Influence of Care Delivery Models on Quality of Diabetes Care Among Individuals With Schizophrenia

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ABSTRACT

Objective: Managing chronic conditions in individuals with severe mental illnesses is critical for amending health disparities in this vulnerable group. The study aimed to compare the management and outcomes of diabetes care under different care models in individuals with schizophrenia in Taiwan.

Methods: A population-based retrospective cohort comprising incident cases of diabetes in individuals (N = 9,109) with schizophrenia (*ICD-9-CM* code 295) in Taiwan between 2008 and 2015 was selected using the National Health Insurance Research Database. Generalized estimating equation (GEE) modeling was used to compare 3 care models: the sole-physician model, the colocation model, and the different-facilities model. Each individual was followed up for 3 years. Propensity score matching was used to address potential selection bias.

Results: Patients in the sole-physician model had the highest number of recommended routine examinations (incident rate ratio [IRR] = 1.2; 95% CI, 1.1–1.2) and the highest likelihood of having regular diabetes-related visits as recommended (odds ratio [OR] = 2.6; 95% CI, 2.1–3.2), followed by those in the colocation model (number of recommended routine examinations: IRR = 1.1; 95% CI, 1.1–1.2; likelihood of regular visits: OR = 1.6; 95% CI, 1.3–1.9) and those in the different-facilities model. However, the sole-physician group had a significantly higher likelihood of admission for diabetes-related ambulatory care sensitive conditions within 1 year (OR = 1.9; 95% CI, 1.3–2.8) and 3 years (OR = 1.6; 95% CI, 1.2–2.1) than its counterparts. Within the sole-physician group, patients of psychiatrists had more favorable disease outcomes than those of non-psychiatrists.

Conclusions: The sole-physician and colocation models may significantly improve the process quality of diabetes care; however, such models alone are not sufficient to improve diabetes outcomes.

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Individuals with severe mental illness have a 10- to 25-year reduction in life expectancies, which is primarily due to chronic medical morbidities such as metabolic diseases.[1] Managing multiple chronic conditions is challenging; the challenge is even greater when managing care for individuals with mental and medical comorbidities. People with coexisting schizophrenia and diabetes are one such example. Excess premature deaths and morbidity caused by diabetes in this vulnerable population underscore the importance of connectedness between mental and medical health services.[2–4] Evidence indicates that inadequate access to and inferior quality of diabetes care may contribute significantly to the disparity in outcomes among this population.[2,4–17] Care and management of diabetes are particularly difficult in individuals with schizophrenia because of symptoms associated with schizophrenia and antipsychotic treatment.[2,4,18–20] For example, cognitive and social impairments may compromise the ability of individuals with schizophrenia to communicate with clinicians and comprehend medical advice.[2,4,5] Low motivation reduces an individual's ability to initiate, navigate, adhere to, and complete medical treatments. Fear, distrust, and stigmatization can further undermine patients' engagement in medical care.[2,5] Finally, the lack of regular monitoring impairs identification or management of diabetes among individuals with schizophrenia taking antipsychotic medications.

Because of these individual disadvantages, a confluence of provider and system factors is even more critical in assuring effective management and quality of diabetes care among individuals with schizophrenia. System fragmentation may exacerbate health care disparities in this population.[21] For example, in many countries, the medical and mental care services are separate. Consequently, individuals may be required to travel to multiple facilities for their mental and medical care. The geographic separation of these services is especially problematic for individuals with schizophrenia because of possible socioeconomic disadvantages, increased burden on families, and the interruption of daily activities. Organizational separation increases difficulty or reluctance in sharing information between medical and mental care providers. Cultural separation resulting from traditional attitudes toward the roles of psychiatry and other medical specialties may impede coordination or communication between specialties.

For many integrative initiatives, colocation of services is one intuitive approach.[22–24] Behavioral health homes,

Clinical Points

- Managing care for individuals with mental and medical comorbidities is particularly challenging, yet little is known about whether colocation of services or receiving care solely from the same physicians improves management and quality of diabetes care among individuals with schizophrenia.

- Sole-physician and colocation models improved process quality of diabetes care among individuals with coexisting schizophrenia and diabetes, but did not lead to significantly better diabetes outcomes.

- Among patients who received diabetes and schizophrenia care solely from the same physicians, patients of psychiatrists had more favorable patient outcomes compared with patients of non-psychiatrists.

which aim to integrate primary care within community-based behavioral health care, have attracted wide attention. Systematic reviews and rigorous evaluations have consistently reported that health homes lead to increased receipt of screening for cardiometabolic risk factors and service use among individuals with serious mental illness.[24,25] However, the effectiveness of health homes in reducing cardiometabolic risk factors or improving clinical outcomes varied widely among studies.[23–27] More specifically, the findings on the effectiveness of health homes in improving management and quality of diabetes care are less encouraging. Whereas some studies found no significant improvement in monitoring parameters for diabetes and hemoglobin A1c (HbA1c) level,[23,27–29] the others even reported poorer preventive service use and clinical outcomes among health home participants.[24,30] Colocation of services may not be enough to significantly improve diabetes outcomes among people with serious mental illness. Therefore, it may be important to go beyond the existing literature by examining alternative strategies such as a sole-physician approach.[2,24,25,31,32] Compared to colocation of services, receiving comprehensive care from sole providers, so called "one-stop shopping," may help to further reduce geographic separation or information fragmentation.

In addition, although the role of provider factors is often discussed, it has seldom been investigated empirically. Limited evidence is available to examine how provider characteristics influence the quality of diabetes care among individuals with schizophrenia. Furthermore, the existing studies are predominantly from the United States. Due to heterogeneity in medical cultures and health care systems, the findings may not be generalizable to other countries with universal health coverage and different delivery systems. Improved understanding of the influence of care models in different types of health care system helps inform further modification and implementation of collaborative and integrative interventions.

