830 75.47% of all diabetic patients Mean= 65.81 patients per provider	**Patients A1C<9** Total=927 77.64% of all diabetic patients Mean= 77.25 patients per provider	**Patients A1C<9** Total= 593 76.91 of all diabetic patients Mean= 49.42 patients per provider	**Patients A1C<9** Total=1310 73.39% of all diabetic patients Mean= 55.64 patients per provider
Patients A1C>9 Total= 647 17.25% of all diabetic patients Mean= 15.05 patients per provider	**Patients A1C>9** Total=209 17.50% of all diabetic patients Mean= 17.42 patients per provider	**Patients A1C>9** Total=137 17.76% of all diabetic patients Mean= 11.42 patients per provider	**Patients A1C>9** Total=301 16.86% of all diabetic patients Mean= 14.91 patients per provider
>9 Prescribed Insulin or GLP-1RA Total= 456 12.16% of all diabetic patients Mean = 10.60 patients per provider	**>9 Prescribed Insulin or GLP-1RA** Total=120 10.05% of all diabetic patients Mean = 10.00 patients per provider	**>9 Prescribed Insulin or GLP-1RA** Total=120 15.56% of all diabetic patients Mean= 10.00 patients per provider	**>9 Prescribed Insulin or GLP-1RA** Total=216 12.10% of all diabetic patients Mean= 11.09 patients per provider
>9 Not prescribed Insulin or GLP-1RA Total= 188 6.64% of all diabetic patients Mean= 4.37 patients per provider	**>9 Not prescribed Insulin or GLP-1RA** Total= 89 7.45% of all diabetic patients Mean= 7.42 patients per provider	**>9 Not prescribed Insulin or GLP-1RA** Total= 14 1.81% of all diabetic patients Mean= 1.17 patients per provider	**>9 Not prescribed Insulin or GLP-1RA** Total=85 4.76% of all diabetic patients Mean= 3.50 patients per provider
% TI 29.05	**% TI** 42.43	**% TI** 9.28	**% TI** 27.63

Note. The highest amount of TI was classified as the top 25% cohort, a moderate amount of TI was the middle 50% cohort, and the lowest amount of TI was the bottom 25% cohort.

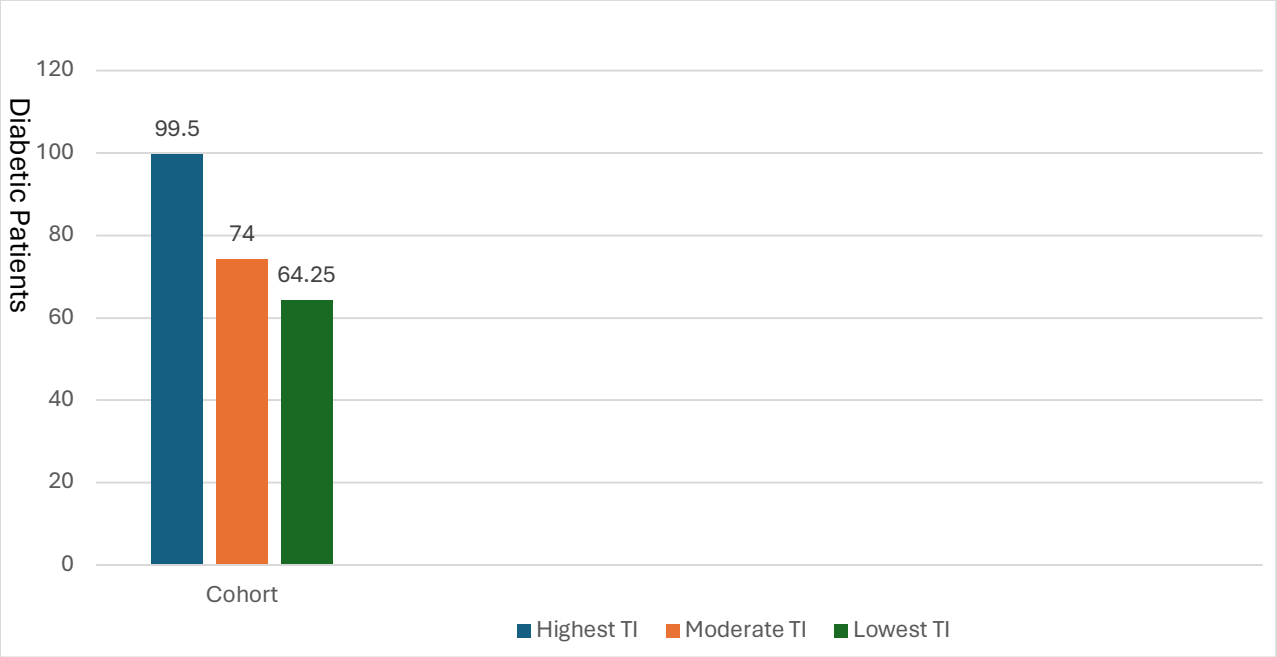
In total, 21,883 patients (with any diagnosis, not only diabetes) were seen amongst the 43 PCPs, with a mean of 509.14 patients per provider. The cohort with the most TI saw a mean of 531.75 patients while the cohort with the lowest amount of TI had a mean of 446.17 on their panel. Amongst PCPs with the highest level of TI, 18.71% of their patients had a diagnosis of T2DM, compared to 14.40% for the PCPs with the lowest level of TI.

