

Research paper

Building high functioning clinical teams through quality improvement initiatives

Thomas P O'Toole MD

Chief, Primary Care, Providence VA Medical Center, Providence, RI, USA and Warren Alpert Medical School at Brown University, Providence, RI, USA

Richard Cabral BS

Automated Data Processing Coordinator, Providence VA Medical Center, Providence, RI, USA

Jonathan M Blumen MS

Health Systems Specialist, Providence VA Medical Center, Providence, RI, USA and Salve Regina University, Newport, RI, USA

Dawna A Blake MD

Associate Chief, Primary Care, Providence VA Medical Center, Providence, RI, USA and Warren Alpert Medical School at Brown University, Providence, RI, USA

ABSTRACT

Background Team-based care has consistently been associated with improved clinical outcomes. However, strategies for promoting and sustaining a team-based approach in family medicine practice are more elusive.

Methods We conducted a longitudinal time series cohort study of 30 primary care providers in seven practices to assess the sequential addition of three different chronic disease management feedback reports over 24 months, culminating in a team-based quality improvement intervention linked to feedback, assessing clinical performance and self-reported effectiveness.

Results The proportion of patients at their low density lipoprotein target (<100 mg/dL) improved over the 24-month study period ($P<0.001$) but the rate of clinical improvement was more modest when

feedback data were only presented at an individual and at a team level. When feedback reports were linked to a team-based quality improvement intervention, the results were more robust and were sustained for 12 months following the intervention cycle. Surveyed clinicians reported that the individual and team reports impacted both on their own practice approach and on team functioning.

Conclusions These findings suggest a strategic role for clinical performance feedback linked to team initiated quality improvement initiatives for improving both clinical outcomes and clinical team-based care.

Keywords: chronic disease management, clinical performance, medical home, primary care, team-based care

How this paper fits in with quality in primary care

What do we know?

We know that organising primary care delivery into team-based models of care can improve clinical outcomes. This has also served as the impetus for efforts to reshape primary care into patient-centred medical homes which provide comprehensive, continuous and seamless care to the patient. What is less clear is how we make our clinical teams high functioning. The use of clinical performance feedback is one approach that has been extensively studied and reported.

What does this paper add?

We present longitudinal time series data associating the transition to clinical teams and different approaches to presenting clinical feedback with chronic disease management outcomes. Our findings suggest that strategies linking clinical performance feedback with quality improvement initiatives using a clinical microsystems design approach can empower team members, improve team functioning and achieve better clinical outcomes.

Introduction

Team-based approaches to chronic disease management have been shown to result in better clinical outcomes.¹⁻⁴ However, getting a team to work together effectively is an active and deliberate process requiring leadership commitment, development of communication skills among staff and clearly defined roles and expectations of team members.^{5,6} Much of the research on integrated team approaches has been in the acute care setting with much less empirical data informing primary care practice.⁷ The transition to a primary care medical home model in many care systems has placed greater urgency on understanding the dynamics of team-based care, means of engaging patients in their own care and optimising use of all team members and clinic time in chronic disease management, disease prevention and health promotion.^{8,9}

Several factors have been identified as critical to a high functioning clinical team. They include; leadership, systems support for the clinic team, having a patient focus, staff education and training, having ready access to information and embedded process improvement efforts.¹⁰ Having shared goals that allow each team member to work to the best of their ability towards that goal, as well as positive feedback and support, are equally important. The converse situation of competing objectives among different team members, inefficient or intransigent care systems, limited infrastructure support and no objective feedback fosters a culture resistant to change and quality improvement.

The role of clinical performance data in developing and operationalising a team culture is less well understood but represents a potential opportunity within the context of quality improvement and microsystems design. Performance feedback to clinicians and the clinical team serves several functions. First, it identifies prioritised outcomes and objectives allowing the clinician and team to focus energies on metrics given higher priority by leadership. It also provides a measure of effectiveness that allows the clinician and clinic team to assess what they are doing and either continue it if successful or try alternative approaches if the outcomes are less than optimal. Finally, it introduces greater accountability into the care dynamic by reporting back to the clinician and clinic team measurable patient outcomes associated with the care they provide.

