

THE BENEFITS OF INPATIENT DIABETES CARE: IMPROVING QUALITY OF CARE AND THE BOTTOM LINE

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ABSTRACT

Objective: To analyze the impact of a hospital-wide inpatient diabetes management program on quality of care, length of stay, and cost.

Methods: A retrospective review was conducted for diabetes identification and treatment in a large tertiary care hospital in Oklahoma City, Oklahoma. Cultural change was accomplished by educating the healthcare professionals and medical staff. Systems were implemented to better identify patients with diabetes and to focus on quality improvement. Protocols were developed and implemented as tools for improving care. Results were monitored, and quality of care was assessed by examining lengths of stay and financial outcomes.

Results: Hospital-wide training, earlier identification of patients with diabetes, and the implementation of inpatient protocols had positive results on both quality of care and the hospital's bottom line. More patients with diabetes were identified earlier in their stays, care was managed effectively to reduce blood glucose levels, lengths of stay were reduced, and coding was improved to more accurately reflect the complexity of care provided.

Conclusion: By increasing diabetes awareness hospital-wide and implementing effective identification and management systems, hospitals are well positioned to provide higher-quality diabetes care, which also translates into a positive impact on the bottom line. (*Endocr Pract.* 2006;12[Suppl 3]:35-42)

Abbreviations:

ediba = ediba[®] Diabetes Center of Excellence; **FY** = fiscal year; **GMLOS** = geometric mean length of stay; **IBMC** = INTEGRIS Baptist Medical Center; **LOS** = length of stay

INTRODUCTION

Hyperglycemia is common and often unrecognized among hospitalized patients (1). Furthermore, hyperglycemia is an indicator of poor outcome (2), increased length of stay (LOS) (3), and cost (4). The impact of hyperglycemia on patient outcomes and healthcare costs traditionally has been underestimated. Various studies suggest that an early and aggressive approach to management of hyperglycemia in hospitalized patients could significantly reduce morbidity, mortality, prolonged hospital stays, and medical costs of patients with or without recognized diabetes (5-9). This negative impact recently led to the development of guidelines for glycemic goals in hospitalized patients, as well as a recent consensus conference focusing on strategies to meet these goals (10).

In 1997, in an effort to improve quality of care and decrease costs, the INTEGRIS Health System began collaboration with the ediba[®] Diabetes Center of Excellence (ediba) focusing on inpatient diabetes. The ediba organization works with health systems to evaluate and provide steps to improve diabetes care. INTEGRIS operates a system of 15 hospitals throughout Oklahoma. They began with an analysis of diabetes care at INTEGRIS Baptist Medical Center (IBMC), a 508-bed tertiary care facility in Oklahoma City. The goal was to improve quality of care and explore the financial impact of the increasingly complex care necessary for patients with diabetes.

This article describes the collaboration between ediba and INTEGRIS to improve the quality of care for patients with diabetes. Also addressed is the financial impact of this complex care.

METHODS

Step 1.

Analyze Recognized Diabetes and Length of Stay in the Hospital

Based on coding data, approximately 11% of patients at IBMC were identified with diabetes in 1997. This was slightly higher than the national average of 9.5% at that time (10). The geometric mean length of stay (GMLOS) for patients with a primary diagnosis of diabetes was 6.4

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days. The GMLOS of patients with diabetes as a secondary diagnosis was 5.9 days. For patients without diabetes, the GMLOS was only 3.4 days.

A subsequent random chart audit, in 1999, identified 70 patients with blood glucose levels above 400 mg/dL who had not been stated to have diabetes or coded with either primary or secondary diabetes. This demonstrated that some patients with elevated glucose levels were not being identified as having diabetes.

In 2001, a computer-generated hospital-wide review identified those patients with no stated diagnosis (or coding) of diabetes, but who had blood glucose levels above 180 mg/dL or had been treated with diabetes medication. These uncoded patients had a GMLOS of 10.6 days. It was discovered that approximately 37% of patients in the hospital actually had diabetes or hyperglycemia. This finding is similar to data published by Umpierrez et al (1) in 2002.