Taiwan serves as an ideal study setting. Since 1995, the National Health Insurance (NHI) program offers comprehensive universal health coverage for both mental and medical care services including ambulatory care, inpatient services, screening and examinations, psychotherapy, and prescription drugs. Because of the lack of a gatekeeper system and low cost-sharing under the NHI program in Taiwan, people have freedom to visit any specialist at any time.[33] There is no requirement for people to register with a primary care physician. This study examined the distribution of common care models and assessed which care models were associated with more favorable process and outcome of diabetes care in individuals with coexisting schizophrenia and diabetes in Taiwan.

METHODS

Data Source and Study Sample

This population-based retrospective cohort study employed the National Health Insurance Research Database (NHIRD) as the main data source. The 2007–2018 NHI enrollment and claims data were used alongside the NHI catastrophic illness files and physician and hospital registries. The Institutional Review Boards of both Yang Ming University and The Taipei Veterans General Hospital approved this study. Restrictions on the use of the NHIRD can be found at https://dep.mohw.gov.tw/DOS/cp-5119-59201-113.html.

To narrow health disparities and reduce financial barriers to care among vulnerable subpopulations, the NHI program offers an NHI catastrophic illness card to people with any of the 30 catastrophic conditions, which include serious physical and mental conditions such as cancer, stroke, dialysis, and schizophrenia. People who receive a confirmed schizophrenia diagnosis from psychiatrists in a written report are eligible to apply. Holders of this card are exempt from the cost-sharing requirement of the NHI program. The NHI catastrophic illness files were used to identify 28,696 individuals with schizophrenia during the period from 2007 to 2015 (code 295 of the *International Classification of Disease, 9th Revision, Clinical Modification* [*ICD-9-CM*]). Individuals with schizophrenia who did not make any visit to providers for schizophrenia during the study period were excluded. Among individuals with schizophrenia, we identified the newly diagnosed diabetes patients by including only people who had received their first outpatient diagnosis of diabetes (*ICD-9-CM* code 250.xx) and were prescribed diabetes-related medication during the same outpatient visits. Individuals with a diagnosis of diabetes in the preceding year were excluded to allow at least a 1-year washout period for identifying incident diabetes cases. Hence, only those who were newly diagnosed with diabetes during the period from 2008 to 2015, aged > 18 years, and whose diabetes was diagnosed later than their schizophrenia were included in our final sample (N = 9,109).

Care Models

From the NHI claims data, each individual's physicians for schizophrenia and diabetes were defined as his/her

Table 1. Baseline Characteristics of Individuals With Coexisting Schizophrenia and Diabetes Cared for by the Sole-Physician Model, the Colocation Model, and the Different-Facilities Model

| | Unmatched Sample Type of Delivery Model | | | | | | | | | Matched Sample[a] Type of Delivery Model | | | | | | | | |
| | Total (N=9,109) | | Sole-Physician Model (n=1,974) | | Colocation Model (n=2,121) | | Different-Facilities Model (n=5,014) | | P | Total (N=5,064) | | Sole-Physician Model (n=1,688) | | Colocation Model (n=1,688) | | Different-Facilities Model (n=1,688) | | P |
Variable	n	%	n	%	n	%	n	%		n	%	n	%	n	%	n	%	
Sex									<.01									.82
Male	4,567	50.1	1,027	52.0	1,113	52.5	2,427	48.4		2,636	52.1	889	52.7	875	51.8	872	51.7	
Female	4,542	49.9	947	48.0	1,008	47.5	2,587	51.6		2,428	47.9	799	47.3	813	48.2	816	48.3	
Age at diagnosis of diabetes, y									<.01									.85
19–40	2,158	23.7	563	28.5	460	21.7	1,135	22.6		1,305	25.8	439	26.0	435	25.8	431	25.5	
41–50	2,969	32.6	661	33.5	626	29.5	1,682	33.5		1,655	32.7	541	32.0	539	31.9	575	34.1	
51–60	2,743	30.1	555	28.1	681	32.1	1,507	30.1		1,552	30.6	517	30.6	529	31.3	506	30.0	
≥61	1,239	13.6	195	9.9	354	16.7	690	13.8		552	10.9	191	11.3	185	11.0	176	10.4	
Employment									.22									.12
Unemployed	7,427	81.5	1,623	82.2	1,748	82.4	4,056	80.9		4,218	83.3	1,398	82.8	1,389	82.3	1,431	84.8	
Employed	1,682	18.5	351	17.8	373	17.6	958	19.1		846	16.7	290	17.2	299	17.7	257	15.2	
Living arrangement									<.01									.23
Community	8,271	90.8	1,854	93.9	1,749	82.5	4,668	93.1		4,736	93.5	1,568	92.9	1,576	93.4	1,592	94.3	
Institution	838	9.2	120	6.1	372	17.5	346	6.9		328	6.5	120	7.1	112	6.6	96	5.7	
Insurable wage[b]									<.01									.53
<20,000	400	4.4	74	3.7	79	3.7	247	4.9		209	4.1	65	3.9	72	4.3	72	4.3	
20,000–39,999	1,525	16.7	343	17.4	272	12.8	910	18.1		763	15.1	252	14.9	250	14.8	261	15.5	
≥40,000	355	3.9	63	3.2	79	3.7	213	4.2		171	3.4	57	3.4	68	4.0	46	2.7	
Other	6,829	75.0	1,494	75.7	1,691	79.7	3,644	72.7		3,921	77.4	1,314	77.8	1,298	76.9	1,309	77.5	
Duration of schizophrenia, y									<.01									.77
0–3	4,227	46.4	907	45.9	1,051	49.6	2,269	45.3		2,413	47.7	794	47.0	798	47.3	821	48.6	
4–5	2,208	24.2	499	25.3	491	23.1	1,218	24.3		1,192	23.5	398	23.6	411	24.3	383	22.7	
≥6	2,674	29.4	568	28.8	579	27.3	1,527	30.5		1,459	28.8	496	29.4	479	28.4	484	28.7	
Diabetes Complication Severity Index (DCSI) score									<.01									.09
0	7,709	84.6	1,745	88.4	1,683	79.3	4,281	85.4		4,443	87.7	1,464	86.7	1,467	86.9	1,512	89.6	
1	649	7.1	93	4.7	205	9.7	351	7.0		259	5.1	92	5.5	92	5.5	75	4.4	
≥2	751	8.2	136	6.9	233	11.0	382	7.6		362	7.1	132	7.8	129	7.6	101	6.0	
Comorbidity—physical									<.01									.57
0	5,745	63.1	1,420	71.9	1,275	60.1	3,050	60.8		3,443	68.0	1,151	68.2	1,132	67.1	1,160	68.7	
≥1	3,364	36.9	554	28.1	846	39.9	1,964	39.2		1,621	32.0	537	31.8	556	32.9	528	31.3	
Comorbidity—mental									<.01									.62
0	7,696	84.5	1,715	86.9	1,822	85.9	4,159	82.9		4,355	86.0	1,446	85.7	1,446	85.7	1,463	86.7	
≥1	1,413	15.5	259	13.1	299	14.1	855	17.1		709	14.0	242	14.3	242	14.3	225	13.3	
Residential location									<.01									.70
Urban	2,094	23.0	406	20.6	511	24.1	1,177	23.5		1,188	23.5	380	22.5	409	24.2	399	23.6	
Suburban	4,371	48.0	999	50.6	949	44.7	2,423	48.3		2,518	49.7	844	50.0	843	49.9	831	49.2	
Rural	2,644	29.0	569	28.8	661	31.2	1,414	28.2		1,358	26.8	464	27.5	436	25.8	458	27.1	
Year diabetes was diagnosed									<.01									.99
2008	1,155	12.7	251	12.7	283	13.3	621	12.4		678	13.4	227	13.4	218	12.9	233	13.8	
2009	1,160	12.7	239	12.1	254	12.0	667	13.3		641	12.7	212	12.6	204	12.1	225	13.3	
2010	1,229	13.5	236	12.0	372	17.5	621	12.4		713	14.1	232	13.7	243	14.4	238	14.1	
2011	1,170	12.8	274	13.9	246	11.6	650	13.0		614	12.1	197	11.7	210	12.4	207	12.3	
2012	1,086	11.9	242	12.3	239	11.3	605	12.1		603	11.9	199	11.8	199	11.8	205	12.1	
2013	1,079	11.8	234	11.9	233	11.0	612	12.2		577	11.4	193	11.4	199	11.8	185	11.0	
2014	1,172	12.9	251	12.7	262	12.4	659	13.1		648	12.8	221	13.1	216	12.8	211	12.5	
2015	1,058	11.6	247	12.5	232	10.9	579	11.5		590	11.7	207	12.3	199	11.8	184	10.9	