Having peer comparisons available along with this feedback also affords the clinician the ability to see how they are doing relative to their colleagues and more aggressively address performance linked to outlying outcomes. This feedback has been well described in the literature, with most feedback processes directed towards individual providers and implemented within the context of pay for performance initiatives.¹⁰⁻¹² Such processes also typically involve some form of

provider-specific incentive or disincentive for higher scores in clinical outcomes, productivity and billing, or some combination. Results from these efforts have generally been positive, although it has also been argued that some adverse behaviours (patient dumping, high-risk case avoidance) may result.¹³

The extent to which these feedback data are used, either by individual clinicians or by a clinic team, to impact on care processes depends upon the infrastructure support within the clinical microsystem for quality improvement processes to take place. Clinical microsystems are the basic building blocks of health care and a platform for providing care and fostering innovation – they are the small, functional units of care where patients and families and care teams meet. The degree to which a clinic team is a microsystem depends on how well that group is defined, individual roles are delineated, goals and objectives are articulated and outcomes specific to that group are measured.¹⁴ Quality improvement models, such as plan–do–study–act (PDSA), provide an overarching framework for testing change ideas and a vehicle for fostering innovation and improvement efforts. With PDSA there is a deliberate iterative-feedback approach to quality improvement that involves identifying a problem and planning an approach or solution to address it (plan), carrying out the plan while documenting problems, observations and data (do), studying the results (study) and finally making the necessary modifications and improvements to the care process (act). Finally, the clinical performance feedback process serves as the driver for innovation, identifying and prioritising clinical needs and informing the clinical team about what is working. To a very large extent, clinical performance feedback has the potential to serve as the bridge between the clinical microsystem and quality improvement initiatives, defining the way clinical teams function.

We present data from a longitudinal time series cohort study assessing the sequential implementation of individual and team-based feedback coupled with a PDSA quality improvement initiative on lipid management outcomes and team-based care. Survey data from primary care providers and team nurses on which approach had the most impact on their individual practice and on the way their team functioned are also presented. The findings suggest a specific role for clinical performance feedback reporting in the development and functioning of patient-centred medical homes and for enhanced chronic disease management.

Methods

We conducted a longitudinal time series cohort study correlating organisational changes and different clinician

performance feedback strategies within the Providence Veterans Administration (VA) Medical Center general internal medicine service over a 24-month period. Approximately 28 000 patients in Rhode Island and southern Massachusetts were assigned to the primary care services and received treatment during the study period in one of seven practice sites, four located within a tertiary medical centre and three in community-based outpatient centres (CBOC). VA Institutional Review Board approval was received for this study.

Clinical practice characteristics

At the beginning of the study period, the clinical service was organised as individual practices administratively grouped into three firms and three community outpatient clinics, with ancillary clinical services provided on an as-needed basis to all providers. Six months into this study the clinical service was reorganised into integrated clinic teams, each with an assigned registered nurse (RN), two to three nursing assistants and four to five primary care providers caring for approximately 4000 to 4500 patients within each team.

All patients are assigned to an individual primary care provider and providers have a pro-rated patient panel of up to 1200 individuals based on national Veterans Health Administration (VHA) guidelines, depending on the amount of clinical time and whether they are a medical doctor or nurse practitioner. Only those providers who maintained an active clinical practice throughout the 24-month study period were included in the study ($n=30$).

Clinical performance reporting

The presentation and feedback of clinical performance data during this time evolved through three phases. Prior to beginning of the study, all feedback data were presented as aggregated data at the service level (blood pressure, HbA1c and lipid control). In Phase 1 of this study, quarterly clinical performance data specific to that provider's panel of patients were presented to each primary care provider. In Phase 2, the practices were reorganised into integrated clinical teams and feedback was provided to the individual provider on his or her own panel as well as data on how the team had done overall. This reorganisation was done to move the practice towards a medical home model of care and the transition from a physician-driven care approach to one defined by a team dynamic with several members of the team (RNs, licensed practical nurses (LPNs), health technicians) more involved in direct patient care and care outcomes.

In Phase 3, clinical performance data were presented at both the individual provider and the clinic team level (as in Phase 2) but with the requirement that the data be linked to team-specific quality improvement initiatives implemented at the start of Phase 3. It was observed during Phase 2 that even though clinical performance data were made available to the entire clinical team and the teams were being ranked relative to their measured outcomes, few team members other than the primary care providers identified with the data or saw it as something to which they were also accountable. Based on these observations and anecdotes, we implemented a third phase where each team was charged with developing a team-based approach to addressing the clinical performance measures being reported.