The analysis identified 12 different sliding scales used as the primary means of diabetes treatment. However, research has shown that sliding scales have long been regarded by diabetes specialists as a “crisis management” approach to insulin therapy that fails to effectively control hyperglycemia (11,12). Treatment of hyperglycemia often was inappropriately delayed and frequently no action was taken to reduce glucose levels until they reached 400 mg/dL.

Based on these findings, there were multiple opportunities for improvement. A systematic approach was needed to create a cultural change in diabetes care, identify patients with diabetes, develop standardized protocols for care, and monitor the financial impact on the hospital. A plan of action that included these additional steps was implemented.

Step 2.

Change the Culture Through Education and Training

To effectively change the culture, it was necessary that all healthcare staff “be on the same page” regarding diabetes knowledge and care. A culture change occurred among the healthcare staff as they better recognized the impact of hyperglycemia and utilized the protocols and systems effectively to better care for patients with diabetes.

The ediba team developed “Diabetes Today: An Update for Healthcare Professionals,” an 8-hour continuing education workshop with current information about diabetes care and management. The program was mandatory for all professionals in healthcare disciplines providing care for patients with diabetes. The intended audience included nurses, dietitians, pharmacists, social workers, physical therapists, and case managers. Over a period of 8 years, 1,500 employees attended the workshop. Verification of the effectiveness of this effort occurred with pre- and post-testing. Scores on the pre-test consistently averaged 62%, compared with 81% on the 3-month post-test.

A Continuing Medical Education program for physicians was developed with INTEGRIS endocrinologist John

Muchmore, MD, PhD. Topics included current standards of care, the importance of appropriate identification and coding of diabetes, and an update on medications and insulin. This program helped establish the foundation for the use of insulin protocols and recognized and supported the role of nurses in protocol implementation.

Step 3.

Implement Systems to Identify Diabetes Patients Earlier in Their Stay

One of the most critical needs from both business and quality-of-care perspectives is to quickly identify patients with diabetes to allow for appropriate medical management and coding consistent with the level of care needed.

Early in the process, a decision was made to recognize hyperglycemia as a serious and treatable condition—even in the absence of a diabetes diagnosis. As efforts were made to improve coding, it became apparent that there was no clear-cut definition of “diabetes out of control.” A collaborative effort with ediba, endocrinologists, and the Oklahoma Foundation for Medical Quality established guidelines concerning appropriate documentation and coding of “uncontrolled diabetes” (13).

A community of practice, as defined in *Harvard Business Review* (14), emerged within the INTEGRIS Health System as the staff and physicians became more knowledgeable and skilled in diabetes management. This community allowed for interaction across traditional boundaries as staff within the various departments recognized their own roles in improving diabetes care. Participants in this process included physicians, diabetes educators, information services, laboratory services, nursing, billing and coding, pharmacy, dietary, case management, and others. A computerized notification system was implemented, with laboratory and information services quickly alerting floor nurses and physicians of any patient with an elevated blood glucose level. The floor nurses, with their increased knowledge of diabetes management, were better equipped to assist physicians in implementing a plan of care for managing diabetes in the hospital, and to educate patients on the importance of glucose control. The billing and coding staff understood the importance of accurate and appropriate coding for the complexity of care being provided. Patients who needed continued outpatient diabetes education were referred to the outpatient diabetes center.

Step 4.

Improve Consistency of Care Through Evidence-Based Clinical Protocols

Physicians and diabetes educators worked together to develop and implement protocols for:

- Diabetic ketoacidosis
- Hypoglycemia
- Hyperglycemia management (with intermittent and continuous insulin)

A hyperglycemia management protocol, utilizing subcutaneous basal, nutritional, and corrective doses of insulin, was developed and tested in a pilot study. A review of blood glucose levels over a 4-month period prior to the study demonstrated a mean level of 243 mg/dL. This improved to a mean value of 148 mg/dL among 20 diabetes patients who were treated with the protocol. The promising results of this small study led to implementation of the protocol hospital-wide.

