

A Quality Improvement Initiative to Enhance the Care of Diabetic Patients in a General Medicine Clinic

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Diabetes is a major health problem in the United States. The number of people diagnosed with diabetes has risen from 1.5 million in 1958 to 17.9 million in 2007. Diabetes is associated with increased risk of serious health conditions, including heart disease, renal failure, retinopathy, vascular compromise, peripheral neuropathy, and limb loss. The impact of these multiple comorbidities led to an estimated economic impact of \$174 billion in 2007.¹ Evidence-based management of diabetes can lower the risk of these comorbidities and other complications.^{2,3}

In addition to evidence-based guidelines, measures have been developed to help assess the quality of care that patients receive. The 2008 National Healthcare Quality Report⁴ highlighted several measures across different conditions and concluded that “health care quality is suboptimal and continues to improve at a slow pace.” The report’s sections on diabetes showed suboptimal care for recommended services: 71% of adults \geq 40 years of age received foot exams, 60% had dilated eye exams, and 90% had an A1C test. Only 40% received all three of these components of diabetes care. These rates have not improved during the last 3 years.⁴

Dartmouth-Hitchcock Medical Center (DHMC) in Lebanon, N.H., provides health care for rural communities in New Hampshire and Vermont. General internal medicine

(GIM) within DHMC provides primary care to 22,000 adults and averages $>$ 50,000 visits annually. Patients diagnosed with either type 1 or type 2 diabetes make up \sim 8% of GIM patients. In 2005, DHMC was chosen as one of 10 participants in the Centers for Medicare and Medicaid Services (CMS) Physician Group Practice Demonstration Project.⁵ This project was designed to determine whether financial incentives would lead to improved quality and decrease the cost of care. Diabetes measures were the focus during the first performance year, and all DHMC primary care clinics, including GIM, were enlisted to participate.

Local Problem

In March 2006, GIM’s diabetes quality measures were reported and discussed at quarterly provider meetings. Similar to national reports and benchmarking to other DHMC primary care sites, most measures were suboptimal; for example, foot, eye, and A1C measures were 18, 39, and 88%, respectively. GIM recognized the need to improve diabetes care both for patients and to succeed in the demonstration project.

Intended Improvement

GIM met as a group before 2006 to discuss various issues and share information, but specific patient population data were typically not on the agenda. Most of the care delivered was designed relative to acute-care principles. During patient visits,

patient information was not easily accessible; therefore, it was difficult to determine whether a patient needed a test or exam. To address the needs of the demonstration project and to improve care, GIM identified areas to improve, which included assessment of workflows, recognition of tests or exams needed for diabetes assessment, and the need for feedback on performance measures.

A multidisciplinary improvement team, including physicians, nurses, and managers, was formed. The purpose of this group was to engage and attract GIM providers and staff to diabetes improvement work. The aim, core to the DHMC mission, was to provide the “best care, in the right place, at the right time, every time.”⁶ Our hypothesis was that instituting workflow changes, having up-to-date test and exam information at the point of care, and setting improvement goals would improve diabetes care and help meet the intent of the CMS demonstration project.

Study Question

The main question GIM addressed in this improvement work was whether providers and staff members could effectively change the delivery of care. It was essential to build knowledge on how to engage providers and staff members in improvement work and to determine what was actually needed to improve diabetes care. Lessons learned here would aid other improvement work in GIM.

Interventions and Measures

Initially, three interventions were identified to meet our aim of improving routine diabetes care. The first two were focused on visit-based care: engaging licensed nursing assistant (LNA) staff in a system-based process of patient preparation and increasing availability of individualized data. The third was to provide increased transparency of monthly data at practice and team levels.

The improvement team encouraged dialogue with providers, LNAs, and management, resulting in identification of target process and outcome measures, including annual eye and foot examinations, annual microalbumin measurement, A1C testing, and pneumococcal vaccinations. LNAs were engaged to assist with modification of workflows and tools, identification of gaps in care, and documentation of actionable items within the electronic medical record (EMR).

