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Impacts of COVID-19 on the Adherence to Oral Anti-Diabetic Medications in Commercially Insured Adult Patients with Type 2 Diabetes Mellitus

Amy Nguyen, PharmD[1]; Ted Williams, PharmD, BCPS[2]; Anne Kangethe, PharmD, MPH, PhD[2]; Michael Polson, PharmD[2]

1. Magellan Rx Management | Phoenix, AZ
2. Magellan Method, A Division of Magellan Rx Management | Phoenix, AZ

Background

- On March 13, 2020, a national emergency was declared in the United States (US) due to the SARS-CoV-2 virus (COVID-19) pandemic[1]
  - The US healthcare infrastructure was strained, with many small private, specialty practices, and health systems around the country furloughing staff, reducing hours, or closing offices entirely[2-3]
  - Medication supply chains were impacted due to demand changes, supply shortages, and panic buying and stocking, with a study estimating approximately a 25% spike in Type 2 Diabetes Mellitus (T2DM) medication claims within the US[4-5]
- Access to healthcare is a major contributor to medication non-adherence in adult patients with chronic diseases
  - Patients with T2DM are among those with the lowest medication adherence rates, with medication possession ratio of approximately 51%[6-7]
  - Downstream effects of medication non-adherence include:
    - Poor clinical outcomes[8-9] – poor metabolic control (i.e. HbA1c), development of disease complications, and increased mortality
    - Increased overall healthcare costs[8] – emergency room visits, hospitalizations, management of T2DM-associated complications
- There are no current studies available evaluating the implications of a global pandemic on adherence patterns within this population
  - Patients with T2DM are considered high-risk individuals for contracting COVID-19

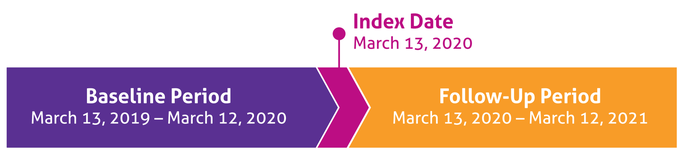
Objective

- To assess the impact of the COVID-19 pandemic on adherence to oral anti-diabetic medications among commercially insured adults with T2DM in the US, as measured by:
  1. Mean medication possession ratio (MPR) during baseline and follow-up periods
  2. Number of members who met the adherence threshold (MPR ≥ 80%) in the baseline and follow-up periods

Methods

Study Design

- Retrospective analysis of real-world administrative claims data derived from the Magellan database for commercial health plan clients was performed from March 13, 2019 to March 12, 2021 for all members with paid oral anti-diabetic claims



Inclusion Criteria

- Members were included if they had at least one paid prescription claim for an oral anti-diabetic medication during the study period, as represented in Table 1

Table 1. Oral Anti-Diabetic Medications for Inclusion

Medication Name
Semaglutide (oral)
Medication Class
DPP-4 Inhibitor + Thiazolidinedione
SGLT2 Inhibitors
SGLT2 Inhibitor + Biguanide
DPP-4 Inhibitor + Biguanide
DPP-4 Inhibitors
Insulin release stimulant types
Alpha-glucosidase
Thiazolidinedione
Thiazolidinedione + Sulfonylurea
Insulin release stimulant + Biguanide
Thiazolidinedione + Biguanide
SGLT2 Inhibitor +DPP-4 Inhibitor
SGLT2 Inhibitor + DPP-4 Inhibitor + Biguanide

DPP-4 = dipeptidyl peptidase-4; SGLT2 = sodium-glucose cotransporter-2

Exclusion Criteria

- Members were excluded from participating if they were
  - Less than 18 years old at the beginning of the study period
  - 65 years or older at the end of the study period
  - Using more than two unique oral anti-diabetic medications at any point during the study period
  - Had no oral anti-diabetic medication claims during either the baseline or follow-up periods

Adherence to oral anti-diabetic medications **increases within commercially insured adult patients** during a global pandemic.

Methods cont.

Statistical analysis

- Adherence rates were measured by calculating the MPR for each included member's most utilized oral anti-diabetic medication from pharmacy claims data
  - MPR is the percentage of days' supply obtained during a specified time period, which was calculated with the following formula:[10]
    - MPR (%) = (Sum of days supply in the study period / Number of days in the study period) * 100
  - MPR ≥ 80% is a commonly used indicator to reflect adherence within this population; members below this threshold reflect poor adherence and may potentiate suboptimal impacts on clinical response (i.e. achieving half the expected reductions in HbA1c)[11]
  - For members using two distinct oral anti-diabetic medications the higher of the two total days supplies was used to calculate that member's MPR
- All statistical tests were performed using SAS® Version 9.4. Differences in baseline and follow-up data were compared using paired t-test for continuous and McNemar's test for paired nominal variables

