QUALITY INDICATORS OF DIABETES CARE IN PRACTICE

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Abstract. The objective of this study was to explore the practicability of using process and outcome indicators to routinely assess the quality of diabetes care. Health care data of diabetic patients using antidiabetic drugs older than 40 years old in 2006-2008 were retrieved from an electronic information system of Phramongkutklao Hospital, Thailand. The process and outcome indicators were taken from the standard of medical care in diabetes of the American Diabetes Association, 2006 - 2008 and other studies. A list of the practical indicators was selected according to the availability and completeness of the electronic data in the information system, consisting of glycemic control, lipid control, and antiplatelet therapy. For process indicators, the percentages of patients with a yearly measured HbA1c, LDL-cholesterol, triglyceride, HDL-cholesterol, and antiplatelet therapy were 56.5-67.2, 87.8-90.2, 76.6-81.4, 71.8-75.5, and 69.7-75.9%, respectively. For outcome indicators, the percentages of patients with most recent blood levels of HbA1c, LDL-cholesterol, triglyceride, and HDL-cholesterol at target levels were 25.1-32.5, 27.7-33.9, 50.1-54.7, and 53.1-62.5%, respectively. The practicability of these quality indicators in determining the quality of diabetes care will depend on the quality of the hospital electronic databases. Among these applicable indicators at this particular setting, the glycemic and lipid control, and antiplatelet therapy seemed to be sufficiently provided according to the standard diabetes care recommendation. However, the poor outcomes as measured by lipid profiles and HbA1c suggested that other intervention may also be necessitated to better these outcomes.

INTRODUCTION

Diabetes mellitus, a chronic disease needing continuous care, has goals of good glycemic control and prevention and management of its complications and related comorbidities. The burden of diabetes care has increased with its rising prevalence worldwide and in Thailand, especially in patients over age 40 years (Aekplakorn *et al*, 2003; Wild *et al*, 2004).

Assessment of medical care quality is important to assure health care services are provided appropriately to patients (Donabedian, 2005). There are many approaches to assessing quality of care, including process and outcome measures (Donabedian, 2005). In many countries quality indicators of diabetes care in regard to processes and outcomes have been used to assess, monitor, and benchmark improvement in practice (Acton *et al*, 2001; Montori *et al*, 2002; Nau, 2002; De Berardis *et al*, 2004;

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Kuo *et al*, 2005; Nicolucci *et al*, 2006; Wens *et al*, 2006). Electronic information, including administrative data, claims data, and other related databases, is important to assess factors in the efficacy of medical care (Montori *et al*, 2002; Zgibor *et al*, 2006).

In Thailand diabetes care is an important health care issue. About one-fourth of diabetic patients has long-standing or uncontrolled disease, or has various complications, especially diabetic neuropathy or diabetic retinopathy (Leelawattana *et al*, 2006). Most public hospitals have a heavy workload caring for diabetic patients and their complications and comorbidities. Inadequate time to care for patients may escalate the risk for poor qualify of diabetes care (Kanchanaphibool, 2005).

Hospitals are not required to routinely submit administrative and claims data to the government health insurance payer. Most hospitals have some electronic data regarding patient care, such as dispensing and financial data. Evaluation of quality indicators may be a possible solution to measure and improve diabetes care. This study aimed to investigate the use of quality indicators to assess the quality of diabetes care.

MATERIALS AND METHODS

The setting

The study was carried out among diabetic patients obtaining care from Phramongkutklao Hospital in 2006-2008. This 1,200-bed hospital under the Royal Thai Army provides tertiary health care. The electronic information system of the hospital includes data regarding demographics, dispensing drugs, laboratory tests, diagnoses, procedures, and payments. Owing to incompleteness of diagnosis and procedures data, eligible diabetic patients were identified by the use of antidiabetic drugs on a regular

bases during the study period who were ≥40 years old. The reason for the recruitment of older patients is the prevalence of diabetes and its complications is more common in this age group (Aekplakorn *et al*, 2003).

