Informatics in Primary Care 2009;17:165–74

Refereed paper

The impact of a physician-directed health information technology system on diabetes outcomes in primary care: a pre- and post-implementation study

Jacquelyn S Hunt PharmD MS
Executive Director, Quality, Providence Health and Services, Portland OR, USA; Adjunct Professor, Oregon State University College of Pharmacy, Portland OR, USA

Joseph Siemienczuk MD
Chief Medical Officer, Providence Health and Services, Portland OR, USA

William Gillanders MD
Director of Graduate Medical Education, Clinical Professor, Oregon Health and Science University, Portland OR, USA

Benjamin H LeBlanc MD MBI
Medical Director of Clinical Informatics

Yelena Rozenfeld MPH
Biostatistician

Kerry Bonin MPH
Analyst

Providence Health and Services, Portland OR, USA

Ginger Pape PharmD
Director, Pharmacy, Providence Health and Services, Portland OR, USA; Adjunct Professor, Oregon State University College of Pharmacy, Portland OR, USA

ABSTRACT

Purpose To determine the impact of a physician-directed, multifaceted health information technology (HIT) system on diabetes outcomes.

Methods A pre/post-interventional study.

Setting and participants The setting was Providence Primary Care Research Network in Oregon, with approximately 71 physicians caring for 117 369 patients in 13 clinic locations. The study covered Network patients with diabetes age 18 years and older.

Intervention The study intervention included implementation of the *CareManager*™ HIT system which augments an electronic medical record (EMR) by automating physician driven quality improvement interventions, including point-of-care decision support and care reminders, diabetes registry with care prompts, performance feedback with benchmarking and access to published evidence and patient educational materials.

Measures The primary clinical measures included the change in mean value for low density lipoprotein (LDL) target <100 mg/dL or 2.6 mmol/l, blood pressure (BP) target <130/80 mmHg and glycated haemoglobin (HbA1c) target <7%, and the proportion of patients meeting guideline-recommended targets for those measures. All measures were analysed using closed and open cohort approaches.

Results A total of 6072 patients were identified at baseline, 70% of whom were continuously enrolled during the 24-month study. Significant improvements were observed in all diabetes related outcomes except mean HbA1c. LDL goal attainment improved from 32% to 56% (P=0.002), while mean LDL decreased by 13 mg/dL (0.33 mmol/l, P=0.002). BP goal attainment increased significantly from 30% to 52%, with significant decreases in both mean systolic and diastolic BP. The proportion of patients with an HbA1c below 7% was higher at the end of the study (P=0.008). Mean patient satisfaction remained high, with no significant difference between baseline and follow-up. Total Relative Value Units per patient per year significantly increased as a result of an increase in the number of visits in year one and the coding complexity throughout.

Conclusion Implementation of a physician-directed, multifaceted HIT system in primary care was associated with significantly improved diabetes process and outcome measures.

Keywords: diabetes, health information technology, primary care

Introduction

Diabetes is a common, costly, serious and growing health problem.[1] It is expected that more than one in three Americans born in 2000 will develop diabetes during their lifetimes.[2] Although there is no cure, diabetes can be controlled through quality medical care and self-management. Despite annually updated American Diabetes Association (ADA) guidelines and effective pharmacotherapy, data continue to demonstrate poor control of the risk factors for vascular disease.[3–6]

Diabetes management is predominantly provided in the outpatient setting.[7,8] The episodic nature of ambulatory medicine has been invoked as a contributor to shortfalls in management of chronic conditions.[9] In the episodic model, practitioners attend to the care of patients typically in the setting of appointments scheduled by the patient. This model is strongly driven by patients' perception of the acuity of their medical conditions. These perceptions are influenced by patients' understanding of their disease processes and symptoms, insights that are often lacking in chronic illness.[10] Practitioners may also be distracted from the management of chronic illness by patients' unrelated acute complaints[11] and often lack the resources required to provide optimal system-based approaches.[12]

Numerous interventions have been proposed to overcome shortfalls in quality of diabetes care. 'Physician-directed' quality improvement interventions include provider education, point-of-care reminders, audit and feedback and registries. Two recent systematic reviews evaluated interventions to improve diabetes management.[13,14] Both reviews found that physician-directed interventions resulted in improved processes, but not outcomes of diabetes care. This pre/post-interventional study was conducted to determine the effectiveness of automating multiple physician-directed diabetes interventions, using a single health information technology (HIT) system.