The primary data source for diabetes care measures in GIM is the DHMC Data Reporting System, which retrieves data from laboratory and financial systems and from the EMR. A cohort report of these data is generated on a monthly basis. Data are reported for each patient, including their primary care provider, laboratory values, and completion of preventive quality measures.

The second intervention involved identifying patients before their appointments, determining from the EMR whether they needed tests, and documenting these needs on a flow sheet. Figure 1 displays the patient visit-based tool. Automating this process allowed integration of current and additional data into the workflow by using the existing monthly cohort report. Individual patient summary data could be printed in advance of a visit, allowing an LNA to identify necessary exams or tests. Figure 2 displays

Diabetes Task Sheet	
Pt Name:	LNA:
Medical Record Number:	
Date of Visit:	Initial when documented in CIS
Provider:	
A. Vaccinations Flu Vaccine, annual Last date:	
Pneumovax, once and repeat after age 65 yrs. Last date:	
B. Labs HbA1c, twice a year Last date:	
Last value:	
C. LDL / DLDL , every year (circle most recent test) Last date:	
Last value:	
D. Microalbumin, every year Last date:	
Last value:	
E. Dilated Eye Exam every year Last date:	
F. Foot Exam every year Last date:	
Visual Exam: _____ Pedal pulse: _____ Monofilament: _____ see foot diagram for today's results	
G. Blood Pressure, every visit Last reading: Today's BP:	
H. Weight, at least once every year Last weight: Today's weight:	
<i>Revised 9/6/07 Approved by GIM DM Comm.</i>	

Figure 1. DHMC GIM visit-based chronic condition form. This is a patient visit-based tool with which an LNA identifies a patient in the monthly cohort report and prints a summary of individualized patient data on a single page.

the second generation of the patient visit-based tool. In addition to diabetes care improvements, quality measures were introduced for patients with heart failure and coro-

nary artery disease because these conditions were included in phase 2 of the CMS demonstration project.

Transparency of process and outcome measures comprised the third

Table 1. Quality Measures for Analysis

Measure	Guideline Recommendation	GIM Performance*		2005 National Performance**	2006 New Hampshire Performance**
		3/07 n = 1,767	12/08 n = 1,807		
Pneumococcal vaccination	One pneumococcal vaccination per lifetime	66%	76%	37%	62%
Foot exam	Annual foot examination	21%	59%	66%	81%
Microalbumin	Annual microalbumin urine test performed	37%	51%	Not available	Not available
Eye exam	Dilated eye examination performed annually	38%	51%	61%	66%

* Operational definitions: percentage of diabetic patients who have ever received a pneumococcal vaccine; percentage of diabetic patients who received at least one foot exam during the past 12 months; percentage of diabetic patients with at least one test for microalbumin in the past 12 months; percentage of diabetic patients who received a dilated eye exam during past 12 months.

**Source: Centers for Disease Control and Prevention: Diabetes data and trends. Available online from <http://apps.nccd.cdc.gov/DDTSTRS/default.aspx>.

intervention. GIM's improvement team reviewed aggregate practice-level data and reported at monthly practice-wide staff meetings and provider meetings. Results were analyzed monthly using individual and moving range statistical process control charts as one means of assessing the effectiveness of interventions. Data were analyzed using Microsoft Excel. Special-cause variation was noted if a point was above the upper or below the lower control limit or if eight or more consecutive points were above or below the center line (average). These signals are equivalent to a probability of < 0.01 for both findings.^{7,8} During 2008, team-level data became available for each of the three clinical teams within GIM and were included in this reporting.

Results

The quality measures from March 2007 to December 2008 improved.

Table 1 shows performance of four diabetes care measures. The most improvement was seen in foot exam rates, which improved from 21 to 59%. This improvement was related to frontline LNA involvement. LNA staff received training by a nurse practitioner who is a certified diabetes educator. Training included didactic and practical skills with return demonstration in foot observations, pedal pulse assessment, and monofilament examination.

Figure 3 is a statistical process control chart that shows patients who received a monofilament test, a component of the annual foot exam. The chart indicates two special-cause variations, in which the monthly rates improved steadily during the 2-year period. The monofilament rate was 16% in 2006, and the first special cause was a linear trend that began in May 2007 as LNAs started to identify needed exams and tests and to docu-

ment those addressed at the time of the visit. The second special cause occurred when the flow sheet was automated, and the rate for this exam was 56% in December of 2008.