Quality indicators and data collection

Many evidence-based clinical practice guidelines and studies regarding the implementation of process and outcome indicators in diabetes care were reviewed. A widely accepted standard of medical care in diabetes (American Diabetes Association, 2006, 2007, 2008) was employed in this study. The list of quality indicators from the review and from adaptation based on the availability and completeness of electronic data in this practice setting are shown in Table 1. The calculations for the process indicators are percentages of patients who received the laboratory tests and in whom the outcome indicators, in percentages of patients who reached the treatment goals, were carried out.

RESULTS

The demographic characteristics of the diabetic patients age > 40 years old identified by the electronic information system are shown in Table 2. The patients age 61 to 70 years old were the largest group of the studied population.

The percentages of the patients who met the process indicators are shown in Table 3. Over half (56.5-67.2%) of patients had a HbA1c test at least twice yearly according to guidelines. A higher percentage of patients had yearly lipid levels checked, 87.8-90.2% for LDL-cholesterol, 76.6-81.4% for triglycerides, and 71.8-75.7% for HDL-cholesterol. Antiplatelet therapy prevention of cardiovascular diseases was prescribed in 69.7-75.9% of patients. A gradual increasing trend in percentages was seen for most processes. However, gaps in the process of glycemic control seemed to become wider.

Table 1
Quality indicators for diabetes care and their practicability to the study setting.

Quality indicators	Practicability in the study setting	Data sources (electronic)
Process indicators (laboratory tests or physical examinations)		
1. HbA1c tests at least twice a year	Yes	Laboratory tests
2. Lipid profile tests at least once a year[a] (LDL-cholesterol, triglyceride[b], and HDL-cholesterol[b])	Yes	Laboratory tests
3. Serum creatinine tests at least once a year (for estimation of the glomerular filtration rate)	No	-
4. Microalbuminuria test at least once a year	No	-
5. Dilated eye exam at least once a year	No	-
6. Comprehensive foot exam at least once a year	No	-
7. Blood pressure measured at each routine diabetes visit	No	-
8. Antiplatelet therapy to prevent cardiovascular disease in diabetic patients over age 40 years old	Yes	Dispensing drugs
Outcome indicators (goals of treatments)		
9. The most recent HbA1c < 7%	Yes	Laboratory tests
10. The most recent LDL-cholesterol < 100 mg/dl	Yes	Laboratory tests
11. The most recent triglyceride < 150 mg/dl	Yes	Laboratory tests
12. The most recent HDL-cholesterol > 50 mg/dl	Yes	Laboratory tests
13. The most recent blood pressure < 130/80 mmHg	No	-

[a]Not able to exclude the patients with low-risk lipid values (LDL-cholesterol < 100 mg/dl, HDL-cholesterol > 50 mg/dl, and triglycerides <150 mg/dl) where lipid assessment may be repeated every 2 years.
[b]Not included in the standard of medical care of diabetes published in 2008 that only the LDL-cholesterol was considered as the preferred strategy for targeted statin therapy.

Table 2
Demographic data of patients receiving diabetic care, by year.

Age group (yrs)	Gender	2006			2007			2008		
		No.	Total	(%)	No.	Total	(%)	No.	Total	(%)
41-50	Female	378	822	12.6	318	691	10.5	268	582	8.9
	Male	444			373			314		
51-60	Female	895	1,783	27.3	838	1,706	26.0	797	1,637	24.9
	Male	888			868			840		
61-70	Female	1,154	2,144	32.9	1,110	2,094	32.0	1,067	2,040	31.0
	Male	990			984			973		
71-80	Female	784	1,509	23.1	904	1,704	26.0	999	1,872	28.5
	Male	725			800			873		
> 80	Female	146	266	4.1	198	358	5.5	251	444	6.8
	Male	120			160			193		
Total			6,524	100		6,553	100		6,575	100

Table 3

Percentage of the patients with diabetes care processes complying with practical process indicators.

