Impact of Using Telehealth in Primary Care on Healthcare Resource Utilization, Costs, and Medication Adherence in Diabetic Patients

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INTRODUCTION

Diabetes mellitus Type 2 is one of the most prevalent chronic conditions among Mississippi Medicare beneficiaries; about 1 in 7 Mississippians are diagnosed and are living with diabetes, making the state one of the top 5 in rates of diabetes in the nation.[1] Effective management of diabetes resulting from consistent primary care interventions is essential to prevent long term complications and decrease morbidity and mortality . The COVID-19 pandemic accelerated the adoption of telehealth, making healthcare services more accessible, particularly for diabetic patients. In Mississippi, where one-third of residents live in primary care shortage areas, telehealth presents an opportunity to bridge gaps in healthcare access.

AIM

This study evaluates the impact of telehealth utilization within primary care settings on sociodemographic disparities, healthcare resource utilization (HCRU), spending, and medication adherence among Medicare beneficiaries with diabetes in Mississippi.

METHODS

Study Design

A retrospective cohort study analyzing Medicare claims data from Mississippi beneficiaries between 2019–2021, adjusting for primary care utilization.

Inclusion criteria:

- Adult beneficiaries (aged 18 and older) who were continuously enrolled in Medicare Parts A, B, and D and accessed primary care during the study period.
- Diagnosed with diabetes in at least two separate years.

Exclusion criteria:

- Beneficiaries who had Part C coverage or were entitled to Medicare due to end-stage renal disease were excluded.

Telehealth for Primary Care Services

- Primary care services were identified based on the 2-step attribution method of the Centers for Medicare & Medicaid Services (CMS) using the Healthcare Common Procedure Coding System (HCPCS) and CMS specialty codes.
- Telehealth services were identified using place of service codes and telehealth modifiers. A practice was classified as telehealth use for primary care if its claim included both primary care service and telehealth service codes.

Marginal Structural Modeling (MSM)

With the COVID-19 pandemic, time-varying confounders impacted primary care practices, telehealth utilization, and study outcomes. To account for both time-invariant baseline covariates and time-varying confounders, we employed an MSM approach using inverse probability of treatment weights (IPTW) in conjunction with mixed-effects models.

RESULTS

Key Findings

- Among the total 60,970 patients with diabetes, 25,090 (41.2%) utilized telehealth for primary care during 2019–2021. Most diabetes patients were aged 65–74 (48.12%), female (56.38%), White (69.47%), not enrolled in Medicaid (68.84%), and residing in rural (67.28%) areas. The mean (SD) Charles Comorbidity Index (CCI) was 3.82 (2.65). Additionally, though they accessed a broader range of primary care providers, a lower proportion of services came from providers who regularly provide primary care services. (Table 1)
- MSM results indicated that telehealth was associated with a significantly lower number of outpatient and inpatient visits, 30-day readmissions, and lower medical and pharmacy costs (p<0.001 for all), though the number of emergency room (ER) visits were similar (p=0.317). (Table 2)
- Additionally, primary care telehealth was associated with a 1.7% and a 0.6% increase in adherence to antihypertensive medication and antilipidemic medication, respectively, but a 2.3% decrease in antidiabetic medication adherence. (Table 2)

Conclusion

1. Telehealth use among Medicare beneficiaries with Diabetes mellitus Type 2 was associated with decreased number of outpatient and inpatient visits, and 30-day readmissions, **suggesting its potential to enhance diabetes management by augmenting primary care services.**
2. The associated decrease in Medicare, beneficiary OOP, and overall medical and pharmacy spending **indicates effective cost management** under current Medicare telehealth reimbursement policies.
3. However, need of involvement of specialists, not considered primary care providers, **may be leading to mixed picture of medication adherence**.
4. **Significant sociodemographic disparities** in telehealth access, particularly among older, minority, and rural populations, highlight concerns regarding the digital divide. Addressing these disparities and addressing health parity is crucial post-pandemic.

