Evaluating the Clinical Effect of Performance Improvement Interventions on Type 2 Diabetes Patient Care

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Introduction

The American Medical Association (AMA) approved the three stage Performance Improvement (PI) educational process as a strategy for improving patient care in 2004.[1]

Recognizing the need for improved patient care for the increasing population of patients with type 2 diabetes within primary care clinics, Med-IQ initiated an AMA-style PI program in 2008. We have demonstrated significant improvements in clinician performance following completion of the PI iniative.[2,3]

As of January of 2013, 1566 clinicians have registered for the diabetes PI initiative, 387 have completed all three stages, and 25,588 charts have been entered. However, the patient impact of clinician participation in, and completion of, the PI process is largely unknown.

To evaluate the clinical effectiveness of PI CME on patient outcomes, Med-IQ conducted a focused research activity.

Specific Aims

1. Evaluate impact of completion of the three-stages of PI CME on patient health
2. Evaluate the impact of participation in traditional CME activities compared to PI CME
3. Assess the value of the final chart review in PI
4. Explore the hypothesis that PI completers represent a sub-group of practitioners who are more aligned with national standards of diabetes care

Methods

Effect of PI CME on Patient Health (Specific Aims 1-3)

Patient-level clinical data were collected retrospectively for US-based clinicians who participated in Med-IQ diabetes PI programs launched in 2008 and 2009. Clinicians were grouped into three categories based on level of participation:

- PI completers: clinicians who completed Stages A, B, and C of a PI initiative
- PI partial completers: clinicians who completed only Stages A and B of a PI initiative
- Traditional CME completers: clinicians who completed a traditional CME activity (webcast or print-based publication) designed to enhance PI education, but who did not participate in a PI initiative

Clinicians in all three categories provided chart-review data from both the pre- and post-intervention periods for 10 patients with type 2 diabetes mellitus (T2DM). Data collected for this study were independent of chart data collected during the PI-CME activity; clinician participation was incentivized with a small stipend distributed after receipt of 10 completed patient forms.

Patient inclusion criteria:

- Established patient with T2DM
- At least two clinic visits in each of the pre- and post-activity periods
- HbA1C above patient's individual goal in at least one pre- and one post-activity visit.

Patient exclusion criteria:

- Pregnancy at any visit
- Age <18 years or > 75 years at any visit

Time periods for abstracted data were as follows:

- PI Completers: One year prior to PI registration, one year after PI completion
- PI Partial Completers: One year prior to PI registration, one year after PI registration
- Traditional CME completers: One year prior to participation in activity, one year after participation in activity

A minimum of 2 and maximum of 4 clinical measurements at each time point were collected. Measures were:

- Glycated hemoglobin (HbA_{1c})
- Blood pressure (BP)
- Low-density lipoprotein (LDL)
- High-density lipoprotein (HDL)

For patients with multiple visits, the earliest valid pre-activity and latest valid post-activity measures were used.

Methods (continued)

An independent Institutional Review Board (Chesapeake IRB, Inc.) reviewed the study and determined it to be exempt from oversight because clinicians submitted retrospective data without patient identifiers.

Mean HbA_{1c}, LDL-C, and HDL-C level for patients in each participant group were calculated for pre- and post-activity periods. BP, HbA_{1c}, and LDL-C levels were grouped categorically as follows:

- BP: <130/80 or ≥130/80 mm Hg
- HbA_{1c} <7%, 7-7.5%, 7.6-9.0%, or >9.0%
- LDL-C <100 or ≥100 mg/dL

Multi-level models incorporating random effects at the patient and provider levels were estimated to compare patient outcomes and participant practices between the pre-activity and post-activity periods and between participant groups. Linear models were estimated for HbA_{1c}, LDL-C, and HDL-C. Logistic regression models were estimated for categories of BP and LDL-C levels. An ordinal logistic regression model was estimated for categorical HbA_{1c} levels.

Key comparisons were tested for statistical significance, including differences between PI completers and traditional CME participants, between PI completers and PI partial completers, and the amount of change from pre- to post-activity measured between groups.

Baseline Performance of PI Completers Compared with Partial Completers (Aim 4)

The diabetes PI activity launched in 2009 included a required self-assessment questionnaire evaluating clinician-reported practice patterns related to general diabetes care, prevention and detection of diabetes-related complications, and glycemic control.

These data were used to assess the similarity of PI completers to non-completers (clinicians who completed stage A only).

Multi-level logistic regression models incorporating random effects at the provider level were estimated to compare participant self-assessment practices between the PI completers and non-completers.

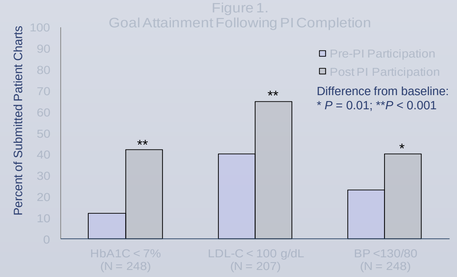
Results

Specific Aim 1: Evaluate impact of completion of the three-stages of PI on patient health

One hundred twenty-five past PI participants were eligible for inclusion in this study, and 44 (37%) of these participants submitted 248 patient charts which met the study inclusion criteria.

A statistically significant improvement was observed in the percentage of patients achieving an HbA_{1c} level <7%, a BP <130/80 mm Hg, and an LDL-C level <100 mg/dL after PI activity completion (Figure 1). Statistically significant improvements from the pre-activity to the post-activity period were also observed for mean HbA_{1c}, LDL-C, and HDL-C values (Table 1). The improvement in this latter percentage was especially dramatic, doubling between the 2 periods.