Methods

Study site and participants

The study was conducted within the Providence Primary Care Research Network. The Network is part of Providence Health and Services (PH&S), a not-for-profit integrated delivery system. All Network primary care, community-based, non-academic clinics were included in the study, with the exception of three clinics involved in another diabetes improvement project (Figure 1). Participating clinics comprised approximately 71 internal and family medicine physicians caring for 117 369 patients in 13 clinic locations. All clinics utilise the GE Centricity EMR to facilitate and document patient care activities.

Participating patients within eligible practices were identified by a problem list entry of diabetes (ICD-9 codes 250.xx) and age^3 18 years. Participants were excluded if they had no evidence of chart activity (i.e. documentation of an office visit, prescription refill or phone contact) within three years.

Intervention

The HIT system (*CareManager*^{TM}) was designed to enable physicians to co-ordinate effective population-based care with minimal ongoing practice expense. *CareManager*^{TM}'s diabetes module includes a suite of integrated point-of-care and web-based tools:

1 *Point-of-care* An EMR-based decision support tool ('*diabetes dashboard*') alerts physicians to diabetes care opportunities at the time of a visit (Figure 2a).
2 *Web-based population system* This includes the following features:
   - Tracking system – automatic daily extracts of EMR data with reformatting to support population management. Users view their list of

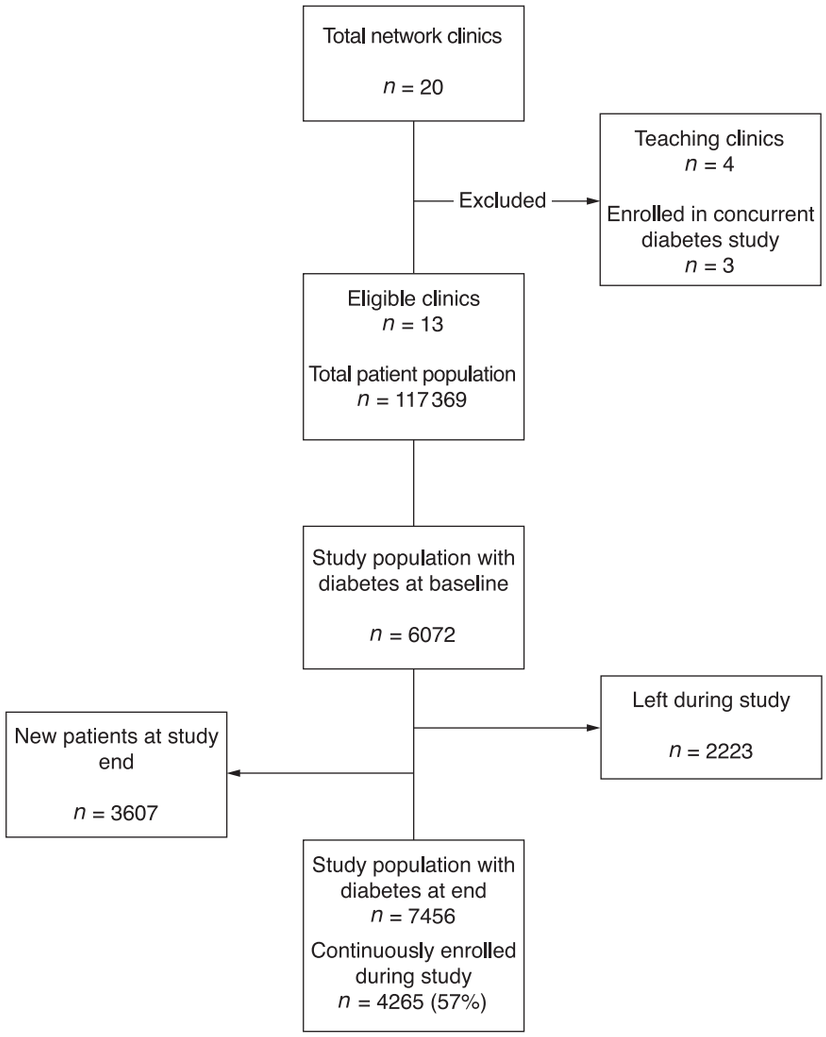

Figure 1 Diabetes study population flowchart

diabetes patients with colour-coded highlights for care opportunities relative to ADA guidelines (Figure 2b).