Among the 43 PCPs practicing at the center, there were 3,750 patients with a diagnosis of type 2 diabetes mellitus, 17.13% of total patients. There was a mean of 87.21 diabetic patients per PCP. There were 2,830 patients with an A1C less than 9%, a mean of 65.81 per PCP (Table 3). 647 patients had a A1C greater than 9%, a mean of 15.05 per PCP. Of the patients with A1C >9%, 456 (70.48%) were prescribed either insulin or a GLP1-RA and 188 (29.06%) were not. Mean percentage of TI was 29.05.

Among the 12 PCPs with the highest level of TI, there were 1,194 patients with a diagnosis of type 2 diabetes mellitus, 18.71% of total patients. There was a mean of 99.50 diabetic patients per PCP (Figure 2). There were 927 patients with an A1C less than 9%, a mean of 77.25 per PCP. 209 patients had an A1C greater than 9%, a mean of 17.42 per PCP. Of the patients with A1C >9%, 120 (57.14%) were prescribed either insulin or a GLP1-RA and 89 (42.43%) were not. Mean percentage of TI was 42.23 (Table 3). This cohort had a mean of 7.42 patients that met the definition of suffering from TI.

Figure 2

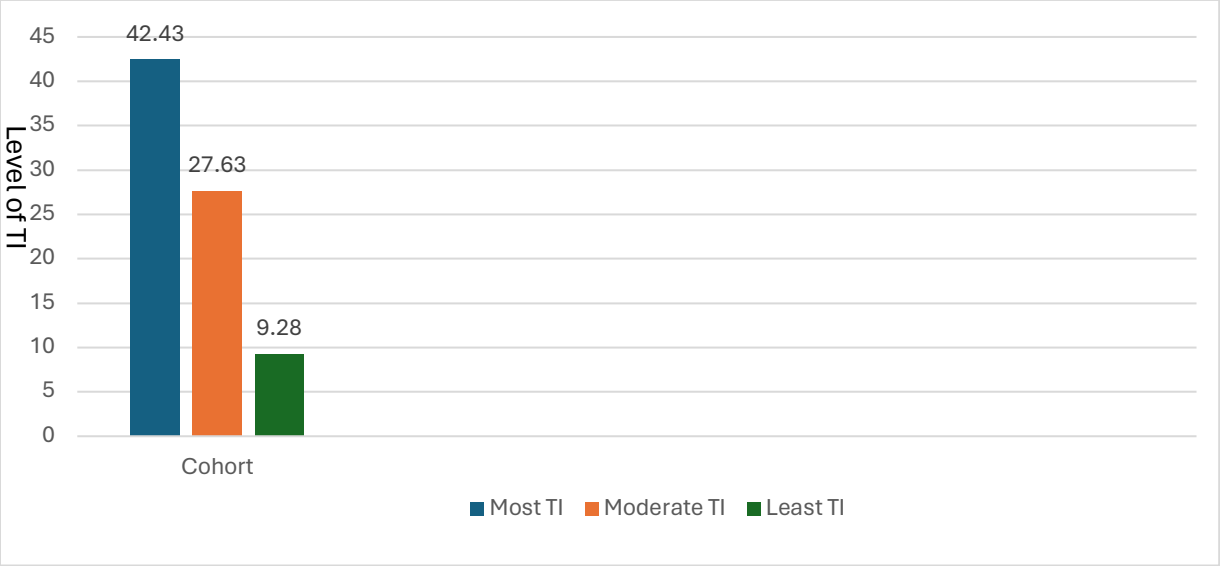
Mean Diabetic Patients per PCP



Among the 12 PCPs with the lowest level of TI, there were 771 patients with a diagnosis of type 2 diabetes mellitus, 14.40% of total patients. There was a mean of 64.25 diabetic patients per PCP. There were 593 patients with an A1C less than 9%, a mean of 49.42 per PCP. 137 patients had an A1C greater than 9%, a mean of 11.42 per PCP. Of the patients with A1C >9%, 120 (87.59) were prescribed either insulin or a GLP1-RA and 14 (9.28%) were not. Mean percentage of TI was 9.28 (Figure 3). This cohort had a mean of 1.17 patients that met the definition of suffering from TI.