[a]The propensity score matching (PSM) method included all of the patient characteristic variables.
[b]Currency unit is NTD (New Taiwan Dollar).

most frequently visited physicians for schizophrenia and for diabetes, respectively, in the first year following his/her first diabetes diagnosis. Three care delivery models were then determined: people who obtained diabetes care from the same physician who treated their schizophrenia were referred as having the sole-physician model, people received diabetes and schizophrenia care from two different physicians but in the same facility were referred as having the colocation model, and people who received care from different physicians in different facilities were referred as having the different-facilities model. Focusing on an individual's care model during the first year since his/her first diabetes diagnosis allowed us to examine whether the care model in the early post–diabetes mellitus diagnosis period influences long-term outcomes in individuals with comorbid schizophrenia and diabetes. We postulated that these 3 models represent different levels of care integration between medical and mental care providers. The sole-physician model was assumed to have the lowest level of separation between the mental and medical care systems, followed by the colocation model and the different-facilities model.

Table 2. Provider Characteristics of Individuals With Coexisting Schizophrenia and Diabetes by 3 Care Models (Matched Sample, N = 5,064)[a]

	Total (N = 5,064)		Sole-Physician Model (n = 1,688)		Colocation Model (n = 1,688)		Different-Facilities Model (N = 1,688)		
Variable	n	%	n	%	n	%	n	%	P
Characteristics of Diabetes Providers									
Sex									<.01
Male	4,304	85.0	1,451	86.0	1,378	81.6	1,475	87.4	
Female	760	15.0	237	14.0	310	18.4	213	12.6	
Age, y									<.01
≤40	1,666	32.9	634	37.6	591	35.0	441	26.1	
41–50	1,995	39.4	709	42.0	696	41.2	590	35.0	
≥51	1,403	27.7	345	20.4	401	23.8	657	38.9	
Specialist									<.01
Psychiatry	1,268	25.0	1,119	66.3	80	4.7	69	4.1	
Non-psychiatry	3,796	75.0	569	33.7	1,608	95.3	1,619	95.9	
Accreditation level									<.01
Medical center	936	18.5	347	20.6	415	24.6	174	10.3	
Regional center	1,988	39.3	826	48.9	785	46.5	377	22.3	
District hospital	1,247	24.6	408	24.2	461	27.3	378	22.4	
Clinic	893	17.6	107	6.3	27	1.6	759	45.0	
Facility ownership									<.01
Private	2,924	57.7	905	53.6	734	43.5	1,285	76.1	
Public	2,140	42.3	783	46.4	954	56.5	403	23.9	
Characteristics of Schizophrenia Providers									
Sex									.06
Male	4,271	84.3	1,451	86.0	1,418	84.0	1,402	83.1	
Female	793	15.7	237	14.0	270	16.0	286	16.9	
Age, y									<.01
≤40	1,666	32.9	634	37.6	591	35.0	441	26.1	
41–50	1,995	39.4	709	42.0	696	41.2	590	35.0	
≥51	1,403	27.7	345	20.4	401	23.8	657	38.9	
Specialty									<.01
Psychiatry	4,178	82.5	1,119	66.3	1,546	91.6	1,513	89.6	
Non-psychiatry	886	17.5	569	33.7	142	8.4	175	10.4	
Accreditation level									<.01
Medical center	1,049	20.7	345	20.4	415	24.6	289	17.1	
Regional center	2,379	47.0	826	48.9	785	46.5	768	45.5	
District hospital	1,224	24.2	406	24.1	461	27.3	357	21.2	
Clinic	412	8.1	111	6.6	27	1.6	274	16.2	
Facility ownership									<.01
Private	2,498	49.3	905	53.6	734	43.5	859	50.9	
Public	2,566	50.7	783	46.4	954	56.5	829	49.1	