- Performance feedback – automated monthly trends in physician and clinic performance on process and outcome diabetes measures.
- Benchmarking – performance reports include evidence-based peer benchmarking.[15]
- Physician education – access to relevant diabetes guidelines and literature.
- Patient education – access to diabetes patient self-management materials.

Implementation strategy

All practitioners and staff were encouraged to attend a 90-minute training session for (1) inspiration, (2) system instruction and (3) best practice workflows. For inspiration, each session started with a video of physicians and staff from pilot sites discussing their experience with the system during a one-year pilot. System instruction involved a clinician (JSH, JS or BHL) providing guided tours of system navigation and functionality. Best practice workflows from the pilot were shared in written and verbal form. Following training, diabetes measures were reviewed quarterly during clinic meetings. No additional staff, resources or instructions were provided. Physicians and staff had the autonomy to implement the system to the extent and in the format chosen.

Measurements

Clinical

The primary clinical outcome measures included change in mean LDL-cholesterol (<100 mg/dL or 2.6 mmol/1), blood pressure (<130/80 mmHg) and glycated haemoglobin (HbA1c – <7%), and the proportion of

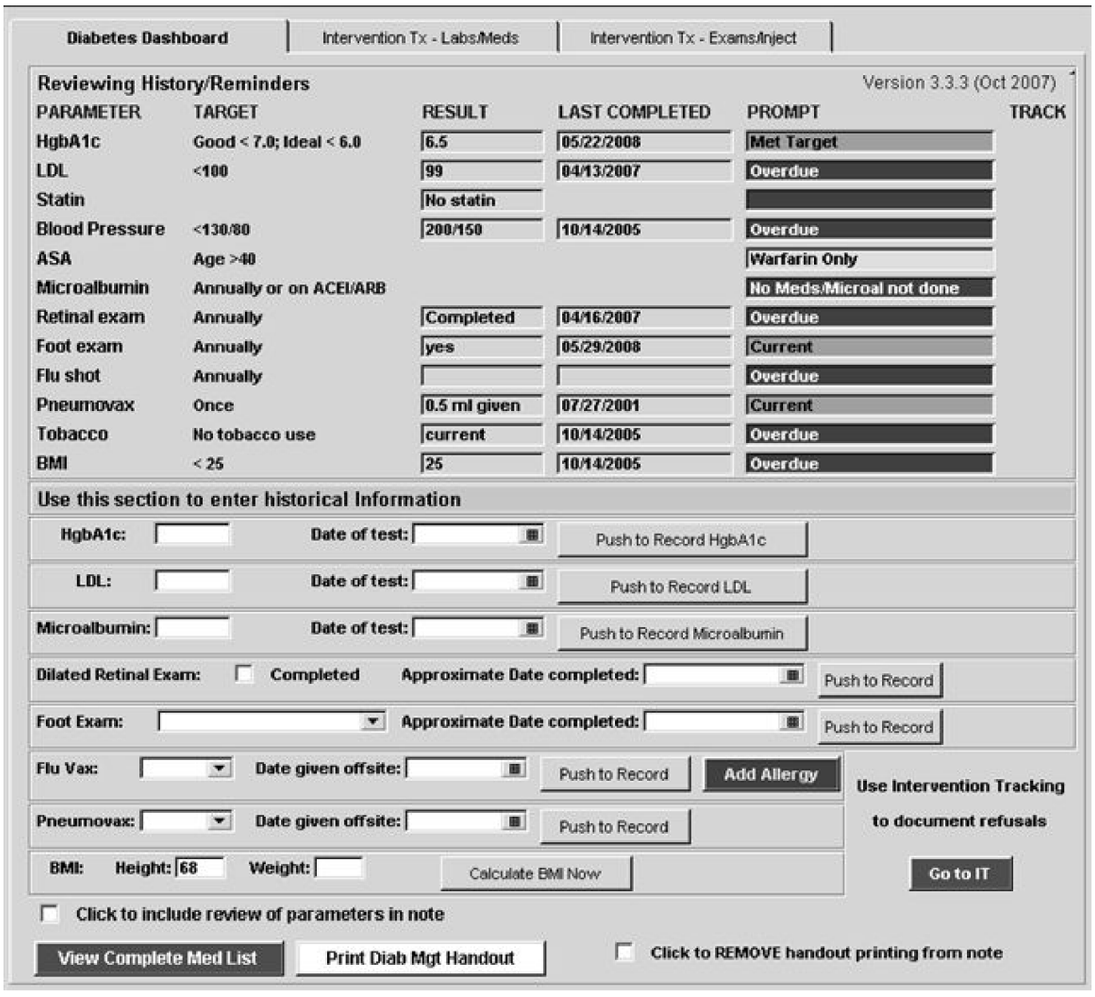

Figure 2a Diabetes dashboard