Prior to developing the team-based initiatives we held a workshop during which the Chronic Care Model was introduced, including the different process domains^{15,16} and potential roles for different team members within each of these domains. At this workshop we also presented the PDSA approach to quality improvement, with guidance on how it could be applied to this initiative. The teams were charged with developing a plan directed towards one of the three chronic disease management outcomes (low density lipoprotein (LDL), blood pressure or HbA1c) using their most recent team report as the baseline for future comparisons. Table 1 presents a worksheet submitted by one team, detailing involvement of different team members, what elements of the Chronic Care Model were being addressed and what was the targeted goal.

Report data

The provider-specific report included three process measures (panel size, clinic visits and telephone notes) and three clinical outcome measures (blood pressure less than 140/90 mmHg and HbA1c less than 9% in patients with diabetes and calculated LDL less than 100 mg/dl in patients with either diabetes or coronary artery disease), as well as a ranking of their clinical performance relative to that of their peer providers in primary care. These were reported for all patients assigned to that provider and/or team during the previous three months. In addition to the proportion of patients on their panel who were at target for each of the clinical outcome measures, the reports also included a listing of patient names from their panel that were not on target. The clinical team reports included only clinical outcome measures of blood pressure control, HbA1c and LDL data with the proportion of patients from each team on target along with a ranking of each team relative to the other six primary care teams in the clinical service.

Table 1 Sample team-based PDSA proposal

Clinical unit	PDSA initiative summary	Chronic Care Model components being addressed	Anticipated outcomes	Team providers involved	Baseline data January 2009
Team 1	Improve LDL management in patients with diabetes mellitus/coronary artery disease by reducing the number of patients with LDL labs >one year old	Delivery system design Self-management support Clinical information systems	Improved LDL control in patients considered non-compliant with meds and/or lifestyle modifications	RN/LPN PCA	LDL <100 mg/dL (62.9%)
Team 2	Improve LDL management for pts with DM/CAD, identify patients with missing labs, increase referrals to metabolic clinic	Clinical information systems Delivery system design	Improved LDL control among patients with DM/CAD	PCP PCA RN Met. clinic	LDL <100 mg/dL (56.4%)
Team 3	Identify poorly controlled diabetics with HbA1c >8.0. Develop team interventions to improve glycaemic control	Self-management support Delivery system design Decision support Clinical information systems	Improved A1c readings. Reduce long-term complications of DM	RN/LPN PCA PCP	A1c >9 (5.4%)
Team 4	Reduce the number of patients with LDL labs >one year old or with no labs; increase provider participation in tracking patients and provider more active follow-up on patients with LDLs in the 100–129 range	Organisation of health care Self-management support Delivery system design Clinical information systems	Improved LDL levels in population in the 100–129 range Greater provider participation Reduction in patients with no tests	RN PCA PCP LPN	LDL < 100 mg/dL (61.0%)

The feedback reports were distributed electronically, with individual primary care provider (PCP) panel performances entered on an Excel spreadsheet and team performances and rankings graphically displayed. Paper copies were also distributed to each primary care provider, along with aggregated reports to the PCP and RN team leaders which included a list of individual patient outliers for each measure. Finally, the graphical display of team performance and rankings were posted on bulletin boards near the staff lounge.

Clinician/registered nurse survey

All eligible primary care providers and RNs were anonymously surveyed as to which feedback or intervention approach had the greatest impact on the way they individually practiced and how their team functioned with regard to communication and coordination of care among team members. The feedback/intervention query fields were: 1) facility-specific reports; 2) provider-specific reports with patient outliers listed; 3) team-based reports and rankings along with patient outliers listed; and 4) team-based reports linked to quality improvement initiatives. Providers ($n=30$) and RNs ($n=7$) were asked to rank order each choice relative to the others, with a text section for comments. The survey was conducted anonymously in order to minimise any bias towards socially favourable responses or perceived coercion.