RESULTS

Coding data were collected each year, starting in 1997, and this process has continued to the present. A data-mining system was developed to analyze data from the hospital's information services. Data included patient volumes, GMLOS, case-mix index, severity of illness, revenue, and glucose test results. This system also allowed for continuous monitoring of outcomes.

A clear trend emerged suggesting that greater attention to diabetes makes a difference in outcome. The percentage of patients identified with diabetes increased from 11.1% to 21.6%. This compares to a national average of 7% to 11% (which has remained relatively flat) during the same period (Fig. 1).

Was the increased volume of patients attributable to (1) a higher incidence of diabetes overall, (2) the implementation of hospital systems to identify these patients, (3) the hospital being recognized as a Diabetes Center of Excellence, or (4) a combination of all the above? Figures

from the Centers for Disease Control show that Oklahoma's diabetes prevalence increased 40% from 1997 to 2004 (15). IBMC's figures reflected an increase of 122% during this same period, which suggests a combination of 2 factors: the hospital being selected more often and the patients being identified appropriately.

What was the financial impact of these newly identified patients? The hospital added more than \$14 million to its bottom line over the past 8 years as a result of the incremental increase in additional patients each year (Table 1). The actual additional amount due to accuracy in coding was \$632,797. This is represented by the difference in revenue between coding with a complication and coding without a complication for all patients identified with secondary diabetes. This number is calculated by subtracting the actual cost of care from the dollars collected for care.

Other significant results observed while monitoring quality of care and financial impact were:

- Medicare GMLOS for patients coded with *primary* diabetes decreased from 8 days in fiscal year (FY) 1997 to 4.3 days in FY 2005 (Fig. 2).
- Medicare GMLOS for patients coded with *secondary* diabetes decreased and then remained stable, despite the increasing volume of patients identified with the disease (Fig. 3 and 4).
- The gap between patients with and without diabetes also was reduced. In FY 1997, patients without diabetes stayed an average of 3.4 days in the hospital, whereas those with primary diabetes stayed 6.4 days—a differ-

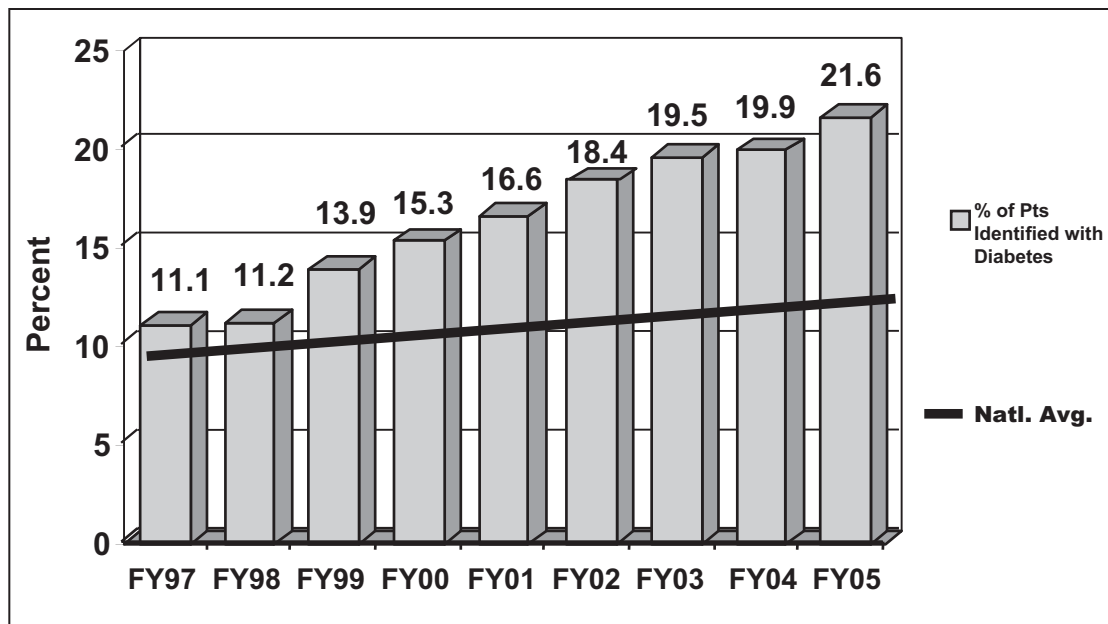


Fig. 1. Patients identified with primary diabetes mellitus (DRG 250) or diabetes as a secondary (concurrent) condition.