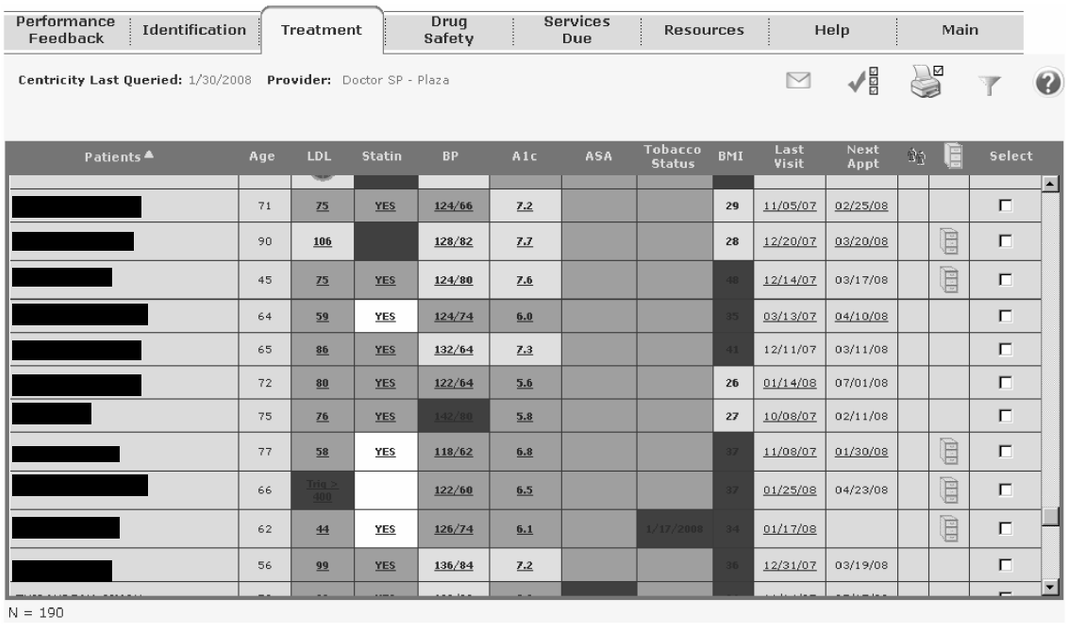

Figure 2b Diabetes registry treatment tab

patients meeting guideline recommended targets.[16] Diabetes related process measures included the proportion of subjects receiving annual LDL, blood pressure and HbA1c testing. Additional measures included documentation of anti-platelet therapy and pneumococcal vaccination, as well as diabetic foot and retinal exams within the previous 12 months.

Satisfaction

Patient satisfaction with diabetes related care was assessed using the ADA-NCQA Provider Recognition Program (PRP) Modified Patient Satisfaction Survey.[13,17] The survey was mailed to a subset of 3000 patients selected randomly at baseline and study end. The ADA-NCQA PRP satisfaction survey rates patient satisfaction on nine components of diabetes treatment. Overall satisfaction was evaluated by calculating mean satisfaction per subject across all nine components. Additionally, the two highest responses were combined to evaluate the percentage of patients that were mostly satisfied with their care.

Office visits

Financial measures were assessed from the physician organisation perspective. Information on visit frequency and complexity was extracted from the Network's practice management system. Change in the complexity of visits was assessed using a relative value unit (RVU). An estimated net revenue impact was calculated as a product of a total RVU, internal conversion ($80) and collection factors (60%).