Data capture

Data were identified from the electronic medical record (the VHA Computerized Patient Record System) using Microsoft Proclarity (Microsoft, Seattle, WA) software for all patients assigned to primary care providers in the study. Laboratory values drawn at facilities outside the VA were manually entered by the provider into the electronic medical record and subsequently abstracted by the same process. Tests not done within the specified time period (12 months for a patient with comorbid diabetes or coronary artery disease) or outside lab values drawn by non-VA facilities that were not entered were considered out of range or missing. While the clinical reporting process included lipid levels, HbA1c and blood pressure results, only the LDL values are presented in this analysis. This was done because the clinical service was already at or above target performance levels for both blood pressure and HbA1c control at the start of this study providing a more limited margin for measured improvement. In addition, the time taken for HbA1c values to change is longer than that for LDL values while blood pressures recorded in this process included readings captured throughout the hospital, including the emergency department and other settings where temporal pain or an acute illness

may have affected the readings. Of note, there were improvements in all three areas although the difference was greatest for the LDL measure.

Data analysis

Temporal data are reported as a proportion of patients with diabetes or coronary artery disease who were at LDL target (<100 mg/dl) at each quarterly interval. These proportions are reported for both overall primary care enrolment and by each individual provider panel. Clinical performance data from the beginning and end of Phase 1 (six months) were compared to assess changes associated with the transition from facility-based to provider-specific reporting. Similarly, clinical performance measures from the end of Phase 1 are compared with data from the end of Phase 2 (nine months) to assess changes associated with the transition to team-based care along with individual provider and team-level feedback. Lipid management outcomes from the end of Phase 2 are compared with the end of Phase 3 (nine months) to assess changes associated with the transition from team-based reporting to team reporting linked to PDSA quality improvement initiatives. Clinical outcome measures are also compared from the beginning of Phase 1 to the end of Phase 3 in order to assess overall performance. Factor analyses of provider practice characteristics (panel size, number of clinic visits and telephone notes generated each quarter etc.) were also considered in relationship to LDL target performance. Stata 8.0 software was used in the analyses and statistical significance is reported as z statistic for proportions of dichotomous variables with a $P<0.05$ (Stata Corp, College Station, TX). Survey data were aggregated and rank ordered with text field comments separately summarised and reported.

Results

The overall number of patients with either diabetes or coronary artery disease considered in this study ranged from 9810 to 10 405 each quarter, depending on shifts in enrolment, patients moving out of the area or deaths (see Table 2). Approximately two-thirds of patients were managed at the medical centre by 22 primary care providers, while the remaining group was managed in the three community outpatient centres by eight primary care providers.

Proportion of patients at target LDL

There was an overall increase in the proportion of patients with LDL values less than 100 mg/dl during the 24 months of data reporting. As shown in Figure 1,

Table 2 LDL proportion at target per team per quarter

Quarter Group	Q1 % Patients LDL<100 mg/dL	Q2 % Patients LDL<100 mg/dL	REORG GROUP	Q3 % Patients LDL<100 mg/dL	Q4 % Patients LDL<100 mg/dL	Q5 % Patients LDL<100 mg/dL	Q6 % Patients LDL<100 mg/dL	Q7 % Patients LDL<100 mg/dL	Q8 % Patients LDL<100 mg/dL
Firm A	64.6 (1531/2369)	66.5 (1577/2373)	TEAM A	69.8 (959/1373)	71.9 (973/1354)	72.3 (972/1345)	72.3 (963/1332)	74.7 (986/1320)	73.4 (981/1336)
Firm B	65.4 (1616/2471)	68.1 (1664/2443)	TEAM B	65.1 (985/1512)	65.5 (950/1451)	63.7 (932/1462)	65.2 (947/1453)	66.4 (970/1460)	66.7 (959/1438)
Firm C	63.8 (1454/2280)	65.6 (1484/2261)	TEAM C	67.5 (1563/2316)	68.6 (1569/2286)	68.2 (1487/2180)	70.0 (1522/2173)	72.5 (1577/2176)	72.0 (1515/2104)
			TEAM D	67.2 (1168/1737)	65.8 (1145/1741)	65.9 (1143/1735)	67.0 (1182/1765)	69.5 (1240/1785)	68.3 (1206/1767)
CBOC A	60.5 (558/923)	60.2 (563/935)	CBOC A	61.6 (580/941)	59.6 (563/945)	61.8 (593/960)	71.1 (631/888)	72.8 (653/897)	74.3 (666/896)
CBOC B	58.5 (713/1218)	57.3 (699/1220)	CBOC B	58.1 (710/1222)	57.1 (699/1224)	59.5 (717/1205)	60.3 (716/1188)	58.9 (702/1192)	59.9 (715/1194)
CBOC C	71.0 (746/1144)	66.3 (760/1147)	CBOC C	67.3 (772/1147)	67.6 (770/1139)	69.7 (784/1125)	71.0 (792/1115)	71.5 (782/1093)	70.4 (757/1075)
Total	63.6 (6618/10405)	65.0 (6747/10379)	TOTAL	65.7 (6737/10248)	65.8 (6669/10140)	66.2 (6628/10012)	68.1 (6753/9914)	69.6 (6910/9923)	69.3 (6799/9810)