Figure 3

Levels of Therapeutic Inertia amongst Cohorts

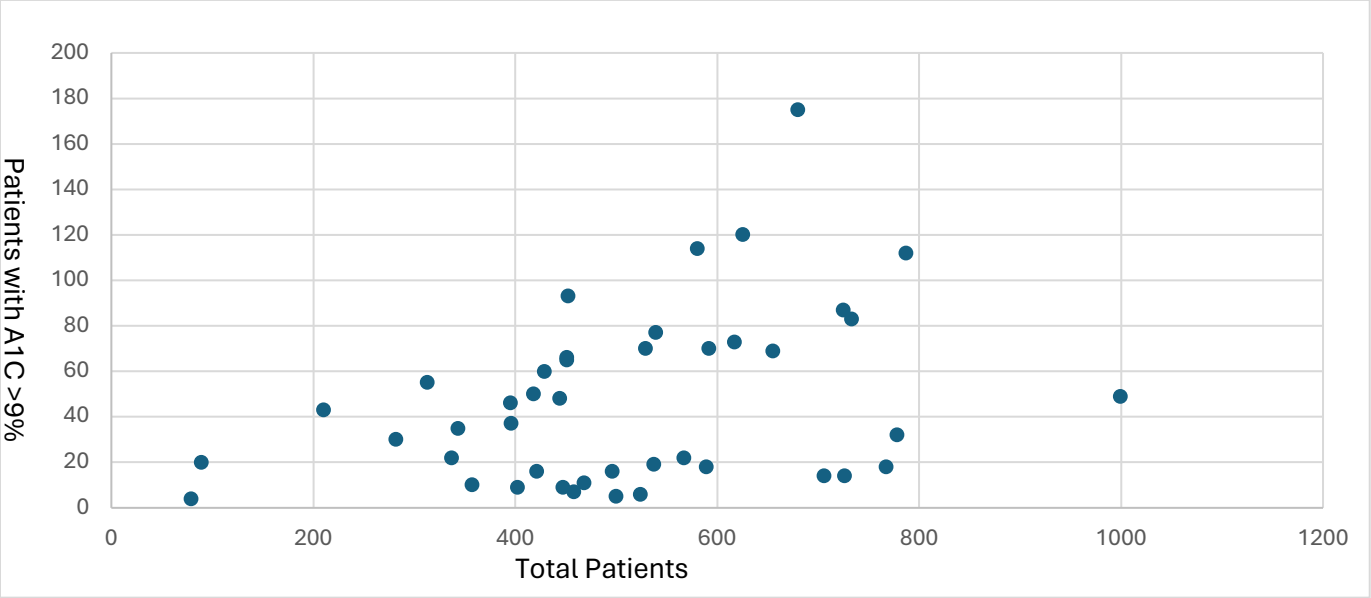


Discussion

Studies of poor glycemic control in relation to TI tend to focus on patient characteristics. This study has attempted to focus on PCP characteristics. Initial findings indicate that individual characteristics do not have an undue influence on rates of TI, but it is apparent that the best predictor of TI is a higher overall patient load. This finding is validated in a number of ways. First, data indicates that as a PCP's patient panel increases, so does TI. The cohort with the most TI saw a mean 85 more patients than the cohort with the lowest amount of TI. This is especially apparent as the total increases between 400 and 600 patients (Figure 4). Second, as the number of diabetic patients increases, so does the amount of TI. The cohort with the most TI had a mean of 99.5 diabetic patients compared to 64.23 for the cohort with the least TI.

Figure 4

Number of patients with A1C >9%



It might appear counterintuitive, but the study also revealed that the higher number of patients per PCP also corresponded with higher number of patients with A1C less than 9%. Said another way, these PCPs have a higher percentage of patients in the uncontrolled diabetes range and also a higher percentage in the controlled range. This finding suggests that total patient numbers reflect both optimum and sub-optimum care. This seeming contradiction leads to the question of whether the PCPs with the most TI have more unwell patients to treat—or are their patients more unwell due to lack of effective treatment? Further research is recommended to answer this question. A logical starting point would involve a retrospective chart review looking at specific PCP behaviors regarding treatment of patients with T2DM. Such behaviors could include whether the PCP prescribed insulin or GLP-1RA, titrated insulin when indicated, prescribed or increased dosage of other hypoglycemic medications, prescribed a glucometer, referred to RD-CDES, ordered quarterly A1C, and scheduled follow-up appointments.