Table 1
Revenues From Increased Diabetes Inpatient Encounters

Year	Average gross margin (revenue – cost)	Total no. of encounters	Increased encounters over previous year	Increased margin (average GM x increased encounters)
FY 1997	\$2,640	2,390
FY 1998	\$4,665	2,362	-28	-\$130,620
FY 1999	\$3,694	3,152	790	\$2,918,260
FY 2000	\$4,221	3,686	534	\$2,254,014
FY 2001	\$4,394	4,011	325	\$1,428,050
FY 2002	\$5,410	4,418	407	\$2,201,870
FY 2003	\$4,785	4,573	155	\$741,675
FY 2004	\$5,917	4,701	128	\$757,376
FY 2005	\$6,233	5,368	667	\$4,157,411
Total increased margin			Total	\$14,328,036

*This table shows the actual dollars added to the bottom line as a result of the incremental increase in volume of additional patients each year. The actual additional dollars due to accuracy in coding was \$632,797. This is represented by the difference in revenue due to coding with a complication versus without a complication for all patients identified with secondary diabetes. The margin is calculated as: dollars collected for care minus actual cost of care.

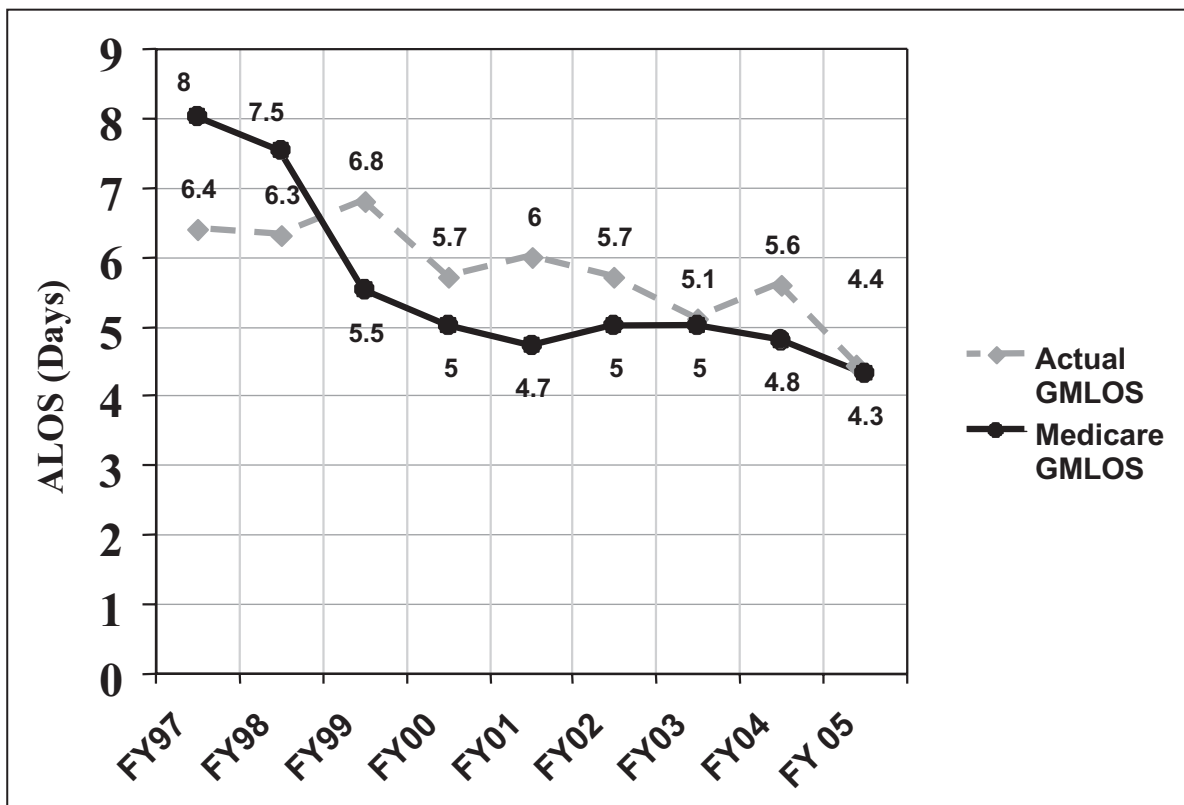


Fig. 2. Lengths of stay for all patients at our hospital with primary diabetes compared with Medicare GMLOS.

