



## RESEARCH LETTER

## Regular mailing of personalized feedback reports improves glycemic control in diabetes: A randomized controlled trial<sup>†</sup>

**Highlights**

- Patients with diabetes who underwent structured complication assessment and received a personalized report through a web-based portal showed significant improvement in glycemic and lipid control after 1 year.
- Under comprehensive care, those who received additional follow-up reports had further reduction in HbA1c.
- In a post-hoc analysis, patients with chronic kidney disease who received additional follow-up reports were less likely to be hospitalized and had shorter length of stay.

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**To the Editor**

Feedback reports that address personal concerns are more effective in motivating health-related behavioral changes than generic information.<sup>1</sup> In the present randomized quality improvement (QI) program, we examined the effects of mailing regular personalized follow-up reports on metabolic control and hospitalization in patients with diabetes receiving integrated care augmented by information technology (IT).<sup>2,3</sup> This QI program took place at a university-affiliated hospital with 1300 beds and 22 medical clinics, which managed a population of 1 million, predominantly Chinese, in Hong Kong. Apart from providing education and care coordination, the Diabetes Centre offers a twice-weekly structured diabetes comprehensive assessment (CA) service to all inpatients and outpatients upon

referral. All clinical and laboratory data were anonymously entered into the web-based Joint Asia Diabetes Evaluation (JADE) portal with built-in modules for structured data collection, risk stratification, issue of personalized reports, and decision support. The JADE portal was developed and supported by the Asia Diabetes Foundation as a research tool to integrate different components of QI initiatives targeted at system, health-care providers and patients.<sup>4</sup>

In a randomized study that examined the effects of a telephone-based peer support program, we reported the benefits of the IT-augmented JADE Program with periodic CA and group empowerment in improving risk factor control by reducing clinical inertia and non-adherence.<sup>5</sup> After the CA, all patients attended their usual follow-up clinics 2–4 monthly for medical review. Despite an average consultation time of 5–10 min, most doctors arranged measurement of blood pressure (BP) and body weight, as well as laboratory tests available in the hospital-based Clinical Management System (CMS).

In 2013, we asked the question whether mailing periodic follow-up reports between CA visits would further improve outcomes. We consecutively recruited 1200 patients with diabetes (95.8% with type 2 diabetes) who underwent CA and randomized 600 to receive two JADE follow-up reports by mail (R+) and 600 to go without these reports (R-). A PhD student (JY) retrieved relevant results from the CMS and entered them into the JADE portal to create a

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personalized follow-up report for informing and empowering patients in the R+ group about their trends of attained treatment targets (HbA1c, BP, low-density lipoprotein cholesterol) and body weight, with individualized reminders and practical suggestions.<sup>3</sup> After a median of 575 days (interquartile range [IQR]

519–646 days), HbA1c fell by  $-0.2\%$  in the whole cohort, with greater reduction in the R+ ( $-0.24\%$ ) than R- group ( $-0.15\%$ ;  $P = 0.03$ ; Table 1). Linear regression confirmed independent effect of follow-up reports on reducing HbA1c ( $\beta$  coefficient  $-0.23$ ; 95% confidence interval [CI]  $-0.39, -0.07$ ;  $P = 0.004$ ). In patients

**Table 1** Baseline clinical profile and comparison of changes in cardiometabolic risk factors between Chinese patients with diabetes who received personalized Joint Asia Diabetes Evaluation (JADE) follow-up reports on top of usual care (R+) compared with usual care only (R-) at Month 12