[a]The propensity score matching (PSM) method included all of the patient characteristic variables.

Management and Quality of Diabetes Care

The primary outcome was hospitalization for ambulatory care sensitive conditions (ACSCs) developed by the Agency for Healthcare Research and Quality, which specifically included admissions for diabetes short-term and long-term complications, uncontrolled diabetes, and lower-extremity amputation.[34,35] We observed whether patients had any admission for the selected ACSCs within 1 and 3 years after their first diabetes diagnosis. An ACSC hospital admission was considered a sign of inadequate routine diabetes care. The secondary outcome was utilization of recommended routine care procedures. Two process indicators were evaluated: the number of recommended examinations and the individual's adherence to the recommended annual number of diabetes-related visits in the first year following diabetes diagnosis.[36,37] The NHI program recommends 7 routine examinations for diabetes care, including ophthalmoscopic examinations and

laboratory tests (blood glucose, HbA1c, lipid profile, serum creatinine, serum glutamic-pyruvic transaminase [SPGT]/ alanine aminotransferase [ALT], and urine). Patients with diabetes should receive the HbA1c test at least 2 times and the other 6 examinations at least once within 1 year. Each of the examinations was counted if the patient had received the examination at least once within 1 year except for the HbA1c test, which was counted only if the patient had received tests at least 2 times within 1 year. This study defined attending the recommended number of diabetes-related visits as attending at least 1 diabetes-related visit every 3 months and 4 visits in 1 year (coded as a dichotomous variable).

Other Covariates

A set of patient and provider variables were included as the controlling variables. Patient characteristics included the following: patient's age when first diagnosed with diabetes,

Table 3. Data on Process of Diabetes Care and Outcomes Among Individuals With Coexisting Schizophrenia and Diabetes by 3 Care Models (Matched Sample, N = 5,064)

Management and Quality Indicator	Total (N = 5,064)		Sole-Physician Model (n = 1,688)		Colocation Model n = 1,688		Different-Facilities Model (n = 1,688)		P
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
No. of recommended examinations	3.8	2.2	3.4	2.2	4.5	2.1	3.5	2.1	<.001
	n	%	n	%	n	%	n	%	
Rate of attending recommended number of DM-related visits	2,997	59.2	1,113	65.9	1,055	62.5	829	49.1	<.0001
1-Year ACSCs	323	6.4	131	7.8	111	6.6	81	4.8	.0019
3-Year ACSCs	666	13.2	266	15.8	231	13.7	169	10.0	<.0001

Abbreviations: ACSC = ambulatory care sensitive condition, DM = diabetes mellitus.

Table 4. Incidence Rate Ratios (IRRs) and Odds Ratios (ORs) for Process of Diabetes Care and Outcomes Among Individuals With Coexisting Schizophrenia and Diabetes by 3 Care Models (Matched Sample, N = 5,064)

Type of Delivery Model	No. of Recommended Examinations		Rate of Attending Recommended Number of DM-Related Visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Different-facilities model	1	Reference	1	Reference	1	Reference	1	Reference
Colocation model	1.1	1.1 to 1.2	1.6	1.3 to 1.9	1.2	0.8 to 1.7	1.2	0.9 to 1.5
Sole-physician model	1.2	1.1 to 1.2	2.6	2.1 to 3.2	1.9	1.3 to 2.8	1.6	1.2 to 2.1

Abbreviation: ACSC = ambulatory care sensitive condition.

sex, working status, living arrangements, insurable wage/category, duration of schizophrenia, other major mental and physical comorbidities, Diabetes Complication Severity Index (DCSI)[38] score, urbanization level of residential location, and year of diabetes diagnosis. The characteristics of schizophrenia and diabetes care providers were analyzed, including age, sex, specialty (psychiatrist or non-psychiatrist), and type of facility (accreditation level and ownership).

Statistical Analysis

To address selection bias potentially existing in the 3 care delivery models, the propensity score matching (PSM) method with 1-to-1 matching was employed using the greedy algorithm.[39,40] All patient characteristics were included in PSM. Generalized estimating equation (GEE) models[41,42] were applied to estimate the effects of types of care models on primary and secondary outcomes. The Poisson distribution was employed to analyze the number of recommended examinations. The attendance rate of diabetes-related visits and the hospitalization rate of diabetes-related ACSCs were analyzed using the GEE model with a logit link function and a binomial distribution. The characteristics of diabetes physicians were adjusted for in the GEE models. Sensitivity analyses were conducted for different sample inclusion and exclusion criteria and varying sets of control variables. The results were robust (Supplementary Tables 1A through 6). Data management and statistical analyses were performed using SAS version 9.4 (July 2013).

RESULTS

Of the 9,109 individuals with schizophrenia who were newly diagnosed with diabetes, in the first year following diabetes diagnosis, 1,974 patients (21.7%) obtained diabetes care from the same physician who treated their schizophrenia, 2,121 (23.3%) received care from a different physician but in the same facility, and 5,014 (55.0%) received care from a different physician in a different facility (Table 1). After matching for individual characteristics, each group was left with 1,688 individuals, and the distributions of individual characteristics among the 3 groups were balanced.

