INNOVATIONS IN CLINICAL PRACTICE

Continuous Quality Improvement in Rural Health Clinics

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AIM: Continuous quality improvement has been shown to work in urban and suburban clinics. The objective of this project is to test whether continuous quality improvement would improve the quality of care for patients with diabetes mellitus and/or hypertension in a rural health clinic.

SETTING: Rural health clinic with 3 providers and two and half full-time registered nurses. Patients were mostly older adults with Medicare health insurance.

PROGRAM DESCRIPTION: Health care providers and nursing staff agreed on the quality improvement project. The intervention included providing quarterly feedback to health care providers, empowering the nurses to remind patients of diabetes care, and flagging the charts to remind providers.

PROGRAM EVALUATION: The proportions of diabetic patients who had ophthalmologic exam, pneumococcal vaccine and lipid screening significantly improved over 12-month period. The proportions of patients with hypertension who had blood pressure less than 140/90 and patients who were taking aspirin also significantly improved over 12-month period.

CONCLUSION: The quality of care for patients with diabetes and patients with hypertension could be improved in rural health clinics using repetitive cycles of measurements, implementation of interventions and evaluation of outcomes. This process could be used as the backbone for translation of evidence into practice and improving quality of care.

KEY WORDS: quality improvement; rural clinic; diabetes; hypertension.
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The quality of health care has become an issue of increasing interest and concern among physicians and health care managers. Quality problems endanger the health and lives of patients and add costs to the health care system.^{1,2} In its report "Crossing the Quality Chasm," the IOM suggested that improvement in health care system depends on promoting evidence-based practice and strengthening clinical information systems.³ The problem is that successful quality improvement programs have been difficult to achieve due to a lack of appropriate information technology and organizational infrastructure.⁴ To improve quality of care, we need scientifically valid measures, adequate data, and strategy to measure quality and present it in a useful manner so that health care providers can use this information to improve quality of care.⁵

According to the "The State of Health Care Quality 2004" diabetes and hypertension are two of the most common conditions leading to cardiovascular morbidity and mortality. Diabetes is the sixth leading cause of death by disease in the

United States, and hypertension is the most treatable cardiovascular risk factor. Recent survey showed that clinicians appear to overestimate their adherence to hypertension guidelines, particularly with regards to the proportion of their patients with controlled blood pressure.⁶ Berwick and Nolan⁷ developed a model to facilitate improvement in health care outcomes. It includes identifying goals, measuring outcomes, finding alternatives, and testing new ideas. Up to date, quality improvement has been addressed in multiple urban settings and large clinics, but it has not been well addressed in rural health clinics.

AIM

The aim of the project was to test whether repetitive cycles of outcomes measurement, providing feedback to health care provider and contacting patients would improve the quality of care for patients with diabetes and/or hypertension in a rural health clinic.

SETTING

The project took place at a rural health clinic in Greensburg, Kansas from January of 2002 up until December of 2002. The clinic had one full-time internal medicine physician, one physician assistant, and one nurse practitioner. There were two and a half full-time employee nurses. The clinic served 3 counties, and patients were mostly older adults with Medicare and Medicaid health insurance. The relationship among the providers and clinic staff were based on mutual respect and cooperation that fostered teamwork. The electronic medical record was introduced 3 months before the quality project started.

Study Subjects

Patients were included if they were 18 years or older and had diabetes mellitus and/or hypertension and were seen in the clinic during the study period. The exclusion criteria included patients who died or transferred their care to another clinic. The patient population served by the clinic was approximately 5,000 patients. Most of the patients got their hypertension and diabetes care at the local clinic. Limited number of patients with diabetes had to travel at least 90 miles to see an endocrinologist. These patients were excluded from the project.

Patient Identification

Two parameters were used to identify the patient population: the medical conditions under investigation and the time frame.