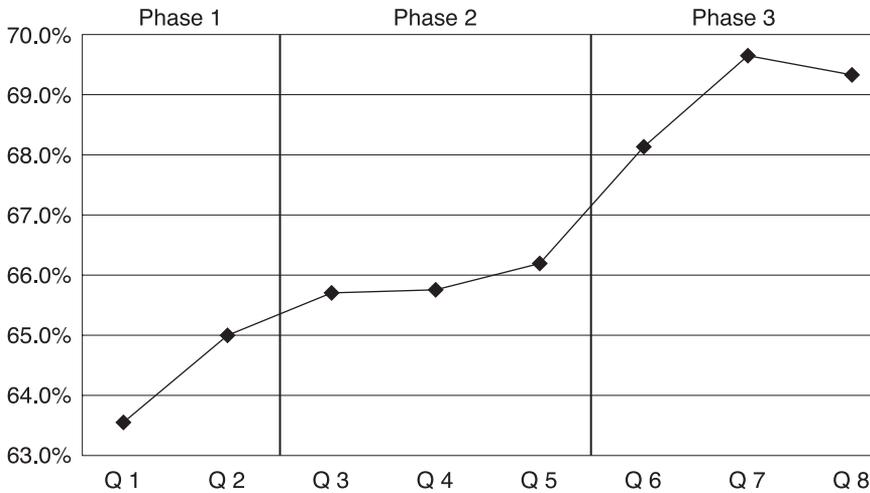


Figure 1 Aggregated proportion of patients at LDL target

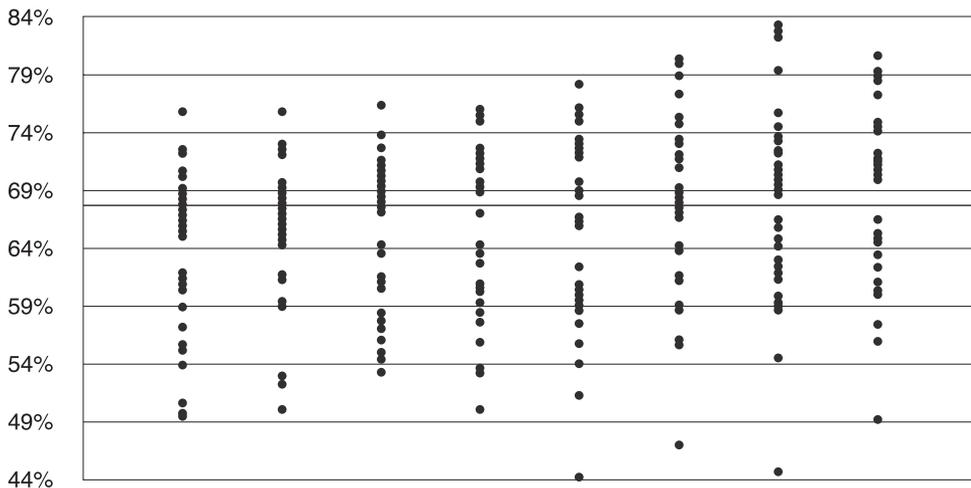


Figure 2 PCP panels with proportion of patients at LDL target

the proportion of patients on target was 63.6% at the beginning of the observation period and increased to 69.3% ($P < 0.001$) by the end of eight quarters. During Phase 1 (provider-specific data only) there was an increase in the proportion of patients reaching the LDL target of 1.4%. In Phase 2 (team-based and individual provider data and ranking; concurrent transition from three firms to four medical teams within the medical centre) there was an overall improvement of 1.2%. Phase 3 (team-based data linked to quality improvement plans, individual provider data and ranking) was notable for the largest increase in the proportion of patients on target for LDL management, with a net increase of 3.1% from the end of Phase 2 to the end of Phase 3 (Figure 1).