A total of 82.5% of the patients received their schizophrenia care from psychiatrists, and 17.5% received their schizophrenia care from non-psychiatrists (Table 2). The top 3 types of schizophrenia providers included in "non-psychiatry" were internal medicine provides (51.6%), family medicine providers (18.7%), and general practitioners (13.3%). In contrast, 75.0% of the patients received their diabetes care from non-psychiatrists. The top 3 types of diabetes providers included in "non-psychiatry" were internal medicine (64.5%), family medicine (23.2%), and neurology (2.9%) providers. Specifically, whereas about 90% of patients in the different-facilities group and colocation group had a psychiatrist as their main schizophrenia care provider, only 66.3% of patients in the sole-physician group did. Most individuals in the colocation (95.3%) and different-facilities group (95.9%) had their diabetes treated by a non-psychiatrist, whereas 66.3% of patients in the sole-physician group had a psychiatrist as their main diabetes care provider.

Table 3 presents crude estimates of quality indicators for all 3 groups. Table 4 shows that after adjusting for the characteristics of patients and providers, the sole-physician group had the highest rate for obtaining number of recommended routine examinations (IRR = 1.2; 95% CI, 1.1–1.2), followed by the colocation group (IRR = 1.1; 95% CI, 1.1–1.2) and the different-facilities group. Similarly, the sole-physician group had the highest likelihood of visiting their diabetes providers regularly as recommended (OR = 2.6; 95% CI, 2.1–3.2), followed by the colocation model (OR = 1.6; 95% CI, 1.3–1.9) and the different-facilities model. However, of the 3 groups, the sole-physician group had the highest likelihood of admission for diabetes-related ACSCs within 1 year (OR = 1.9; 95% CI, 1.3–2.8) and 3 years

Table 5. Specialty of Diabetes Care Providers in Relation to Process of Care and Outcomes Among Individuals With Coexisting Schizophrenia and Diabetes Who Received Care From the Sole-Physician Model (n = 1,688)								
Specialty of Diabetes Providers	No. of Recommended Examinations		Rate of Attending Recommended Number of DM-Related Visits		1- Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Non-psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.7	0.6 to 0.7	0.9	0.7 to 1.1	0.5	0.4 to 0.7	0.7	0.5 to 0.9

Abbreviations: ACSC = ambulatory care sensitive condition, DM = diabetes mellitus, IRR = incidence rate ratio, OR = odds ratio.

(OR = 1.6; 95% CI, 1.2–2.1). No significant differences were observed between the colocation model and the different-facilities model.

We further analyzed the influence of physician specialty on the quality of diabetes care in the sole-physician group (Table 5). After adjusting for other characteristics, compared to patients of non-psychiatrists, patients of psychiatrists had a significantly lower rate for recommended examinations (IRR = 0.7; 95% CI, 0.6–0.7), but had significantly lower likelihood of ACSCs (1-year: OR = 0.5; 95% CI, 0.4–0.7; 3-year: OR = 0.7; 95% CI, 0.5–0.9).

DISCUSSION

This population-based study is one of the first to explore the extent to which the care models affect the management and quality of diabetes care among individuals with schizophrenia. Under Taiwan's NHI system, which lacks gatekeeper control and offers flexible provider choices and comprehensive coverage for both medical and mental care, approximately 55.0%, 23.3%, and 21.7% of individuals with coexisting schizophrenia and diabetes received care from the different-facilities model, the colocation model, and the sole-physician model, respectively.

Although the sole-physician model is common among individuals with mental and medical comorbidities, few studies have investigated the quality of medical care it offers. Our study showed that of all 3 care models, the sole-physician model yielded the highest adherence to recommended routine care processes. Having the same physicians treat both mental and medical illnesses incurs the lowest level of geographic or cultural separation. Organization and information separation may also be the lowest because the treating physicians are familiar with and knowledgeable about the patients' condition or history. These advantages may contribute to improved process quality of diabetes care.

Colocating medical and mental care providers may also address geographic, organizational, and information separation, but is likely to do so to a lesser extent than in the sole-physician model. Consistent with previous studies,[2,23,27,43,44] the colocation model led to better management of routine care than did the different-facilities model; however, it led to an inferior performance in care

management compared with the sole-physician model. As the 3 care models serve as a proxy for the integration level between mental and medical care, the significant care management differences observed across the 3 care models suggest that higher integration levels lead to better process quality of diabetes care among individuals with schizophrenia.

Although the findings indicate that the sole-physician and colocation models are associated with the improved process quality of diabetes care among individuals with coexisting schizophrenia and diabetes, these two care models did not exhibit a significantly lower occurrence of preventable hospitalization. Moreover, patients who received diabetes and schizophrenia care from the same physicians had worse outcomes. The fact that clinical outcomes (eg, preventable hospitalization) are multifactorial and only partially attributable to the diabetes management may explain why the improved management of diabetes care fails to translate to favorable disease outcomes.[2,4,23] For example, lifestyle and health behavior factors, including obesity and smoking, play a significant role in diabetes outcomes. However, lifestyle or behavior modification interventions or education are rarely incorporated in physicians' usual and routine practices because of time and resource constraints. Improved care process for diabetes does not in and of itself guarantee favorable outcomes among individuals with schizophrenia. The content of the integrated care delivered by providers is equally crucial.

More specifically, we found that within the sole-physician model—compared with patients managed solely by non-psychiatrists—patients of psychiatrists had more favorable patient outcomes. This difference may be because psychiatrists' familiarity with and training in caring for severe mental illnesses and their knowledge of complex pharmacologic regimens help to avert potential adverse outcomes. Also, it is possible that patients of psychiatrists may have a less severe diabetes condition. Our results are still preliminary; therefore, any interpretation of within-group differences should be considered cautiously.