Framed in a larger context this research suggests the importance of examining optimum PCP panel sizes and perhaps capping them. If it can be conclusively determined that patient

outcomes suffer as panels exceed a certain level, there would be profound effects on clinic staffing ratios and patient care. Questions that need to be resolved include ideal panel sizes based on disease state and comorbidity, and what other factors affect management of patient panels such as length of visit, acuteness of illness and provider competence and experience.

It should be noted that in the study there was one particular PCP personal characteristic that was highly correlated with TI. 50.00% of PCPs with a low level of TI have received Washington credentials in the past 1-5 years, compared to 25.00% of PCPs with a high level of TI who were credentialed in Washington in the last 5 years. This could signify that PCPs who are more recently qualified are more familiar with new therapies like GLP-1RAs and more confident in prescribing them. This may be conjecture, as years of experience are not equivalent to years certified to practice in Washington, but it may be worthy of further consideration.

These findings confirm that provider level barriers contribute to TI. Patient panel size is directly related to a lack of time during appointments and the complexity of managing diabetic care. Similarly, the more time since PCP certification aligns with the overwhelming number of pharmacological options available and unfamiliarity with new drug classes (Table 2).

Recommendations for Practice

1. Determine optimum patient panel size. The data in this study show a correlation between PCPs with large patient panels and high levels of TI. Panels should be determined by the number of appointments available. Availability is dependent upon length of appointments and clinic hours. Adequate PCPs on staff are essential for maintaining optimum patient panels.
2. Consider distribution of diabetic patients on individual PCP panels. The data in this study show that when a PCP holds a high number of diabetic patients on their panel, this is correlated with higher levels of TI.
3. Simplify methods to quickly locate specific PCP characteristics, as there is currently no straightforward approach to gather a PCP's professional experience, employment status,

clinic location, gender, and age. Although this baseline study did not show a relationship between individual PCP characteristics and TI, it is worthwhile to consider a “one-stop” option that allows for monitoring of these characteristics to determine if an association with TI emerges at a future time.

4. Offer continuing education on new therapies. Professional support to PCPs to educate them on the latest evidence-based therapies is vital, as the field of glucose-lowering pharmacotherapies changes rapidly.
5. This baseline study did not show a correlation between individual PCP characteristics and high levels of TI. However, future investigation is recommended that would examine PCP behaviors associated with treatment of diabetic patients. This could provide insights into whether such behaviors are correlated with TI.

Limitations

This study had several limitations. First, patient-related factors have not been considered (access to care, insurance status, and other social determinants of health). Second, patients may have attended limited appointments, meaning a lack of quarterly A1C collection results. As a result, some data is based on a single lab result taken at any point in the last 12 months. Third, patients may have declined medication. Fourth, comorbidities that indicate acceptably higher A1C levels have not been considered (such as advanced age or limited expected life expectancy). Fifth, patients may have been seen by more than one provider. Sixth, years since credentialed in Washington was used as a proxy for determining a PCP's years of experience. This may not be an accurate indication of how many years a provider has actually practiced. For example, if a provider with 15 years of experience relocated to Washington state in 2022, they would have been classified as having 1-5 years of experience.

Conclusion

Prompt pharmacological treatment for elevated A1C levels reduces the consequences of hyperglycemia and improves health outcomes. When PCPs exhibit increased levels of TI, treatment of diabetic patients may be substandard. The primary causes of TI can be differentiated into barriers related to patients, providers, and the healthcare system. Though there is widespread academic interest in reducing TI, there is a gap in the literature related to correlations between PCP characteristics and high levels of TI. The purpose of this project was to determine whether PCP characteristics are related to TI. Initial findings indicate that individual PCP characteristics do not have an influence on rates of TI. Rather, this study finds that the best predictor of TI is the overall size of a PCP's patient panel and the number of diabetic patients on it. Further, this study outlined recommendations to reduce TI. These include determining optimum patient panel size, reviewing diabetic patient distribution amongst PCPs, simplifying methods that track PCP characteristics, and providing continuing education on new therapies Finally, this study puts forth a suggestion for future consideration, an examination of whether PCP behaviors, in treating diabetic patients, are associated with higher levels of TI.

Appendix

ADA Overcoming Therapeutic Inertia in Type 2 Diabetes: Practical Implementation in Practice (ADA 2023):

- Action Item 1: Identify high-risk patients with type 2 diabetes who are not at target goals (Using electronic medical record data, identify which patients are not achieving target goals and begin to examine why).
- Action Item 2: Identify and prioritize reasons for not achieving goals
- Action Item 3: Implement a team-based approach
- Action Item 4: Use algorithms and/or protocols to intensify therapy efficiently and effectively
- Action Item 5: Leverage technology in practice
- Action Item 6: Empower patients with type 2 diabetes to actively manage their diabetes

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