	All patients ( $n = 1200$ )	R- group ( $n = 600$ )	R+ group ( $n = 600$ )	<i>P</i> -value
Baseline				
Age (years)	58.3 $\pm$ 12.6	58.4 $\pm$ 12.4	58.2 $\pm$ 12.7	0.809
Gender (male)	661 (55.1)	322 (53.7)	339 (56.6)	0.308
Education above 11 years	278 (23.2)	131 (21.8)	147 (24.6)	0.253
Diabetes duration (years)	10.1 $\pm$ 8.2	10.3 $\pm$ 8.3	9.6 $\pm$ 8.0	0.142
HbA1c (%)	7.4 $\pm$ 1.4	7.4 $\pm$ 1.3	7.3 $\pm$ 1.5	0.362
FPG (mmol/L)	7.3 $\pm$ 2.8	7.4 $\pm$ 2.4	7.3 $\pm$ 3.2	0.434
BMI (kg/m <sup>2</sup> )	26.4 $\pm$ 7.5	26.5 $\pm$ 9.5	26.2 $\pm$ 4.7	0.469
LDL-C (mmol/L)	2.3 $\pm$ 0.7	2.4 $\pm$ 0.7	2.3 $\pm$ 0.7	0.114
HDL-C (mmol/L)	1.3 $\pm$ 0.5	1.3 $\pm$ 0.4	1.4 $\pm$ 0.6	0.059
TG (mmol/L)	1.2 [0.9, 1.8]	1.3 [0.9, 1.8]	1.2 [0.9, 1.7]	0.033
SBP (mmHg)	137.1 $\pm$ 19.5	137.4 $\pm$ 19.9	136.9 $\pm$ 19.1	0.664
DBP (mmHg)	78.1 $\pm$ 10.6	78.3 $\pm$ 10.9	77.9 $\pm$ 10.4	0.461
eGFR (mL/min per 1.73 m <sup>2</sup> )	109.0 $\pm$ 37.3	108.2 $\pm$ 37.2	109.8 $\pm$ 37.3	0.463
Spot urinary ACR (mg/mmol)	1.6 [0.6, 8.0]	1.7 [0.7, 8.1]	1.6 [0.6, 7.4]	0.354
Microalbuminuria	280 (23.4)	148 (24.7)	132 (22.1)	0.289
Macroalbuminuria	177 (14.8)	89 (14.8)	88 (14.7)	0.954
CKD*	110 (9.2)	54 (9.0)	56 (9.3)	0.834
CVD <sup>†</sup>	292 (24.4)	153 (25.5)	139 (23.2)	0.363
Diabetic retinopathy	297 (24.8)	146 (24.3)	151 (25.2)	0.726
Treatments for diabetes				0.956
Lifestyle modification	106 (8.6)	52 (8.7)	54 (9.0)	
OAD only	679 (56.5)	340 (56.7)	339 (56.6)	
Insulin only	94 (8.0)	45 (7.5)	49 (8.2)	
OAD and insulin	320 (27.0)	163 (27.1)	157 (26.2)	
Other treatments				
RAS inhibitors	650 (54.2)	339 (56.5)	311 (51.9)	0.111
Statins	710 (59.2)	352 (58.7)	358 (59.8)	0.698
Diabetes education by nurse	894 (74.6)	449 (75.0)	445 (74.3)	0.791
Current smoker	134 (11.2)	63 (10.5)	71 (11.9)	0.457
SMBG at least once weekly in last 3 months	654 (54.6)	330 (55.1)	324 (54.1)	0.728
Changes versus baseline <sup>‡</sup>				
HbA1c (%)	$-0.20$ [ $-0.27, -0.13$ ]	$-0.15$ [ $-0.24, -0.06$ ]	$-0.24$ [ $-0.35, -0.14$ ]	0.030
FPG (mmol/L)	$-0.10$ [ $-0.26, 0.06$ ]*	$-0.11$ [ $-0.30, 0.09$ ]*	$-0.10$ [ $-0.37, 0.17$ ]*	0.643
TC (mmol/L)	$-0.13$ [ $-0.17, -0.09$ ]	$-0.15$ [ $-0.21, -0.09$ ]	$-0.10$ [ $-0.16, -0.04$ ]	0.706
LDL-C (mmol/L)	0.09 [0.06, 0.12]	0.07 [0.04, 0.11]	0.10 [0.06, 0.14]	0.419
HDL-C (mmol/L)	0.02 [0.001, 0.04]	0.01 [ $-0.03, 0.05$ ]	0.04 [0.02, 0.06]	0.875
Triglyceride (mmol/L)	$-0.02$ [ $-0.06, 0.03$ ]	$-0.02$ [ $-0.09, 0.05$ ]	$-0.01$ [ $-0.06, 0.04$ ]	0.863
eGFR (ml/min/1.73 m <sup>2</sup> )	4.56 [3.73, 5.39]	5.10 [3.93, 6.28]	3.88 [2.65, 5.11]	0.181
Urinary ACR (mg/mmol)	0.86 [ $-0.66, 2.39$ ]	2.35 [ $-0.51, 5.21$ ]	$-0.55$ [ $-1.92, 0.84$ ]	0.074

Baseline data are expressed as the mean  $\pm$  SD, median [interquartile range], or  $n$  (%), as appropriate. Estimated differences are expressed as the mean (95% confidence intervals).

\*Chronic kidney disease (CKD) was defined as estimated glomerular filtration rate (eGFR)  $<60$  mL/min per 1.73 m<sup>2</sup>.

<sup>†</sup>Cardiovascular disease (CVD) defined as stroke and coronary heart diseases.

<sup>‡</sup>Except for the albumin to creatinine ratio (ACR) and triglycerides (TG), comparisons between baseline and month 12 were significant for all other variables. Changes for HbA1c from baseline to Month 12 were significantly different between the R- and R+ groups ( $*P < 0.05$ ).

BMI, body mass index; DBP, diastolic blood pressure; FPG, fasting plasma glucose; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; OAD, oral antidiabetic drugs; SBP, systolic blood pressure; SMBG, self-monitoring of blood glucose; RAS, renin-angiotensin system.

with chronic kidney disease (CKD), fewer patients in the R+ group had hospitalizations (42.3% vs 69.2%;  $P = 0.047$ ; relative risk [RR] 0.50; 95% CI 0.28, 0.91;  $P = 0.021$ ) and shorter length of stay (RR 0.49; 95% CI 0.23, 0.94;  $P = 0.023$ ) than the R- group, after adjustment for confounders.

Given a relatively low baseline HbA1c of 7.4%, the effects of providing additional reports was modest, albeit significant, whereas their effects on hospitalization in high-risk patients requires further evaluation. In this IT era, apart from using structured processes to collect quality data, integration, analysis and communication of these data to promote informed decision making can further improve the quality of care.

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### Disclosure

The authors declare they have no conflict of interests.

### References

1. Kreuter MW, Strecher VJ. Do tailored behavior change messages enhance the effectiveness of health risk appraisal? Results from a randomized trial. *Health Educ Res.* 1996; **11**: 97–105.
2. Chan JC, Ozaki R, Luk A et al. Delivery of integrated diabetes care using logistics and information technology: The Joint Asia Diabetes Evaluation (JADE) program. *Diabetes Res Clin Pract.* 2014; **106** (Suppl. 2): S295–304.
3. Ko GT, So WY, Tong PC et al. From design to implementation – The Joint Asia Diabetes Evaluation (JADE) program: A descriptive report of an electronic web-based diabetes management program. *BMC Med Inform Decis Mak.* 2010; **10**: 26.
4. Tricco AC, Ivers NM, Grimshaw JM et al. Effectiveness of quality improvement strategies on the management of diabetes: A systematic review and meta-analysis. *Lancet.* 2012; **379**: 2252–61.
5. Chan JC, Sui Y, Oldenburg B et al. Effects of telephone-based peer support in patients with type 2 diabetes mellitus receiving integrated care: A randomized clinical trial. *JAMA Intern Med.* 2014; **174**: 972–81.