Nevertheless, extending psychiatrists' roles to treat general medical conditions such as diabetes has been the subject of heated debate.[31,32,45,46] With greater emphasis on integration of mental and general medical services among

people with serious mental illness, pressures are mounting among psychiatrists to extend their role in treating general medical conditions. However, psychiatrists have been reluctant to assume this role.[47] The major barriers may include psychiatrists' concerns about patient safety and professional competency, exacerbation of an already overburdened mental health system, and lack of support capacities and resources in their clinical setting.[31,32,45–47] Appropriately addressing these concerns may increase the willingness of psychiatrists to take on this extended role.

Some limitations were noted. First, because our study was based on observational data, selection bias may be likely. Although we used the PSM method to address this concern, self-selection on unobservable factors among the 3 care models may remain possible. Second, to determine a clearer temporal relationship between type of care model and diabetes outcomes, a patient's care model was determined based on his/her care-seeking records in the first year following diabetes diagnosis. The findings should therefore be interpreted with caution because an individual's care model may change over time. Third, because of the lack

of laboratory data, we examined only ACSCs admissions as diabetes outcomes. Future studies with more comprehensive data may incorporate more diabetes outcomes such as HbA1c level. Last, because of the unique features of Taiwan's NHI system, the results may not be generalizable to health care systems with more restrictions on provider choice or separate mental and general medical care coverage.

This study illustrated 3 types of care models that individuals with schizophrenia may experience when they are first diagnosed with diabetes and how these models influence the management and quality of diabetes care received under a single-payer system. The results suggest that improving management quality of diabetes care among people with severe mental illness is possible if the separation between mental and medical care is reduced. However, reducing the separation between mental and medical care through the sole-physician or colocation models alone is insufficient for improving diabetes outcomes. To guarantee the benefits of integrating mental and medical care, the contents of care provision and provider-related factors should not be overlooked.

REFERENCES

1. World Health Organization. Premature death among people with severe mental disorders. WHO website. http://wwwwhoint/mental_health/management/info_sheetpdf. 2013.
2. Chwastiak LA, Freudenreich O, Tek C, et al. Clinical management of comorbid diabetes and psychotic disorders. *Lancet Psychiatry*. 2015;2(5):465–476.
3. DE Hert M, Correll CU, Bobes J, et al. Physical illness in patients with severe mental disorders, I: prevalence, impact of medications and disparities in health care. *World Psychiatry*. 2011;10(1):52–77.
4. Ward M, Druss B. The epidemiology of diabetes in psychotic disorders. *Lancet Psychiatry*. 2015;2(5):431–451.
5. De Hert M, Cohen D, Bobes J, et al. Physical illness in patients with severe mental disorders. II. Barriers to care, monitoring and treatment guidelines, plus recommendations at the system and individual level. *World Psychiatry*. 2011;10(2):138–151.
6. Domino ME, Beadles CA, Lichstein JC, et al. Heterogeneity in the quality of care for patients with multiple chronic conditions by psychiatric comorbidity. *Med Care*. 2014;52(suppl 3):S101–S109.
7. Druss BG, Rosenheck RA, Desai MM, et al.

Quality of preventive medical care for patients with mental disorders. *Med Care*. 2002;40(2):129–136.
8. Druss BG, Zhao L, Cummings JR, et al. Mental comorbidity and quality of diabetes care under Medicaid: a 50-state analysis. *Med Care*. 2012;50(5):428–433.
9. Frayne SM, Halanych JH, Miller DR, et al. Disparities in diabetes care: impact of mental illness. *Arch Intern Med*. 2005;165(22):2631–2638.
10. Goldberg RW, Kreyenbuhl JA, Medoff DR, et al. Quality of diabetes care among adults with serious mental illness. *Psychiatr Serv*. 2007;58(4):536–543.
11. Green JL, Gazmararian JA, Rask KJ, et al. Quality of diabetes care for underserved patients with and without mental illness: site of care matters. *Psychiatr Serv*. 2010;61(12):1204–1210.
12. Jones LE, Clarke W, Carney CP. Receipt of diabetes services by insured adults with and without claims for mental disorders. *Med Care*. 2004;42(12):1167–1175.
13. Li Y, Glance LG, Cai X, et al. Mental illness and hospitalization for ambulatory care sensitive medical conditions. *Med Care*. 2008;46(12):1249–1256.
14. Lin HC, Huang CC, Chen SF, et al. Increased risk of avoidable hospitalization among patients with schizophrenia. *Can J Psychiatry*. 2011;56(3):171–178.
15. Mangurian C, Newcomer JW, Vittinghoff E, et al. Diabetes screening among underserved adults with severe mental illness who take antipsychotic medications. *JAMA Intern Med*. 2015;175(12):1977–1979.
16. Shim RS, Druss BG, Zhang S, et al. Emergency department utilization among Medicaid beneficiaries with schizophrenia and diabetes: the consequences of increasing medical complexity. *Schizophr Res*. 2014;152(2–3):490–497.
17. Vinogradova Y, Coupland C, Hippisley-Cox J, et al. Effects of severe mental illness on survival of people with diabetes. *Br J Psychiatry*. 2010;197(4):272–277.
18. Millar H. Management of physical health in schizophrenia: a stepping stone to treatment