Improvement was also seen in the number of patients who received pneumococcal vaccinations. The rate was 60% in 2006. Implementation of standing orders for administration of the vaccine occurred in early 2007 and resulted in the first special-cause variation and an increase in rate to 66%. This process improvement continued until the end of 2008 when the rate reached 75%. Figure 4 shows this quality measure in a statistical process control chart. Improvement in other process measures also showed special-cause variation, which was documented in statistical control charts indicating statistical significance for those measures (charts not shown).

MRN: [REDACTED]	Visits through: 12/31/2009		VISIT DATE:		
Name: [REDACTED]			Prepared by LNA:		
				Performed by LNA:	
Current PCP	[REDACTED]	Age	43	Diabetes	Y
D-H Division	Hc-Lebanon	Gender	F	CAD	Y
FSC Mgmt Group				HF	
				HTN	Y
Today's Vital Signs:		BP		Weight	
		Pulse		Previous Weight	
		Temp		Height	
Vaccinations		Date	Blood Pressure		Value Date
Last Flu Vaccination		9/20/09	Last Blood Pressure		120/85 12/10/09
Last Pneumococcal Vaccination			Last BMI		
Last Tetanus Vaccination		07/11/08			
			Smoker (Y/N)		N
			Last Smoking History		12/08/09
Diabetes Measures		Value Date	Coronary Artery Disease/Heart Failure Measures		
Last Seen in GIM		12/10/09	Last Seen in Cardio		12/08/09
Last Seen by PCP		12/10/09	Last Seen in PC		12/10/09
Diabetes Type		2	Last Seen in ED		
Last HA1C		6.5 12/03/09	Last Inpt HF Disch		
Last Microalbumin		12/10/09	MI (Y/N and first date)		Y 10/17/09
Last Total Cholesterol		175 12/03/09	Current LVF		
Last LDL		81 12/03/09	Worst LVF		
Last Creatinine		0.9 12/03/09	Last Lipid Profile		12/03/09
Last Eye Exam		12/10/09	Last LDL		81 12/03/09
Last Foot Exam (visual)		12/10/09	Last Beta Blocker		12/10/09
Normal / Other			Last ACE/ARB		
Last Pedal Pulse		12/10/09	Last Aldosterone		
Palpable / Not Papable			Last Coumadin Entry		
Last Monofilament		12/10/09	Last Lipid Lowering Med Entry		12/10/09
Intact			Last AntiPlatelet Med Entry		12/10/09
Decreased L R Heel			Last Aspirin Med Entry		12/10/09
Ball of foot					
Toes					
Last Beta Blocker		12/10/09			
Last ACE/ARB					
Preventive Measures			Other Comorbidities		
Pap			Cancer		N
Dexa Scan		08/22/08	Psychologic		N
Mammogram		08/22/08	Vascular		N
PSA Test			COPD		N
Colonoscopy			Renal		N
Sigmoidoscopy					
Fecal Occult Blood					
Advanced Directives					

Figure 2. Second-generation DHMC GIM visit-based chronic condition form.

Discussion

GIM began with a system response whereby workflows were modified, tools were improved, standing orders were implemented, and staff roles and responsibilities were redefined. Metrics improved and were sustained. Improved performance for the CMS Demonstration Project resulted in performance payments for DHMC, and the project has continued into subsequent phases of additional chronic conditions and prevention.⁹

Transparency of data at the aggregate practice and team lev-

els raised the awareness of GIM members. Providers verbalized appreciation for the assistance they received (data collection and documentation), and they felt they were able to increase their direct patient encounter time. Empowering the LNAs to own part of the process was a vital step.

Limitations

The population initially included adult patients who were diagnosed with type 1 or type 2 diabetes. Since 2008, the population has changed to include

a number of type 2 diabetic patients in the geriatric population because two additional geriatricians were added. Current data collection methods and measurement do not take into consideration valid exclusions to explain why all quality measures were not performed for all patients. This may account for some unwarranted variation. Measurement accounts for what was performed and does not include measures that were addressed and determined to be of no additional clinical value, were contraindicated, or were declined by patients.