Provider-specific performance

Figure 2 represents the proportion of patients achieving their LDL target within each provider panel during

the eight reporting periods, with the number at or above the VA goal of 68% depicted above the horizontal bar. In the first reporting period, only eight providers (26.7%) were at or above the VA goal of 68%. By reporting period eight, the proportion at or above goal was 60% with most of the increase occurring the last three quarters, when the quality improvement initiatives were underway.

There was no association between panel size and whether the panel was at or above capacity and between LDL performance or trend improvement in LDL performance. Nor were there any differences noted based on whether the provider was a nurse practitioner or medical doctor. Those providers that registered at least 20 telephone calls to their patients in the previous quarter were more likely to register a significant improvement in LDL performance and to be at or above the VHA national goal ($P = 0.04$).

Survey responses

The overall response rate was 73.3% for primary care providers and 71.4% for nurses. The provider-specific report with patient outliers was rated by 77.3% of respondents as having the most impact on individual practice approach compared with the three other options (facility-specific reports, team reports and rankings and team reports linked to QI initiatives), while 86.4% rated it as either first or second. This was also reported as having the most impact on team-based care and coordination, with 68.2% rating it as first and 72.7% ranking it first or second. Team-based reports and rankings were ranked second by most providers in relation to impact on individual practices (68.2%) and second in relation to impact on team care and coordination (72.7%). Fewer respondents ranked team-based reporting linked to quality improvement initiatives as having a major impact on either their individual practice approach (with 45.4% of respondents ranking it first or second) or surprisingly as having an impact on team-based care and coordination (with 50% ranking it first or second for team based care and coordination). Facility-aggregated reports were overwhelmingly ranked fourth for both questions. The nurses' rankings were consistent with the primary care providers', except that slightly more nurses rated the team reports linked to quality improvement initiatives as having an impact on individual and team-based functioning, but this still followed individual and team-based reports.

Text field comments broadly reflected three themes: 1) practice-specific comments; 2) provider accountability; and 3) process of care related comments. They included statements such as:

'I like to see where I stand among my peers.'

'Facility-wide reports don't have a lot of impact.'

'Provider-specific reports are of use – others are almost not.'

'It's helpful to see how my panel is doing.'

'The reports helped me keep track of patients I might have lost track of.'

Comments specific to the quality improvement PDSA included:

'The project helped focus us on a plan and who would do what.'

Discussion

How well clinical teams work together is as much a function of who is on the team and how they are organised as of what they are tasked to do. In this

longitudinal time series cohort study of incremental implementation of a patient-centred medical home model, reorganising into teams alone had a nominal impact on chronic disease management. This was despite directed clinical feedback, clearly articulated clinical service priorities and structural modelling to optimise team-based care (team meetings, engaging all team members, skill-building workshops etc.). More robust clinical performance outcomes occurred only when care planning was organised around a quality improvement PDSA-based initiative. This process appeared to give the teams a more formalised structure for engaging the full complement of team members in tasks specific to the team-identified goal. Ironically, five of the seven teams specifically focused on an LDL management goal (the others concentrating on HbA1c or blood pressure goals), but they all noted some improvements in lipid management, reflecting a spillover effect from employing this process.

These findings are consistent with those previously noted in the literature. Practices more actively engaged in chronic disease management and applying the Chronic Care Model have consistently been associated with enhanced clinical performance.¹⁷ Strategies employed by these clinics include using patient registries, patient prompts, clinical reminders and reports, applying evidence-based guidelines to care, engaging patients in their own self-care and employing community resources, all core elements of the Chronic Care Model.^{15,16} Hysong and colleagues found that facilities with high rates of compliance with clinical practice guidelines were more likely to provide timely, individualised, non-punitive feedback to providers.¹⁸ A literature review of interventions to improve team effectiveness found positive results associated with simulation, Crew resource management training, team-based training and projects on continuous quality improvement.⁷ Continuous quality improvement interventions have also been associated with improvements in primary care management in a randomised controlled trial involving 49 practices in the Netherlands.¹⁹ In our study, the incremental addition of individual and team-based feedback was associated with modest improvements in lipid management that increased substantially when linked to team-based quality improvement initiatives.