Process indicators	2006 ($n = 6,524$)		2007 ($n = 6,553$)		2008 ($n = 6,575$)	
	No.	%	No.	%	No.	%
HbA1c tests at least twice a year	3,689	56.5	4,227	64.5	4,421	67.2
Check LDL-cholesterol at least once a year	5,730	87.8	5,872	89.6	5,932	90.2
Check Triglycerides at least once a year	4,997	76.6	5,251	80.1	5,350	81.4
Check HDL- cholesterol at least once a year	4,682	71.8	4,946	75.5	4,954	75.3
Antiplatelet therapy for prevention of cardiovascular disease	4,549	69.7	4,807	73.4	4,992	75.9

Table 4

Percentage of the patients with diabetes care outcomes complying with outcome indicators.

Outcome indicators	Level	2006		2007		2008	
		No.	%	No.	%	No.	%
Most recent HbA1c level (%)	n[a]	6,521		6,938		7,634	
	< 7.0	1,730	26.5	2,027	29.2	2,556	33.5
	7.0-9.0	3,139	48.1	3,306	47.7	3,425	44.9
	> 9.0	1,652	25.3	1,605	23.1	1,653	21.7
Most recent LDL-cholesterol level (mg/dl)	n	7,254		7,365		8,061	
	< 100	1,966	27.1	2,316	31.4	2,444	30.3
	≥ 100	5,288	72.9	5,049	68.6	5,617	69.7
Most recent triglyceride level (mg/dl)	n	6,343		6.660		7.376	
	< 150	3,383	53.3	3,597	54.0	3,602	48.8
	≥ 150	2,960	46.7	3,063	46.0	3,774	51.2
Most recent HDL-cholesterol level (mg/dl)	n	5,946		6,280		6,885	
	< 50	2,302	38.7	2,364	37.6	3,240	47.1
	≥ 50	3,644	61.3	3,916	62.4	3,645	52.9

[a]Includes diabetic patients with HbA1c testing less frequent than the guidelines (once a year).

The percentages of patients who achieved the goals of therapy for the latest HbA1c, LDL-cholesterol, triglyceride, and HDL-cholesterol levels were 26.5, 27.1, 53.3, and 61.3%, respectively (Table 4). Vast disparities between goals and outcomes of care were detected.

DISCUSSION

Some of the process and outcome indicators were practical for routine assessment of diabetes care using administrative and medical care data from the hospital electronic information system in this study. The

achievability depended heavily on the availability and completeness of pertinent data. In this hospital, the glycemic control, lipid control, and antiplatelet therapy were the great potential indicators, while the data needed for the indicators of diabetic nephropathy, diabetic neuropathy, and hypertension were inadequate.

The outcome indicators in this study illustrate a wide gap compared to the evidence-based standards of medical care (American Diabetes Association, 2006, 2007, 2008), and agree with the other studies (Acton *et al*, 2001; Montori *et al*, 2002; De Berardis *et al*, 2004). Gaps were seen with process indicators, possibly because some patients shop around for medical care from more than one hospital. Some laboratory tests may have been performed at other hospitals. A root-cause analysis should be performed to understand the reasons behind these problems, then effective interventions should be implemented to bridge these gaps.

Evaluation of quality indicators is advantageous for quality improvement. Outcome indicators are also useful for evaluating severity of patients. Electronic information systems should be improved to support routine medical care and for monitoring of quality of care. Although there are inadequate financial incentives to carry this out, hospital administrators should encourage other incentives for quality improvement. Periodic updates on indicators is important due to rapid advances in evidence-based clinical practice guidelines.

A limitation of this study was the identification of diabetic patients. Due to incomplete diagnostic data in electronic form, dispensing of antidiabetic agents was used as the criterion to identify diabetic patients. Therefore, patients with diabetes not taking diabetic medicine were not included in the study. These indicators only provided a screening mechanism for addressing problems in diabetic care. Further studies to evaluate the reasons behind the gaps in care are needed.

In conclusion, evaluation of process and outcome indicators for diabetes care using the data from hospital electronic information systems is practical to assess care quality. The practicability depends on availability and completeness of data. In this study evaluator of glycemic control, lipid control, and antiplatelet therapy was possible, but evaluation of diabetic nephropathy, diabetic retinopathy, diabetic neuropathy and blood pressure was not possible. The practical indicators in this study reveal the process of care was good but the outcomes of glycemic and lipid control were poor.

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