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We used International Classification of Disease, Ninth Revision (ICD-9) codes that start with 250 to identify patients with diabetes, and ICD-9 codes that start with 401 to identify patients with hypertension. Both new and follow up patients were included in the study cohort. The medical staff approved the study design and goals.

PROGRAM DESCRIPTION

We used guidelines and randomized controlled trials to derive the operational definitions for quality of care measures. Each quality measure was defined as the percentage of patients receiving a recommended intervention.

Quality Measures for Diabetes Mellitus

- I. Glycosylated hemoglobin testing: is the proportion of diabetic patients who received glycosylated hemoglobin (HbA1c) at least once within the past year. The minimum standard is one or more HbA1c tests per year.⁸
- II. Diabetes control: is the proportion of diabetic patients who had HbA1c less or equal to 7.0. Improved blood glucose control in Type I and II reduces the risk of retinopathy, nephropathy and neuropathy.⁹⁻¹⁰
- III. Blood pressure control: is the proportion of diabetic patients with blood pressure less or equal to 130/80. Improved control of blood pressure leads to substantially reduced risks for cardiovascular events and death.¹¹
- IV. Lipid level screening: is the proportion of diabetic patients who had lipid profile testing at least once within the past year.^{12,13}
- V. Ophthalmology exam: is the proportion of diabetic patients who had ophthalmology exam once within the past year. Routine screening can help identify asymptomatic patients whose undetected retinopathy could result in irreversible visual loss.^{10,14}
- VI. Pneumococcal vaccination: is the proportion of diabetic patients who had pneumonia vaccine within the past 10 years.¹⁵

Quality Measures for Hypertension

- I. Blood pressure control: is the proportion of patients with hypertension who had blood pressure less than 140/90.¹⁶
- II. Aspirin usage: is the proportion of patients with hypertension who were on aspirin and were not taking anticoagulants or had allergy to aspirin. Low-dose aspirin was associated with decreased cardiovascular events in adults with treated hypertension.¹⁷

Intervention

The quality improvement project was developed by the health care providers and supported by administration and clinic staff. The improvement process was planned to go through repetitive cycles of measuring clinical outcomes, identifying patients with deficiencies in outcome measures, and focusing the intervention on those patients then re-measurement.

The nurses and the health care providers were responsible for updating the problem and the medication lists and for entering the pneumococcal vaccination and last eye exam on the diabetes flow-sheet. Every 3 months, we ran queries from billing records to identify diabetic and hypertensive patients

who were seen within the last 3 months. Then, we used electronic medical records to collect the latest results of glycosylated hemoglobin, lipid level, pneumococcal vaccination, eye exam, blood pressure, and aspirin usage. We used these clinical variables to calculate the quality measures according to the criteria defined above. Using Microsoft Access, we generated lists of patients who did not meet the quality criteria.

For patients with uncontrolled diabetes or hypertension and for patients with hypertension who were not taking aspirin, the nurse flagged their charts to remind the health care provider to address these issues during next visit. For patients with diabetes who needed pneumococcal vaccination and or eye exam, the nurse called the patients, or mailed letters, to inform them about the importance of these interventions and the need for getting the vaccine and eye exam. For patients who needed glycosylated hemoglobin and/or lipid level testing, the nurses contacted the patients and instructed them to do the lab tests at their convenience or prior to next appointment.

Statistical Analysis

The measures of the processes of care were expressed as a ratio of the actual practice divided by the best practice as defined by the guidelines. As the quality measure, expressed as a ratio, approaches the value of 1, the quality of care approaches the best practice. Thus, the referent for the evaluation of process of care is normative.

To check for significant differences between the ratios, we calculated the 95% confidence level around each measure.¹⁸ Graphs were created to show error bars of plus and minus 1 standard error about each percentage. If the error bars do not overlap, the ratios would be considered statistically significant different.