Statistical analysis

Descriptive statistics, proportions, means and standard deviations (SD) were used to examine demographic characteristics of patients and providers. Continuous data were described by mean (SD) and compared using paired and unpaired *t*-tests. Categorical data were described by percentages and compared by Chi-square tests with continuity correction. The McNemar test for paired proportions was used to evaluate the difference between time periods among continuously enrolled patients. The significance level was set at 0.05. The Bonferroni method was used to correct concerns caused by multiple analysis of the same data.[18,19]

Study outcomes were measured at baseline and 24 months. The primary study analysis was conducted for patients with diabetes active within the practice for the entire 24-month study period (closed cohort). A second analysis was conducted comparing all patients active at baseline with all patients active at study end (open cohort). This latter analysis does not allow every patient the benefit of 24 months' exposure to the intervention, but is a method of quality performance assessment that is widely utilised and reported.

Changes in mean number of office visits per patient per year, mean total RVUs per visit and mean net revenue impact were evaluated by unpaired *t*-test. Increase in the complexity of reimbursement coding was measured by chi-square testing for proportions. All analyses were completed using SAS version 9.1 (SAS Institute, Cary NC).

Results

A total of 6072 eligible patients were identified at baseline. Table 1 displays the characteristics of participating physicians and their diabetes panels. Of the patients with diabetes identified at baseline, 4265 (70.2%) were continuously enrolled during the 24-month study (Figure 1). An additional 3607 new patients with diabetes received care from the Network and 2223 left the Network at some time during the study period.

Clinical

Outcome measures

Two years after implementation, significant improvements were observed in all diabetes related outcomes with the exception of mean HbA1c (Table 2). In the primary analysis of continuously enrolled patients, LDL goal attainment improved significantly from 32% at baseline to 56% at study end (P=0.002), while the mean LDL decreased by 13 (0.33mmol/l, P=0.002). Similarly, blood pressure goal attainment increased significantly from 30% to 52% with statistically significant decreases in mean systolic and diastolic pressures (5 mmHg and 3 mmHg respectively). Although mean HbA1c was not changed, the proportion of patients below HbA1c target was significantly higher at study end (P=0.008). No differences in outcome were identified when the data for the open cohort was analysed.

Process measures

In the continuously enrolled population, there were significant improvements in most diabetes related process measures (Table 2). There was statistically significant improvement in the proportion of patients having LDL and HbA1c laboratory tests within the previous 12 months (16% and 7% respectively). There were also significant increases in the proportion of patients with a documented prescription for lipid lowering, ACEI/ARB, oral hypoglycaemic and anti-

Table 1 Physician and patient characteristics at baseline

Physician (PCP) characteristics	
Total number of physicians, *n*	71
Total number of full-time equivalents (FTEs)	61
Physicians per clinic – mean (SD)	5 (2)
Part-time physicians, %	52
Specialty type, %	
Family medicine	52
Internal medicine	48
Gender, female (%)	58
Panel size per physician FTE – mean (SD)	1971 (862)
Patients with diabetes per physician FTE – mean (SD)	91 (62)
Patients with diabetes per clinic – mean (SD)	379 (282)
Patient characteristics	
Total number of patients with diabetes, *n*	6072
Gender, female (%)	56
Age, years – mean (SD)	62 (15)
Smoking, %	11
Insurance, %	
Self-pay/no insurance	3
Commercial	46
Medicare	46
Medicaid or other	5
BMI – mean (SD)	34 (11)
Hypertension, %	60
Serum creatinine – mean (range)	1.1 (0.3–14)
Creatinine clearance – mean (SD)	98 (59)
Microvascular complications	
Documented retinopathy, %	3
Documented neuropathy, %	10

platelet therapies. In addition, there were significant increases in documentation of retinal (39% to 59%) and diabetes foot (26% to 79%) examinations.

Satisfaction

The response rate for the satisfaction survey was 21.4% (641/3000) at baseline and 26.2% (785/3000) at study end. No significant difference in satisfaction was identified in individual survey items (Table 3). Overall satisfaction remained high with no statistical change from baseline (mean=5.2, SD=1.1, P=0.67). Additionally, no association was found between patient satisfaction and clinical outcome measures.