Figure 1.
Goal Attainment Following PI Completion



Results (continued)

Specific Aim 2: Evaluate the impact of participation in traditional CME activities compared to PI-CME

Patients treated by traditional CME participants demonstrated statistically significant improvements in all measured values, except BP (Table 1). A comparison of patient clinical indicators between PI completers and traditional CME participants showed statistically significant differences in categorical HbA_{1c} values that favored PI completers. At study completion, PI completers had a greater percentage of patients with HbA_{1c} levels <7% and fewer patients with HbA_{1c} levels between 7.6% and 9.0% compared with traditional CME participants. Changes in the percentage of patients below goal BP, mean HbA_{1c}, mean (or distribution of) LDL-C, and mean HDL-C values were not significantly different statistically between these participant groups.

Table 1. Patient Outcomes for PI Completers vs. Traditional CME Participants

	PI Completers			Traditional CME Participants				
	Pre-activity period	Post-activity period	P Change	Pre-activity period	Post-activity period	P Change	Change for PI completers vs. change for traditional CME	P
HbA_{1c} (%)	(n=248)			(n=225)				
Mean	8.4	7.5	<0.001	8.1	7.7	0.031	−0.5	0.112
<7%	13	42		19	32		16	
7-7.5%	21	26		27	27		5	<0.001
7.6-9.0%	40	20	<0.001	31	28	<0.001	−17	
>9.0%	25	11		23	12		−3	
BP (%)	(n=248)			(n=224)				
<130/80 mm Hg	20	40	0.003	27	34	0.330	13	0.066
≥130/80 mm Hg	80	60		73	66		−13	
LDL-C	(n=207)			(n=208)				
Mean (mg/dL)	111	94	<0.001	102	91	0.008	−6	0.155
<100 mg/dL (%)	38	66	<0.001	49	64	0.002	13	0.100
≥100 mg/dL (%)	62	34		51	36		−13	
HDL-C	(n=209)			(n=217)				
Mean (mg/dL)	44	46	0.007	44	46	0.009	0	0.923

Specific Aim 3: Assess the value of the final chart review in PI

Patients of PI completers experienced statistically significant changes in all clinical indicators from the pre-activity to the post-activity period (Table 2). Patients treated by PI partial completers similarly demonstrated statistically significant improvements in all clinical values, with the exception of BP, and no statistically significant differences in patient improvements achieved over time were found between the groups.

Specific Aim 4: Explore the hypothesis that PI completers represent a sub-group of practitioners who are more aligned with national standards of diabetes care

One hundred fifty PI completers from the Diabetes PI 2009 activity were compared with 71 participants who completed only the Stage A chart review. Initial self-assessment data revealed similar demographic and practice characteristics, with the exception that PI completers (n = 71) were more likely to have a Certified Diabetes Educator on staff than were non-completers (n = 38); 61% vs. 36% (P = 0.028). The 2 clinical groups were also very similar in the care provided to patients. The only significant difference identified was that PI completers were more likely to discuss smoking cessation with patients than were non-completers (data not shown).

Results (continued)

Table 2. Patient Outcomes for PI Completers vs. Partial Completers

	PI Completers				Partial Completers					
	Pre-activity period	Post-activity period	Change from pre to post	P	Pre-activity period	Post-activity period	Change from pre to post	P	Change for PI completers compared to change for partial completers	P
HbA_{1c} (%)	(n=323)				(n=65)					
Mean	8.4	7.5	−0.9	<0.001	8.2	7.5	−0.8	0.042	−0.1	0.789
<7%	12	39	27		20	46	26		1	
7-7.5%	21	26	5	<0.001	19	29	10	<0.001	−5	0.952
7.6-9.0%	44	22	−22		43	11	−32		10	
>9.0%	23	13	−10		19	14	−5		−5	
BP (%)	(n=320)				(n=65)					
<130/80 mm Hg	23	39	16	0.001	28	42	14	0.227	2	0.801
≥130/80 mm Hg	78	61	−17		72	59	−13		−4	
LDL-C	(n=287)				(n=64)					
Mean (mg/dL)	110	94	−16	<0.001	121	98	−23	0.001	7	0.356
<100 mg/dL (%)	39	63	24	<0.001	41	61	20	0.041	4	0.610
≥100 mg/dL (%)	61	37	−24		59	39	−20		−4	
HDL-C	(n=290)				(n=63)					
Mean (mg/dL)	44	45	1	0.048	43	46	3	0.028	−2	0.237

Conclusions

This study demonstrated that patients with diabetes cared for by clinicians who complete all 3 stages of the PI CME initiative experienced significant improvements in clinical measures of patient health (HbA_{1c}, BP, LDL-C, and HDL-C). Importantly, categorical improvements in HbA_{1c} levels were significantly greater for clinicians who completed the entire PI initiative than for traditional CME participants. Patients whose clinicians completed most, but not all, of the PI-CME activity also showed significant changes in the measured patient characteristics. However, clinical improvements in patients of the partial completer group were similar to those of patients of the PI completer group. These data suggest that the second chart review within the PI educational process may have less influence on patient outcomes than the initial chart review and development of an implementation plan.

Overall, PI completers were similar to their peers, with few exceptions. These results and the finding of similar changes in patient health outcomes between the completer and non-completer groups suggest that clinicians who participate in the majority of PI activity have the potential to achieve similar improvements in patient health.

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