Interestingly, primary care providers and nurses responding to the survey consistently rated the individual report with peer ranking as having a greater influence on how they practiced and how they coordinated care with their team. The team-based reports linked to quality improvement initiatives were rated much lower despite the fact that the most robust clinical improvements occurred when these reports were initiated. While the study design does not allow us to determine the independent effect of the different clinical performance feedback reports, there are three possible

explanations for our findings. First, the survey was conducted about six months after the PDSA cycle concluded and it is possible that the PDSA-developed interventions had already been incorporated into standard clinical practice with only nominal attribution given to any role they may have played. The fact that the performance gains achieved during this phase continued for 12 months following the study conclusion would support this. Second, it is also possible that the robust improvement noted in Phase 3 compared with Phases 1 and 2 reflect acclimatisation to the individual reports/rankings as suggested by the clinician survey results and the noted effect occurred independent of the PDSA process. The nurses in this study who prior to the PDSA process had not been involved in chronic disease management protocols cited similar benefits from the feedback reports which would not support this explanation. Finally, it is possible that the different reports address two distinct dimensions of continuous quality improvement. The reporting linked to the PDSA cycle addresses a micro-systems design/care processing approach to quality improvement while the individual and team-based reports focus on enhancing provider and team-member accountability and 'ownership' of outcomes. Both represent critical elements for practice innovation, adoption and sustainability.

Our findings do suggest that linking performance measures to team-based quality improvement initiatives serves to codify and reinforce practice principles consistent with a Chronic Care Model. Finally, it is important to note that those providers with more than 20 calls to patients outside of clinic visits during a reporting period were more likely to have better LDL management performance. This out-of-clinic activity reflects an element of planned care espoused in the patient-centred medical home model and is likely to be an accurate metric of better performing clinical units.

There are several limitations to consider and address. First, the data are limited to one clinical department in the north-east USA serving a veteran population. It is unclear whether these data are replicable in other geographic settings or with other population groups. However, it is important to note that the outcomes reported exceed Healthcare Effectiveness Data and Information Set (HEDIS) results found in Medicare and private health plans and occurred in a veteran population considered as more challenging in their burden of chronic disease care.^{20,21} The infrastructure within the VA system with limited panel sizes, an integrated care system, robust primary care service line structure and efficient electronic medical record system all facilitate the implementation of the Chronic Care Model and chronic disease management initiatives. Replicating this in settings without the established infrastructure and the comprehensive electronic

health record that is afforded within the VA health system²² may be more challenging.

Second, it is possible that there were other care trends or factors taking place that influenced our outcomes. However, there were no changes to the drug formulary during this time, only providers who maintained panels throughout the course of the study were included in the analysis and there were no major influxes or effluxes of patients to influence the denominator significantly. An important limitation described earlier is that the different clinical performance reports were implemented sequentially and were cumulative, making it difficult to determine with any degree of certainty any independent effect from a specific reporting process or metric. Finally, the study period was 24 months with eight quarterly reporting cycles. It is possible that these changes are non-sustainable beyond this period of scrutiny and reflect an observer effect that the reporting and clinical improvement initiatives prompted. To counter this, we continued to monitor and report quarterly data and have not noted a drop-off in clinical performance in the 12 months following completion of this study.

In summary, reporting of clinical performance data can promote and reflect significantly improved clinical outcomes when the data is reported to clinical teams and when it is used to drive clinical improvement initiatives.