Office visits

As seen in Table 4, the mean number of office visits per patient per year in the open cohort increased significantly following implementation of the intervention (P<0.0001). In the second year of the intervention, the number of visits returned to slightly below baseline (P<0.0001). Complexity of reimbursement coding continued to increase over the two years of the study. As a result, total RVUs per visit significantly increased in the first and second years following implementation. This translated into a $4 increase in net revenue impact per visit from baseline to the study end. The combined positive effect on annual revenue resulting from changes in office visit frequency and coding

Table 2 Diabetes outcomes and process measures in continuously enrolled patients (*n*=4265)

	Baseline	Study end	*P*-value*
Office visit within the past 12 months (%)	96	95	0.99
LDL cholesterol			
LDL test within past 12 months (%)	70	86	0.002
Mean LDL, mg/dL (SD)	106 (33)	93 (31)	0.002
LDL goal attainment, <100 mg/dL (%)	32	56	0.002
Any lipid lowering medication (%)	48	70	0.002
Blood pressure (BP)			
BP measures within past 12 months (%)	95	96	0.99
Mean SBP, mmHg (SD)	133 (18)	128 (16)	0.002
Mean DBP, mmHg (SD)	75 (11)	72 (11)	0.002
BP goal attainment, <130/80 mmHg (%)	30	52	0.002
ACEI or ARB (%)	54	69	0.002
Glycaemia			
HbA1c test within past 12 months (%)	83	90	0.002
Mean HbA1c, % (SD)	7.11 (1.4)	7.13 (1.4)	0.23
HbA1c goal attainment, <7% (%)	47	50	0.008
Diabetes therapy (%)			
Insulin	20	25	0.18
Oral hypoglycaemic medications	56	68	0.002
Anti-platelets, age>40 (%)	54	88	0.002
Other process measures (%)			
Retinal eye exam	39	59	0.002
Diabetes foot exam	26	79	0.002
Pneumococcal vaccination	54	90	0.002

* *P*-value adjusted for multiple comparisons

Table 3 Patient satisfaction comparing baseline to study end

During the past 12 months	Baseline % (N/D)	Study end % (N/D)	*P*-value
Satisfaction with overall care of diabetes	81 (513/635)	80 (620/777)	0.64
Satisfaction with the way questions were answered	82 (520/635)	80 (617/772)	0.35
Satisfaction with reaching someone in an emergency	80 (461/579)	77 (537/696)	0.29
Satisfaction with review of test results	81 (517/638)	79 (612/780)	0.23
Satisfaction with quality of diabetes information	78 (488/629)	75 (574/765)	0.27
Satisfaction with respect shown to you	88 (566/641)	87 (686/785)	0.60
Satisfaction with the way the staff co-ordinate	85 (541/634)	83 (629/762)	0.16
Would you recommend us to your family and friends	84 (531/631)	84 (643/766)	0.92
Satisfaction with the ease of scheduling	85 (542/635)	87 (677/781)	0.47

Note: Percentages represent patient responses mostly satisfied (5 and 6 on scale from 0 to 6)

Table 4 Office visits and coding complexity, comparing baseline to one and two years post-implementation

	Baseline	Post-implementation	
		1 year	2 years
n	6072	6668	7456
Total visits for patients with diabetes	24 445	29 899	28 073
No. visits per patient with diabetes	4.0	4.5*	3.8
Coding level – %			
99212	2.1	1.9	2.2
99213	50.7	43.6	37.9
99214	47.2	54.5*	59.8*
Total RVU** – mean (SD)	1.76 (0.4)	1.82* (0.4)	1.85* (0.4)
Total RVU**	43 023	54 416	51 935
Total revenue	$2 065 104	$2 611 968	$2 492 880

* Statistically significant improvement from baseline, ** $P<0.001$

complexity was $546 864 in year one and $427 776 in year two.

Discussion

The results of this study demonstrate favourable changes in diabetes process and outcome measures following implementation of a robust automated HIT system. The change in primary outcome, LDL goal attainment, implies that a patient with diabetes may be as much as 75% more likely to achieve optimal cholesterol management in a practice using this HIT intervention. Considering the simultaneous improvements in multiple other processes and intermediate outcomes, the clinical impact of this intervention appears substantial.

Many organisations adopt EMR systems anticipating that the technology will improve quality. Our own experience[6] corresponds with emerging evidence demonstrating that EMRs, as currently implemented, do not result in better quality ambulatory care.[20] Additionally, prior studies of population-based[21,22] or point-of-care[23,24] physician-directed diabetes interventions have failed to demonstrate meaningful improvement in clinical outcome measures. The results of this study suggest a synergistic effect when multiple physician-directed strategies are implemented within an HIT system augmenting an EMR.

Although HbA1c goal attainment significantly improved, this intervention had no effect on mean HbA1c. Several potential explanations exist for the negligible impact, including the heightened role of patient self-management and the complexity of medication management. Valuable improvements in HbA1c may require the addition of a structured behavioural intervention.