success. *Eur Neuropsychopharmacol*. 2008;18(suppl 2):S121–S128.
19. Heald A. Physical health in schizophrenia: a challenge for antipsychotic therapy. *Eur Psychiatry*. 2010;25(suppl 2):S6–S11.
20. Montejo AL. The need for routine physical health care in schizophrenia. *Eur Psychiatry*. 2010;25(suppl 2):S3–S5.
21. Druss BG. Improving medical care for persons with serious mental illness: challenges and solutions. *J Clin Psychiatry*. 2007;68(suppl 4):40–44.
22. Chwastiak L, Fortney J. Learning to integrate cardiometabolic care in serious mental illness. *Am J Psychiatry*. 2017;174(3):199–201.
23. Druss BG, von Esenwein SA, Glick GE, et al. Randomized trial of an integrated behavioral health home: The Health Outcomes Management and Evaluation (HOME) Study. *Am J Psychiatry*. 2017;174(3):246–255.
24. Fortuna KL, DiMilia PR, Lohman MC, et al. Systematic review of the impact of behavioral health homes on cardiometabolic risk factors for adults with serious mental illness. *Psychiatr Serv*. 2020;71(1):57–74.
25. Bradford DW, Cunningham NT, Slubicki MN, et al. An evidence synthesis of care models to improve general medical outcomes for individuals with serious mental illness: a systematic review. *J Clin Psychiatry*. 2013;74(8):e754–e764.
26. Druss BG, Rohrbaugh RM, Levinson CM, et al. Integrated medical care for patients with serious psychiatric illness: a randomized trial. *Arch Gen Psychiatry*. 2001;58(9):861–868.
27. Breslau J, Leckman-Westin E, Yu H, et al. Impact of a mental health based primary care program on quality of physical health care. *Adm Policy Ment Health*. 2018;45(2):276–285.
28. Tepper MC, Cohen AM, Progovac AM, et al. Mind the gap: developing an integrated behavioral health home to address health disparities in serious mental illness. *Psychiatr Serv*. 2017;68(12):1217–1224.
29. McGinty EE, Stone EM, Kennedy-Hendricks A, et al. Effects of Maryland's Affordable Care Act Medicaid Health Home Waiver on quality of cardiovascular care among people with serious

mental illness. *J Gen Intern Med*. 2020;35(11):3148–3158.

30. Gilmer TP, Henwood BF, Goode M, et al. Implementation of integrated health homes and health outcomes for persons with serious mental illness in Los Angeles County. *Psychiatr Serv*. 2016;67(10):1062–1067.

31. Rosen P. Reflections from a primary care physician and psychiatrist on a framework for extending psychiatrists' roles in treating general health conditions. *Am J Psychiatry*. 2016;173(12):1243–1244.

32. Vanderlip ER, Raney LE, Druss BG. A framework for extending psychiatrists' roles in treating general health conditions. *Am J Psychiatry*. 2016;173(7):658–663.

33. Cheng T-M. International Health Care System Profiles-Taiwan. The Commonwealth Fund website. https://www.commonwealthfund.org/international-health-policy-center/countries/taiwan. 2021. Accessed August 11, 2021.

34. Huang YC, Lee MC, Chou YJ, et al. Disease-specific pay-for-performance programs: do the P4P effects differ between diabetic patients with and without multiple chronic conditions? *Med Care*. 2016;54(11):977–983.

35. Chen YC, Lee CT, Lin BJ, et al. Impact of pay-for-performance on mortality in diabetes patients

in Taiwan: a population-based study. *Medicine (Baltimore)*. 2016;95(27):e4197.

36. Agency for Healthcare Research and Quality. Chartbook on Care Coordination: Potentially Avoidable Hospitalizations. AHRQ website. https://www.ahrq.gov/research/findings/nhqrdr/chartbooks/carecoordination/measure3.html. Accessed Jan 04, 2021.

37. Davydow DS, Ribe AR, Pedersen HS, et al. Serious mental illness and risk for hospitalizations and rehospitalizations for ambulatory care-sensitive conditions in denmark: a nationwide population-based cohort study. *Med Care*. 2016;54(1):90–97.

38. Glasheen WP, Renda A, Dong Y. Diabetes Complications Severity Index (DCSI)—update and ICD-10 translation. *J Diabetes Complications*. 2017 Jun;31(6):1007–1013.

39. Pan W, Bai H. *Propensity Score Analysis: Fundamentals and Developments*. Guilford Publications; 2015.

40. Austin PC. A comparison of 12 algorithms for matching on the propensity score. *Stat Med*. 2014;33(6):1057–1069.

41. Hardin JW, Hilbe JM. *Generalized Estimating Equations*. Chapman and Hall/CRC; 2002.

42. Ballinger GA. Using generalized estimating equations for longitudinal data analysis.

J Organ Res Methods. 2004;7(2):127–150.

43. Kilbourne AM, Lai Z, Bowersox N, et al. Does colocated care improve access to cardiometabolic screening for patients with serious mental illness? *Gen Hosp Psychiatry*. 2011;33(6):634–636.

44. Kilbourne AM, Pirraglia PA, Lai Z, et al. Quality of general medical care among patients with serious mental illness: does colocation of services matter? *Psychiatr Serv*. 2011;62(8):922–928.

45. Arbuckle MR. Harnessing medical training for psychiatrists to expand access to care. *Am J Psychiatry*. 2016;173(12):1244.

46. Vanderlip ER, Raney LE, Druss BG. In support of a call for enhancing general medical training of psychiatrists: response to Rosen and Arbuckle. *Am J Psychiatry*. 2016;173(12):1244–1245.

47. Mojtabai R, Olfson M. Management of common medical conditions by office-based psychiatrists. *Psychiatr Serv*. 2018;69(4):410–423.