Results

- A total of 11,943 members met the inclusion criteria from baseline through the follow-up periods
- During follow-up, the change in mean MPR from baseline was statistically significant and yielded a 6% increase from baseline ($p < 0.0001$) [Table 3]
- The interquartile range (IQR) in the follow-up was compressed and shifted upwards compared to the IQR in the baseline [Figure 1]
- There was a statistically significant difference in the percentage of members who met the adherence threshold in the follow-up period (40%) compared to the baseline period (36%), with an increase of 534 members from baseline ($p < 0.0001$) [Figure 2]

Table 2. Patient Demographics

Measure	Outcome
Total Patients, n	11,943
Patient Age (years), Mean (Median) [SD]	54 (55) [8]
Patient Sex, n (%)	
Female	4,685 (39)
Male	7,258 (61)
Patient Age Groups (years), n (%)	
18-29	91 (< 1)
30-49	3,178 (27)
50-64	8,674 (73)

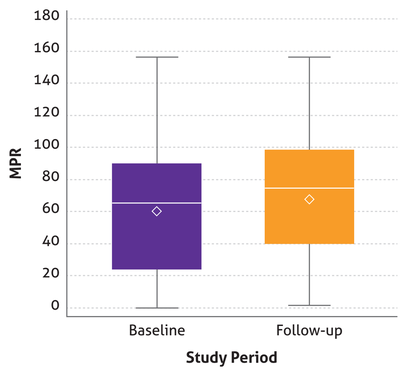
SD = Standard Deviation

Table 3. Results

Primary Objective				
Measure	Baseline	Follow-Up	Mean % Change	P-value*
MPR, *Mean (Median) [SD]{Q1-Q3}*	61 (66) [33] {25-90}	67 (74) [31] {41-98}	+6	< 0.0001
Secondary Objective				
Measure	Baseline	Follow-Up	Mean % Change	P-value*
MPR ≥ 80%, *n (%)*	4,261 (36)	4,795 (40)	+4	< 0.0001

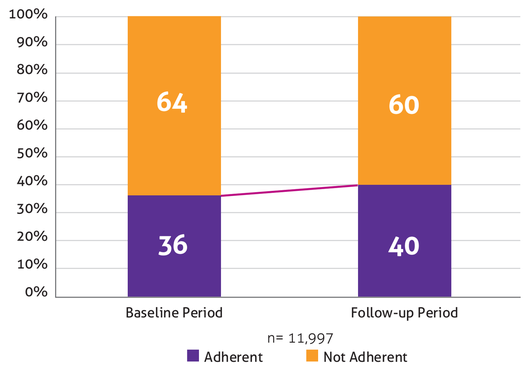
* Statistically significance at $p < 0.05$; MPR = Medication possession ratio (%); % Change = [(Follow-up) – (Baseline)] / Baseline

Figure 1. Comparison of MPRs per Study Period



MPR = Medication possession ratio

Figure 2. Percentages of Adherent vs. Non-Adherent Members per Study Period



Discussion

- Higher MPRs indicate more frequent prescription filling which may be associated with either increased adherence or buying and stockpiling medications out of fear of potential medications shortages
- Adult patients with T2DM are at increased risks for developing severe illnesses from COVID-19, which may affect patient behavior in taking better care of their health as a result of increased health awareness
- Limitations of this study include:
  - Analysis was based on prescription claims data, which may not reflect actual medication use
  - Claims not billed to the health plan (i.e., claims paid with cash) were not captured but may impact adherence measures among this population
  - Prescriptions that were extended beyond the study periods, such as those prescribed before the baseline start date and those that extend after the follow-up end date, were not accounted for in the study and may have led to an overestimated adherence
  - Members using more than two oral anti-diabetic medications during the targeted period were excluded to simplify analysis with respect to distinguishing between medication switches and additions
  - Prescriber factors (i.e., prescriber type and location of service) and member factors (i.e., member regional location, comorbidities, socioeconomic status) were not accounted for in the study but may influence adherence rates
  - Analysis does not include members taking metformin, bromocriptine, or mifepristone on the assumption that these medications have other indications for use; inclusion of these medications may affect member adherence rates
  - Generalizability to other populations may be limited due to study sample population characteristics

Conclusion

- During the COVID-19 pandemic, mean MPR for oral anti-diabetic agents increased by 6% and the proportion of patients with an MPR ≥ 80% increased by 4% in commercially insured adult patients
  - Future studies should evaluate the entirety of diabetic therapies (i.e. insulins, injectables) in addition to these oral agents
- Member follow-up and analysis may provide further insights to examine reasons for adherence during a global pandemic and its downstream effects on health outcomes and healthcare costs

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Disclosures

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Amy Nguyen
nguyena3@magellanhealth.com

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