This study also demonstrated no impact on patient satisfaction. The lack of correlation between improvements in multiple aspects of diabetes care and satisfaction is consistent with other findings that patients' perception of care is based on factors other than effectiveness.[25] However, these results may help to dispel the notion that introducing more proactive disease management in primary care risks jeopardising the physician–patient relationship. Further, the increasing prevalence of public transparency of quality measures may yield a more educated patient population who would place higher value on improvements in clinical care and patient outreach.

In contrast to external, non-clinic based ('carve out') disease management programs, several elements of this intervention are attractive to physicians.[26] This physician-directed intervention relies on data accessed directly from patient charts, as opposed to administrative claims data. Because the program continuously extracts the requisite information from existing EMR data, the improvement was accomplished without added staffing requirements. Importantly, it also includes the clinician's entire diabetic panel, regardless of insurance coverage.

In the absence of capitation, risk, or pay-for-performance, provider organisations may question the business justification for the costs associated with internal quality improvement programs. This study provides valuable insights into enhanced fee-for-service revenue from increased frequency and complexity of office visits. Further, the automated capture of clinical data from an EMR eliminates the costs of manual data entry traditionally associated with stand-alone registries. Revenue from ancillary services, including laboratory testing, and professional fees from dilated retinal exams was not included in this analysis.

This study has several strengths, including (1) a setting of community-based physicians practicing in multiple clinic locations, (2) the 24-month study duration, (3) a large diabetes population with a diverse payer mix, (4) a comprehensive inventory of clinical process and outcome measures and (5) inclusion of patient satisfaction and financial outcomes.

There are also several notable study limitations. Although the pre/post-study design was considered more ethical, this methodology limits the ability to draw firm conclusions. A randomised, controlled study would be needed to draw conclusions regarding the isolated impact of the intervention. A concern with this study design is the potential for *state-of-health bias* (i.e. difference between patient characteristics at baseline and follow-up).[27] We attempted to minimise this issue by evaluating continuously enrolled subjects for the primary analysis. A potential confounding factor in this study was the simultaneous existence of a modest tiered performance incentive for clinicians (up to $600). The relevant performance measure was limited to blood pressure control. Interestingly, goal attainment for blood pressure and LDL were similar in this study despite the lack of monetary incentive for the latter.

Conclusion

Implementation of an HIT system in primary care was associated with significantly improved diabetes process and outcome measures. This improvement occurred in a setting with 13 clinics, 71 physicians and 7500 patients with diabetes. Because the program continuously extracts the requisite information from existing EMR data, the improvement was accomplished without added staff. This internal disease management intervention had negligible effect on patient satisfaction, but did enhance revenue for the physician organisation.

ACKNOWLEDGEMENTS

Grant from Merck and Co., Providence Health Plans.