Summary

GIM has implemented several interventions that have resulted in measureable improvement in the care of diabetic patients. Providers and staff members effectively changed the delivery of care. This required their involvement and engagement in the work of changing care. It also required activating and changing the role of LNAs to support the new system.

Further improvement of care is needed and will require exploration into the reasons for variations in care among providers, potential revision of inclusion and exclusion criteria for metrics, identification of potential new interventions, and increased efforts toward population-based programs. Finally, the results discussed here are only related to process-of-care measures. We believe the work done so far has provided a foundation for further improvement, including outcome measures such as eye examinations and A1C measures.

ACKNOWLEDGMENTS

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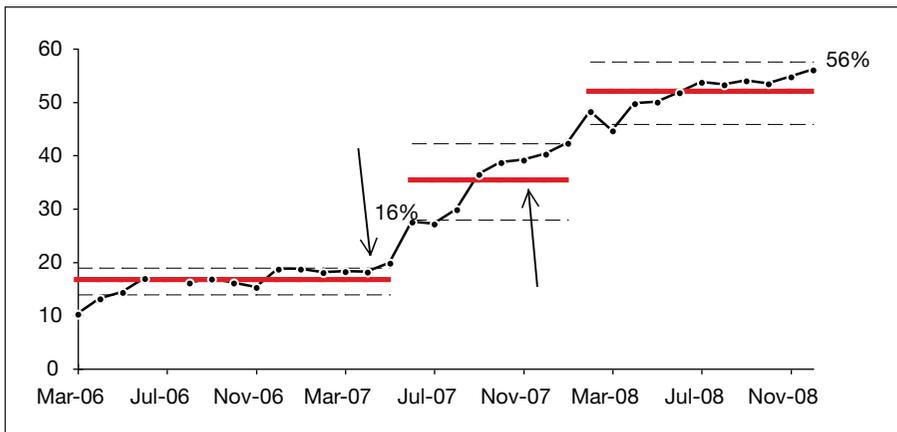


Figure 3. Statistical process control chart displaying percentage of patients receiving monofilament exam. Arrow 1 at May 2007 is when LNA began supporting providers with foot examinations. Arrow 2 at November 2007 indicates when the automated flow sheet was initiated.

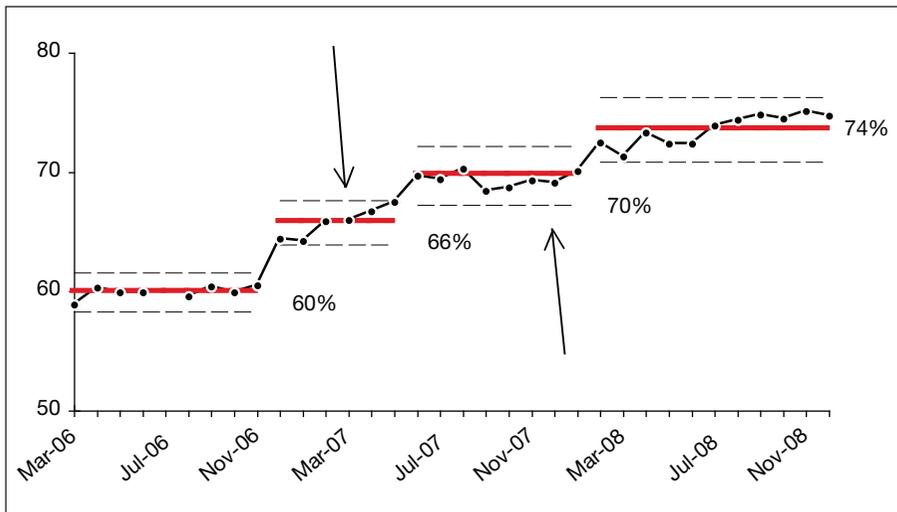


Figure 4. Statistical control chart indicating the percentage of patients who received pneumococcal vaccinations. Arrow 1 in early 2007 indicates initiation of standing orders. Arrow 2 at November 2007 indicates initiation of automated flow sheet.

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