Figure 1. Absolute standardized difference before and after IPTW

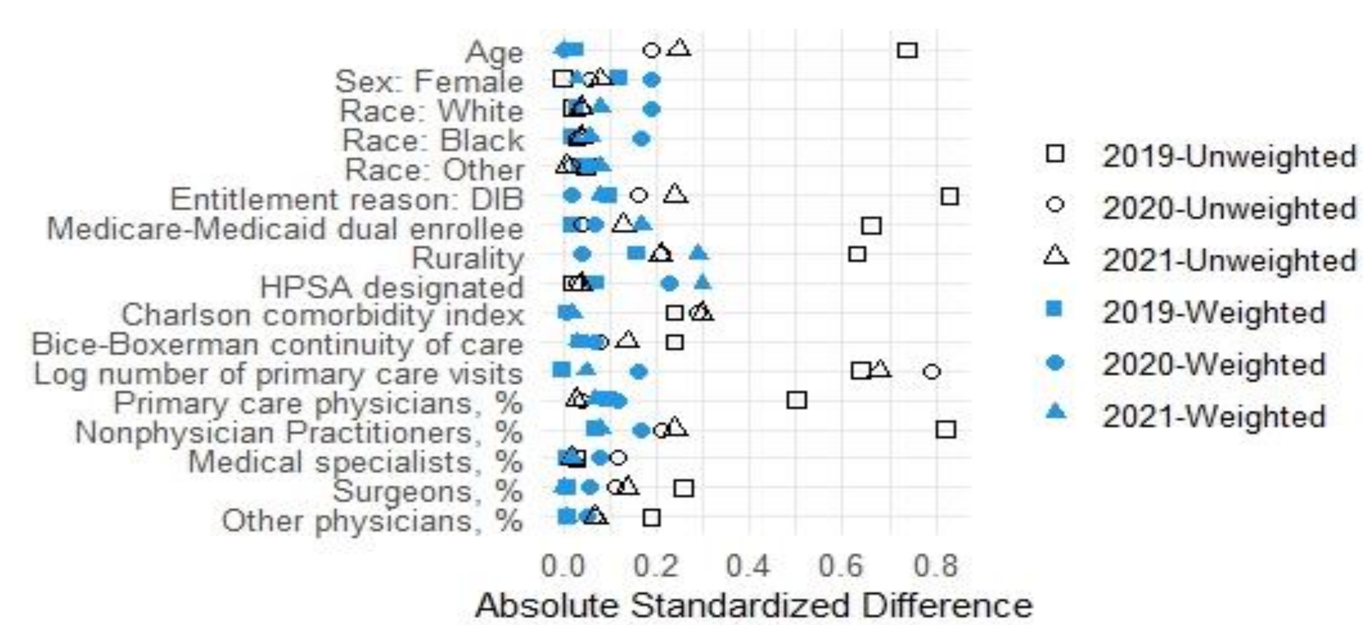

Table 1. Participant baseline characteristics (N = 60,970)

