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The impact of a medication record sharing program among diabetes patients under a single-payer system: The role of inquiry rate

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ABSTRACT

Objective: Taiwan's single health insurer introduced a medication record exchange platform, the PharmaCloud program, in 2013. This study aimed to evaluate the effects of the medication record inquiry rate on medication duplication among patients with diabetes.

Materials and methods: A retrospective pre-post design with a comparison group was conducted using nationwide health insurance claim data of diabetic patients from 2013 to 2014. Patients whose medication record inquiry rate fell within the upper 25th percentile were classified as the high-inquiry group, and the others as the low-inquiry group. The dependent variables were the likelihood of receiving duplicated medication and the overlapped medication days of the study subjects. Generalized estimation equations with difference-in-difference analysis were calculated to examine the net effect of the PharmaCloud inquiry rate for a matched sub-sample.

Results: In total, 106,508 patients with diabetes were randomly selected. From 2013 to 2014, the medication duplication rate was reduced 7.76 percentile (54.12%–46.36%) for the high-inquiry group and 9.58 percentile (63.72%–54.14%) for the low-inquiry group; the average medication overlap periods were shortened 4.36 days (8.49–4.13) and 6.29 days (11.28–4.99), respectively. The regression models showed patients in the high-inquiry group were more likely to receive duplicated medication (OR = 1.11, 95% C.I. = 1.07–1.16) and with longer overlapped days (7.53%, P = 0.0081) after the program.

Conclusion: The medication record sharing program has reduced medication duplication among diabetes patients. However, higher inquiry rate did not lead to greater reduction in medication duplication; the overall effect might be due to enhanced internal control via prescription alert system in hospitals rather physician's review of the records.

1. Introduction

Many nations around the globe are facing the growing prevalence of chronic conditions in aging societies. Medication management is considered the most effective means of containing the progress of chronic conditions and health maintenance [1–4]. Unfortunately, fragmented care may hamper proper medication management for patients with chronic conditions. In many Asian countries, due to the lack of a gatekeeping system, potential doctor-shopping behavior and fragmented care commonly exist [5–8], which may lead to inappropriate prescriptions or duplicate medication among patients with chronic conditions. A Japanese study revealed that among patients visiting multiple healthcare institutes, 8.8% received duplicate medication [9]. A recent study in Taiwan reported that among elderly patients, the occurrence of duplicated medication ranged from 40.38% to 43.50% during 2005–2011 [10]. Inappropriate prescriptions or duplicate medications are also important issues in healthcare settings in western countries [11,12].

The Institute of Medicine (IOM) had proposed that using medical information systems to promote patient health information exchange (HIE) which may improve care coordination and safety, and lead to better health outcomes [13,14]. In Canada, the British Columbia introduced a drug inquiries and management system entitled "PharmaNet"; the system effectively reduced the number of inappropriate prescriptions, improve the quality and safety of medication prescribed by physicians and pharmacists [15–17]. Another study found that a lack of needed clinical information of patients in primary care setting caused adverse reactions or delays in patient care [18].

In Taiwan, the compulsory National Health Insurance (NHI) program was implemented in 1995 and covered over 99% of the country's

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Table 1
The rates and days of duplicated medication in the high-inquiry (upper 25th percentile) and low-inquiry groups.

		2013 (Time 1)		2014 (Time 2)		Difference (P-value)	
High-inquiry group (N = 27,388)							
PharmaCloud inquiry rate (Mean, SD)		–	–	39.80%	17.19%		
Duplicated medication (N, %)	Yes	14,823	54.12	12,696	46.36	−7.76[a]	< 0.0001
	No	12,565	45.88	14,692	53.64		
Days of overlapped medication (Mean, SD)		8.49	27.66	4.13	8.84	−4.36[b]	< 0.0001
Low-inquiry group (N = 79,120)							
PharmaCloud inquiry rate (Mean, SD)		–	–	2.73%	5.58%		
Duplicated medication (N, %)	Yes	50,418	63.72	42,834	54.14	−9.58[a]	< 0.0001
	No	28,702	36.28	36,286	45.86		
Days of overlapped medication (Mean, SD)		11.28	35.89	4.99	9.50	−6.29[b]	< 0.0001

Note: [a]McNemar test; [b]Paired *t*-test.

Table 2
The characteristics of the subjects before and after propensity score matching at baseline (2013).