REFERENCES

- 1 Shojania KG, Ranji SR, McDonald KM *et al.* Effects of quality improvement strategies for type 2 diabetes on glycemic control. *Journal of the American Medical Association* 2006;296:427–40.
- 2 Scanlon DP, Hollenbeak CS, Beich J, Dyer A, Gabbay RA and Milstein A. Financial and clinical impact of team-based treatment for Medicaid enrollees with diabetes in a federally qualified health center. *Diabetes Care* 2008; 31:2160–5.
- 3 Hunt JS, Siemenczuk J, Pape G *et al.* A randomized controlled trial of team-based care: impact of physician–pharmacist collaboration on uncontrolled hypertension. *Journal of General Internal Medicine* 2008;23: 1966–72.
- 4 Carter BL, Rogers M, Daly J, Zheng S and James PA. The potency of team-based care interventions for hypertension: a meta-analysis. *Archives of Internal Medicine* 2009;169:1748–55.
- 5 www.teammeasure.org
- 6 Rodríguez C and Pozzebon M. The implementation evaluation of primary care groups of practice: a focus on organizational identity. *BMC Family Practice* 2010; 11:15.
- 7 Buljac-Samardzic M, Dekker-vanDoorn CM, van Wijngaarden JD and van Wijk KP. Interventions to improve team effectiveness: a systematic review. *Health Policy* 2010;94:183–95.

- 8 Bodenheimer T and Laing BY. The teamlet model of primary care. *Annals of Family Medicine* 2007;5:457–61.
- 9 Friedberg MW, Safran DG, Coltin KL, Dresser M and Schneider EC. Readiness for the Patient-Centered Medical Home: structural capabilities of Massachusetts primary care practices. *Journal of General Internal Medicine* 2009;24:162–9.
- 10 Mehrotra A, Pearson SD, Coltin KL *et al*. The response of physician groups to P4P incentives. *American Journal of Managed Care* 2007;13:249–55.
- 11 O'Kane ME. Performance-based measures: the early results are in. *Journal of Managed Care Pharmacy* 2007; 13:S3–6.
- 12 Conrad DA and Perry L. Quality-based financial incentives in health care: can we improve quality by paying for it? *Annual Review of Public Health* 2009;30:357–71.
- 13 McMahan LF, Hofer TP and Hayward RA. Physician-level P4P – DOA? Can quality-based payment be resuscitated? *American Journal of Managed Care* 2007; 13:233–6.
- 14 Nelson C, Batalden PB and Godfrey MM. *Quality by Design: a clinical microsystems approach*. San Francisco, CA: Jossey-Bass, 2007.
- 15 Bodenheimer T, Wagner EH and Grumbach K. Improving primary care for patients with chronic illness. *Journal of the American Medical Association* 2002;288:1775–9.
- 16 Bodenheimer T, Wagner EH and Grumbach K. Improving primary care for patients with chronic illness: the Chronic Care Model, Part 2. *Journal of the American Medical Association* 2002;288:1909–14.
- 17 Atlas SJ, Grant RW, Ferris TG, Chang Y and Barry MJ. Patient–physician connectedness and quality of primary care. *Annals of Internal Medicine* 2009;150:325–35.
- 18 Hysong SJ, Best RG and Pugh JA. Audit and feedback and clinical practice guideline adherence. Making feedback actionable. *Implementation Science* 2006;1:9.
- 19 Engels Y, van den Hombergh P, Mookink H, van den Hoogen H, van den Bosch W and Grol R. The effects of a team-based continuous quality improvement intervention on the management of primary care. *British Journal of General Practice* 2006;56:781–7.
- 20 Agha Z, Lofgren RP, VanRuiswyk JV and Layde PM. Are patients at Veterans Affairs Medical Centers sicker? *Archives of Internal Medicine* 2000;160:3252–7.
- 21 Asch SM, McGlynn EA, Hogan MM *et al*. Comparison of quality of care for patients in the Veterans Health Administration and patients in a national sample. *Annals of Internal Medicine* 2004;141:938–45.
- 22 Jha AK, DesRoches CM, Campbell EG *et al*. Use of electronic health records in US hospitals. *New England Journal of Medicine* 2009;360:1628–38.

FUNDING

No external funding was received for this study.

ETHICAL APPROVAL

Institutional Review Board approval was received for this study.

PEER REVIEW

Not commissioned; externally peer reviewed.

CONFLICTS OF INTEREST

None.

ADDRESS FOR CORRESPONDENCE

Thomas P O'Toole, Providence VA Medical Center, 830 Chalkstone Avenue, Providence, RI, USA. Email: thomas.o'toole@va.gov

Received 24 April 2010

Accepted 28 November 2010