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Supplementary Material

Article Title: Influence of Care Delivery Models on Quality of Diabetes Care Among Individuals With Schizophrenia

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List of Supplementary Material for the article

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Supplementary Table 1A. Process of diabetes care and outcomes among individuals with coexisting schizophrenia and diabetes by three care delivery models. (Individuals with schizophrenia were defined as those who had any diagnosis of schizophrenia in at least three outpatient visits or one inpatient admission within one year.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.1	1.1 to 1.2	1.5	1.3 to 1.8	1.2	0.9 to 1.7	1.2	0.9 to 1.5
Same Physician Model	1.1	1.0 to 1.2	2.5	2.0 to 3.0	2.0	1.4 to 3.0	1.6	1.2 to 2.1

Supplementary Table 1B. Specialty of diabetes care providers in relation to process of diabetes care and outcomes among patients with coexisting schizophrenia and diabetes who received care from the sole-physician model (Individuals with schizophrenia were defined as those who had any diagnosis of schizophrenia in at least three outpatient visits or one inpatient admission within one year.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Specialty of Diabetes Providers								
Non-Psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.6	0.6 to 0.6	0.7	0.6 to 0.9	0.4	0.3 to 0.6	0.6	0.5 to 0.8

Supplementary Table 2A. Process of diabetes care and outcomes among individuals with coexisting schizophrenia and diabetes by three care delivery models. (Individuals with schizophrenia were defined as those who had received a diagnosis of schizophrenia from a psychiatrist.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	IRR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.1	1.1 to 1.2	1.4	1.2 to 1.7	1.2	0.9 to 1.7	1.1	0.9 to 1.5
Same Physician Model	1.1	1.1 to 1.2	2.6	2.1 to 3.2	2.2	1.5 to 3.2	1.7	1.3 to 2.3

Supplementary Table 2B Specialty of diabetes care providers in relation to process of diabetes care and outcomes among patients with coexisting schizophrenia and diabetes who received care from the sole-physician model (Individuals with schizophrenia were defined as those who had received a diagnosis of schizophrenia from a psychiatrist.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Specialty of Diabetes Providers								
Non-Psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.6	0.6 to 0.7	0.7	0.6 to 0.9	0.5	0.3 to 0.7	0.6	0.5 to 0.8

Supplementary Table 3A. Process of diabetes care and outcomes among individuals with coexisting schizophrenia and diabetes by three care delivery models. (Individuals with diabetes were defined as those who had at least 3 diabetes-related physician visit or one inpatient admission with any diagnosis of ICD-9-CM codes 250, excluding 250.x1 or 250.x3.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.2	1.1 to 1.2	1.5	1.3 to 1.7	1.1	0.9 to 1.5	1.2	0.9 to 1.5
Same Physician Model	1.3	1.2 to 1.4	3.2	2.6 to 3.8	1.8	1.3 to 2.4	1.9	1.5 to 2.4

Supplementary Table 3B. Specialty of diabetes care providers in relation to process of diabetes care and outcomes among patients with coexisting schizophrenia and diabetes who received care from the sole-physician model. (Individuals with diabetes were defined as those who had at least 3 diabetes-related physician visit or one inpatient admission with any diagnosis of ICD-9-CM codes 250, excluding 250.x1 or 250.x3.)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Specialty of Diabetes Providers								
Non-Psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.6	0.6 to 0.6	0.7	0.5 to 0.8	0.7	0.5 to 0.9	0.7	0.5 to 0.9

Supplementary Table 4A. Incidence Rate Ratios (IRRs) and Odds Ratios for Process of Diabetes Care and Outcomes among Individuals with Coexisting Schizophrenia and Diabetes by Three Care Models. (Adjusting for the characteristics of patients only)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.0	1.2 to 1.3	1.9	1.6 to 2.2	1.4	1.0 to 1.9	1.4	1.2 to 1.8
Same Physician Model	1.3	0.9 to 1.0	2.3	2.0 to 2.7	1.7	1.3 to 2.2	1.7	1.4 to 2.1

Supplementary Table 4B. Specialty of Diabetes Care Providers in Relation to Process of Care and Outcomes among Individuals with Coexisting Schizophrenia and Diabetes Who Received Care from the Sole-Physician Model (Adjusting for the characteristics of patients only)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Specialty of Diabetes Providers								
Non-Psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.7	0.6 to 0.7	0.8	0.7 to 1.1	0.5	0.4 to 0.7	0.7	0.5 to 0.9

Supplementary Table 5A. Incidence Rate Ratios (IRRs) and Odds Ratios for Process of Diabetes Care and Outcomes among Individuals with Coexisting Schizophrenia and Diabetes by Three Care Models. (Adjusting for the characteristics of patients and schizophrenia physicians)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.2	1.2 to 1.3	1.8	1.9 to 2.7	1.4	1.0 to 1.9	1.4	1.1 to 1.7
Same Physician Model	0.9	0.9 to 1.0	2.3	1.6 to 2.1	1.4	1.0 to 1.0	1.5	1.2 to 1.8

Supplementary Table 5B. Specialty of Diabetes Care Providers in Relation to Process of Care and Outcomes among Individuals with Coexisting Schizophrenia and Diabetes Who Received Care from the Sole-Physician Model (Adjusting for the characteristics of patients and schizophrenia physicians)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Specialty of Diabetes Providers								
Non-Psychiatry	1	Reference	1	Reference	1	Reference	1	Reference
Psychiatry	0.7	0.6 to 0.7	0.8	0.7 to 1.1	0.5	0.4 to 0.7	0.7	0.5 to 0.9

Supplementary Table 6. Incidence Rate Ratios (IRRs) and Odds Ratios for Process of Diabetes Care and Outcomes among Individuals with Coexisting Schizophrenia and Diabetes by Three Care Models. (Adjusting for the characteristics of patients, schizophrenia and diabetes physicians)

	No. recommended examinations		Rate of attending recommended number of DM-related visits		1-Year ACSCs		3-Year ACSCs	
	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Type of Delivery Model								
Different facilities	1	Reference	1	Reference	1	Reference	1	Reference
Colocation Model	1.1	1.1 to 1.2	1.6	1.3 to 1.9	1.2	0.9 to 1.7	1.2	0.9 to 1.5
Same Physician Model	1.3	1.2 to 1.4	3.2	2.5 to 4.0	1.3	0.9 to 2.1	1.2	0.9 to 1.6