	Pre-Match				Difference (P-value)	Post-Match				Difference (P-value)
	High-inquiry group		Low-inquiry group			High-inquiry group		Low-inquiry group		
N	27,388		79,120			26,078		26,078		
Age (N, %)										
Age < 55 yr	4,872	17.79%	17,057	21.56%	< 0.0001	4,790	18.37%	4,619	17.71%	0.0906
55 yr ≤ Age < 65 yr	7,938	28.98%	25,148	31.78%		7,698	29.52%	7,654	29.35%	
65 yr ≤ Age < 75 yr	7,785	28.42%	20,380	25.76%		7,292	27.96%	7,511	28.8%	
Age ≥ 75 yr	6,793	24.8%	16,535	20.9%		6,298	24.15%	6,294	24.14%	
Gender (N, %)										
Male	13,630	49.77%	40,264	50.89%	0.0013	13,073	50.13%	13,246	50.79%	0.1297
Female	13,758	50.23%	38,856	49.11%		13,005	49.87%	12,832	49.21%	
CCI (N, %)										
0–1	24,078	87.91%	70,477	89.08%	< 0.0001	22,951	88.01%	22,989	88.15%	0.6076
≥ 2	3,310	12.09%	8,643	10.92%		3,127	11.99%	3,089	11.85%	
No. of physician visits(N, %)										
0–21	5,649	20.63%	20,297	25.65%	< 0.0001	5,566	21.34%	5,681	21.78%	0.1401
22–43	13,810	50.42%	38,968	49.25%		13,225	50.71%	13,000	49.85%	
≥ 44	7,929	28.95%	19,855	25.09%		7,287	27.94%	7,397	28.36%	
No. of doctors seen (N, %)										
0–3	4,981	18.19%	18,007	22.76%	< 0.0001	4,874	18.69%	4,929	18.9%	0.2858
4–8	13,134	47.96%	38,098	48.15%		12,596	48.3%	12,416	47.61%	
≥ 9	9,273	33.86%	23,015	29.09%		8,608	33.01%	8,733	33.49%	
NHI area (N, %)										
Taipei Division	5,830	21.29%	24,317	30.73%	< 0.0001	5,830	22.36%	6,127	23.49%	0.0004
Northern Division	5,432	19.83%	8,902	11.25%		4,935	18.92%	5,125	19.65%	
Central Division	7,887	28.8%	14,426	18.23%		7,269	27.87%	7,046	27.02%	
Southern Division	1,860	6.79%	14,796	18.7%		1,860	7.13%	1,829	7.01%	
Kaoping Division	5,821	21.25%	14,091	17.81%		5,626	21.57%	5,356	20.54%	
Eastern Division	558	2.04%	2,588	3.27%		558	2.14%	595	2.28%	
Accreditation level (N, %)										
Medical Center Hospitals	6,159	22.49%	13,376	16.91%	< 0.0001	5,922	22.71%	5,668	21.73%	< 0.0001
Regional Hospitals	10,264	37.48%	18,498	23.38%		9,266	35.53%	9,238	35.42%	
District Hospitals	5,444	19.88%	11,701	14.79%		5,369	20.59%	5,832	22.36%	
Clinics	5,521	20.16%	35,545	44.93%		5,521	21.17%	5,340	20.48%	

23 million residents. Due to the lack of gatekeeper and easy access to ambulatory care, Taiwanese conduct an average of 15 physician visits per year. The single-payer NHI Administration introduced a centralized medication record sharing platform, entitled “PharmaCloud”, in July 2013, which made patient medication information available to contracted healthcare providers nationwide. It is hoped that the new system may improve medication safety by avoiding overlapped medications and drug interactions [19].

To understand and promote the usage of the PharmaCloud platform by clinics and hospitals, the NHI Administration announced in 2013 that six prevalent categories of medication would be monitored. Healthcare providers prescribing duplicated medication from these six categories would be penalized after 2015. The six categories of medications are anti-hypertension medicine, anti-glycemic medicine, anti-hyperlipidemia medicine, anti-depressant medicine, anti-schizophrenia medicine and hypnotic and sedative medicines. The current study aimed to investigate the preliminary impact of the PharmaCloud inquiry rate on medication duplication of anti-glycemic medicine among diabetes patients, since diabetes has been an increasing chronic condition and one of the major causes for renal dialysis in Taiwan. This study employed a pre-post study design with a comparison group which may better detect the true effects of the program. It is hypothesized that subjects in the high-inquiry group may have greater reduction in medication duplication than those in the low-inquiry group.