REFERENCES

1 Engelgau MM, Geiss LS, Saaddine JB *et al.* The evolving diabetes burden in the United States. *Annals of Internal Medicine* 2004;140:945–50.
2 Narayan KM, Boyle JP, Thompson TJ, Sorensen SW and Williamson DF. Lifetime risk for diabetes mellitus in the United States. *Journal of the American Medical Association* 2003;290:1884–90.
3 Saaddine JB, Cadwell B, Gregg EW *et al.* Improvements in diabetes processes of care and intermediate outcomes: United States, 1988–2002. *Annals of Internal Medicine* 2006;144:465–74.
4 Saydah SH, Fradkin J and Cowie CC. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. *Journal of the American Medical Association* 2004;291:335–42.
5 Saaddine JB, Engelgau MM, Beckles GL, Gregg EW, Thompson TJ and Narayan KM. A diabetes report card for the United States: quality of care in the 1990s. *Annals of Internal Medicine* 2002;136:565–74.
6 Fuke D, Hunt J, Siemienczuk J *et al.* Cholesterol management of patients with diabetes in a primary care practice-based research network. *American Journal of Managed Care* 2004;10:130–6.
7 Whitford DL and Roberts SH. Changes in prevalence and site of care of diabetes in a health district 1991–2001. *Diabetic Medicine* 2004;21:640–3.
8 Dagogo-Jack S. Preventing diabetes related morbidity and mortality in the primary care setting. *Journal of the National Medical Association* 2002;94:549–60.
9 Verbrugge LM and Patrick DL. Seven chronic conditions: their impact on US adults' activity levels and use of medical services. *American Journal of Public Health* 1995;85:173–82.
10 Frostholm L, Fink P, Christensen KS *et al.* The patients' illness perceptions and the use of primary health care. *Psychosomatic Medicine* 2005;67:997–1005.
11 Jaen CR, Stange KC and Nutting PA. Competing demands of primary care: a model for the delivery of clinical preventive services. *Journal of Family Practice* 1994;38:166–71.
12 DeBusk RF, West JA, Miller NH and Taylor CB. Chronic disease management: treating the patient with disease(s) vs treating disease(s) in the patient. *Archives of Internal Medicine* 1999;159:2739–42.
13 Renders CM, Valk GD, Griffin SJ, Wagner EH, Eijk Van JT and Assendelft WJ. Interventions to improve the management of diabetes in primary care, outpatient, and community settings: a systematic review. *Diabetes Care* 2001;24:1821–33.
14 Shojania KG, Ranji SR, McDonald KM *et al.* Effects of quality improvement strategies for type 2 diabetes on glycaemic control: a meta-regression analysis. *Journal of the American Medical Association* 2006;296:427–40.
15 Kiefe CI, Allison JJ, Williams OD, Person SD, Weaver MT and Weissman NW. Improving quality improvement using achievable benchmarks for physician feedback: a randomized controlled trial. *Journal of the American Medical Association* 2001;285:2871–9.
16 American Diabetes Association. Standards of Medical Care in Diabetes. *Diabetes Care* 2004;27:S15–S35.

17 Montori VM, Bjornsen SS, Green EM *et al.* Performance of the provider recognition program's survey to assess patient satisfaction with the provision of diabetes care in primary care. *American Journal of Managed Care* 2002; 8:365–72.
18 Dmitrienko A, Molenberghs G, Chuang-Stein C and Offen W. *Analysis of Clinical Trials Using SAS: a practical guide.* Cary, NC: SAS Publishing, 2005.
19 Friedman L, Furberg CD and DeMets DL. *Fundamentals of Clinical Trials* (3e). New York: Springer-Verlag, 1998.
20 Linder JA, Ma J, Bates DW, Middleton B and Stafford RS. Electronic health record use and the quality of ambulatory care in the United States. *Archives of Internal Medicine* 2007;167:1400–5.
21 Grant RW, Cagliero E, Sullivan CM *et al.* A controlled trial of population management: diabetes mellitus – putting evidence into practice (DM-PEP). *Diabetes Care* 2004;27:2299–305.
22 Montori VM, Dinneen SF, Gorman CA *et al.* The impact of planned care and a diabetes electronic management system on community-based diabetes care: the Mayo Health System Diabetes Translation Project. *Diabetes Care* 2002;25:1952–7.
23 Meigs JB, Cagliero E, Dubey A *et al.* A controlled trial of web-based diabetes disease management: the MGH diabetes primary care improvement project. *Diabetes Care* 2003;26:750–7.
24 O'Connor PJ, Crain AL, Rush WA, Sperl-Hillen JM, Gutenkauf JJ and Duncan JE. Impact of an electronic medical record on diabetes quality of care. *Annals of Family Medicine* 2005;3:300–6.
25 Chang JT, Hays RD, Shekelle PG et al. Patients' global ratings of their health care are not associated with the technical quality of their care.[summary for patients in *Annals of Internal Medicine* 2006;144(9):I26. PMID: 16670130]. *Annals of Internal Medicine* 2006;144(9): 665–72.
26 O'Connor PJ, Solberg LI and Baird M. The future of primary care. The enhanced primary care model. *Journal of Family Practice* 1998;47(1):62–7.
27 Wolfe RA. Observational studies are just as effective as randomized clinical trials. *Blood Purif* 2000;18(4):323–6.

CONFLICTS OF INTEREST

Providence Health and Services holds ownership of the *CareManager*™ software application and receives shares of royalties from marketing through Kryptiq Inc. JSH and JS receive a share of royalty revenue.

ADDRESS FOR CORRESPONDENCE

Jacquelyn Hunt
Providence Medical Group
3601 SW Murray Blvd, suite #45
Beaverton, OR 97005
USA
Tel: +1 (503) 574 9850
Fax: +1 (503) 574 9875
Email: Jacquelyn.Hunt@providence.org

Accepted July 2009