PROGRAM EVALUATION

There were a total of 136 patients with diabetes mellitus at the end of the first quarter and 251 patients at the end of the fourth quarter. Patients' average age was 62.3 years, and 41% were male patients. There were a total of 276 patients with hypertension at the end of the first quarter, and 640 patients at the end of the fourth quarter. Patients' average age was 64.5 years, and 55% were male patients. The number of patients at the end of each quarter represents the cumulative number of patients since the beginning of the first quarter and it included both new and follow-up patients.

Quality Measures for Diabetes Mellitus

The proportion of patients with HbA1c testing and the proportion of patients with HbA1c less or equal to 7.0 did not significantly change over the study period (Fig. 1). Within group analysis revealed that among the 136 patients who were seen during the first quarter, the proportion of controlled glycosylated hemoglobin improved from 56% to 76% by the end of the fourth quarter. These patients had an average of 4 visits per patient over 12-month period.

The proportion of patients with lipid screening and the proportion of patients with blood pressure equal or less than 130/80 significantly improved from first quarter to the fourth quarter (Fig. 1). The proportions of patients with pneumococcal vaccination and ophthalmology exam also significantly improved over 12-month period (Fig. 2).

FIGURE 1. Diabetes: process and outcome measures.

Quality Measures for Hypertension

The proportion of patients taking aspirin and the proportion of patients with blood pressure less than 140/90 significantly improved from the first quarter to the fourth quarter (Fig. 3).

At the end of each quarter, we generated lists of patient names who did not meet the quality criteria. The number of patients on the lists of lipid screening, pneumococcal vaccination and ophthalmology exam decreased as the proportion of patients who met the criteria increased.

DISCUSSION

Measuring and improving quality of care play a pivotal role in shaping the health care system of the United States. Improvements in health care depend not only on the physicians and their knowledge but also on the system of health care delivery.^{19,20} Guidelines predispose physicians to consider changing their behavior, but unless they are coupled with effective implementation methods, guidelines may be unlikely to effect rapid change in actual practice.²¹⁻²³

Our project showed that quality of care can be measured and improved in rural health clinic using repetitive cycles of measuring outcomes and implementing interventions to improve outcomes. The project described how to identify the variables and calculate quality measures. The intervention was multifaceted including providing feedback to providers, flagging the charts, and contacting the patients. It empowered the nurses to intervene on deficiencies of process of care. The electronic medical records made it easier to incorporate these measures in daily work and give regular feedback to providers. Besides, enrolling new and follow up patients with each quarter strengthened the validity by eliminating patient volunteer bias.

FIGURE 2. Diabetes: prevention quality measures.

FIGURE 3. Hypertension quality measures.

The lack of improvement in the proportion of HbA1c less or equal to 7.0 could be related to multiple factors. One explanation is that new and uncontrolled diabetic patients were included with each new cycle. Another explanation is time-lag phenomena. This is supported by the subgroup analysis that showed improvement in HbA1c among the 136 patients who were seen during the first quarter. A third possible explanation is patients' compliance and lifestyle changes. This is true especially in patients with diabetes and hypertension because clinical outcomes are dependent on compliance with treatment, diet and exercise as well as quality of care provided by clinicians.

During early stages of implementation, the providers missed entering information in medical records. This was a barrier to quality of care. After the first quarter, the intervention was modified to allow either the provider or his/her nurse to enter information. The limited number of staff members and patients limits the ability to generalize the results to larger clinics. The commitment of the staff and health care providers played a significant role in the success of this quality initiative. Future projects may consider studying this approach in bigger health care organizations to assess the feasibility of identifying and contacting larger number of patients, and the process of involving larger number of health care provider in quality initiatives.

CONCLUSION

This project suggests that the quality of care for patients with diabetes mellitus and patients with hypertension can be improved by repetitive cycles of outcome measurements, followed by interventions targeted toward patients who did not meet the quality criteria, and then re-evaluation of quality measures. This process can be used as the backbone of a reliable and beneficial translation of evidence into practice and ultimately improving clinical outcomes.

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