Sociodemographic Characteristics	TH participants (n = 25.090)	Non-TH participants (n = 35,880)	Odds Ratio (95% CI)	*P*-value
Age group, yr, n (%)				<.001
< 55	2,211 (8.81)	1,757 (4.90)	Ref	
55 – 64	2,981 (11.88)	3,308 (9.22)	0.72 (0.66, 0.78)	
65 – 74	11,863 (47.28)	17,476 (48.71)	0.54 (0.51, 0.58)	
75 – 84	6,623 (26.40)	10,806 (30.12)	0.49 (0.45, 0.52)	
≥ 85	1,412 (5.63)	2,533 (7.06)	0.44 (0.41, 0.49)	
Sex, n (%)				<.001
Male	10,581 (42.17)	16,013 (44.63)	Ref	
Female	14,509 (57.83)	19,867 (55.37)	1.11 (1.07, 1.14)	
Race, n (%)				<.001
White	17,647 (70.80)	24,456 (68.54)	Ref	
Black	7,069 (28.36)	10,836 (30.37)	0.90 (0.87, 0.94)	
Other	210 (0.84)	390 (1.09)	0.75 (0.63, 0.88)	
Original reason for entitlement, n (%)				<.001
OASI	15,174 (60.48)	24,493 (68.26)	Ref	
DIB	9,916 (39.52)	11,387 (31.74)	1.41 (1.36, 1.45)	
Dual enrollment, n (%)	8,071 (32.17)	10,926 (30.45)	1.08 (1.05, 1.12)	<.001
Rurality, n (%)	15,421 (61.46)	25,600 (71.35)	0.64 (0.62, 0.66)	<.001
HPSA designated, n (%)	4,790 (19.09)	7,022 (19.57)	0.97 (0.93, 1.01)	0.140
Charlson Comorbidity Index, mean (SD)	4.23 (2.76)	3.53 (2.54)	1.10 (1.10, 1.11)	<.001
Primary Care Utilization, mean (SD)				
Bice-Boxerman Care of Continuity Index	0.40 (0.27)	0.40 (0.31)	1.00 (0.95, 1.06)	<.001
Number of primary care visits	13.71 (9.10)	9.00 (7.08)	1.08 (1.08, 1.08)	<.001
Access to provider types				
Primary care physician	19,329 (77.04)	23,719 (66.11)	1.72 (1.66, 1.78)	<.001
Nonphysician Practitioner	18,763 (74.78)	20,984 (58.48)	2.11 (2.03, 2.18)	<.001
Medical specialist	18,634 (74.27)	21,211 (59.12)	2.00 (1.93, 2.07)	<.001
Surgeon	14,842 (59.16)	17,967 (50.08)	1.44 (1.40, 1.49)	<.001
Other physicians	7,981 (31.81)	9,080 (25.31)	1.38 (1.33, 1.43)	<.001
Proportion of services provided				
Primary care physician	0.30 (0.27)	0.32 (0.32)	0.81 (0.77, 0.86)	0.030
Nonphysician Practitioner	0.28 (0.26)	0.23 (0.28)	1.83 (1.73, 1.94)	<.001
Medical specialist	0.23 (0.22)	0.21 (0.25)	1.58 (1.47, 1.69)	<.001
Surgeon	0.13 (0.16)	0.14 (0.21)	0.59 (0.54, 0.64)	<.001
Other physicians	0.06 (0.12)	0.07 (0.16)	0.69 (0.61, 0.77)	<.001

Table 2. MSM results (N = 60,970)

Primary Outcome	Estimates (Std Err)	Exponentiated Estimates (95% CI)	*P*-value
HCRU, PPPY			
Outpatient visits	-0.006 (0.001)	0.994 (0.993, 0.996)	<.001
ED admissions	-0.003 (0.003)	0.997 (0.990, 1.003)	0.317
Inpatient visits	-0.113 (0.007)	0.893 (0.881, 0.905)	<.001
30-day readmissions	-0.283 (0.010)	0.753 (0.739, 0.768)	<.001
Medical spending, PPPY			
Medicare	-0.162 (0.005)	0.851 (0.842, 0.859)	<.001
Beneficiary OOP	-0.324 (0.009)	0.723 (0.711, 0.736)	<.001
Gross	-0.166 (0.005)	0.847 (0.839, 0.856)	<.001
Pharmacy spending, PPPY			
Medicare Part D	-0.095 (0.007)	0.909 (0.897, 0.922)	<.001
Beneficiary OOP	-0.035 (0.004)	0.965 (0.958, 0.972)	<.001
Gross	-0.095 (0.004)	0.909 (0.902, 0.917)	<.001
Secondary Outcome	**Estimates (Std Err)**	**(95% CI)**	***P*-value**
Medication adherence, PPPY			
Antidiabetic	-0.023 (0.002)	(-0.026, -0.020)	<.001
Antihypertensive	0.017 (0.002)	(0.014, 0.021)	<.001
Antihyperlipidemic	0.006 (0.002)	(0.003, 0.009)	<.001

Abbreviations: OASI (Old Age & Survivors Insurance), DIB (Disability Insurance Benefits), HPSA (Health Professional Shortage Area), OOP (Out-of-Pocket), PPPY (Per Patient Per Year).

1. Diabetes in Mississippi. Mississippi State Department of Health. https://msdh.ms.gov/page/43,0,296.html Accessed March 10,2025

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