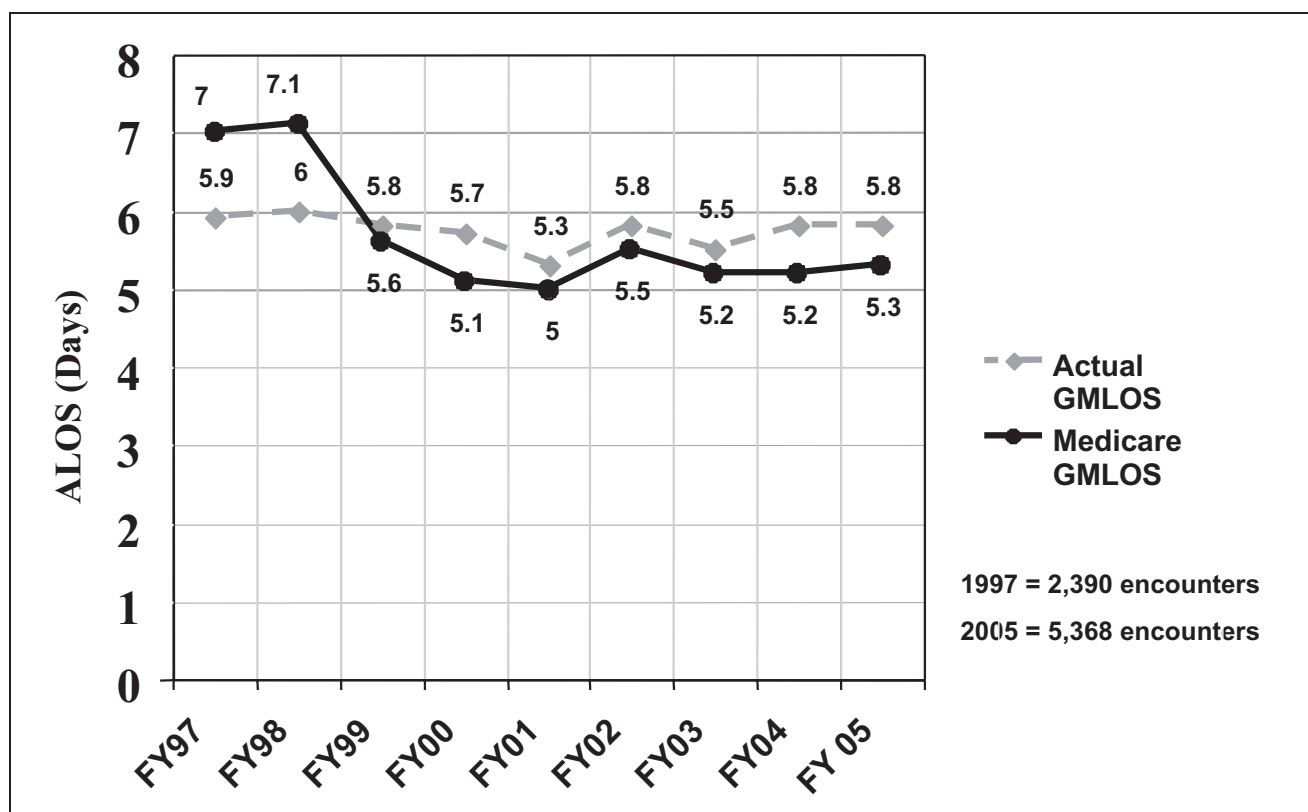


Fig. 3. There was little change in GMLOS for patients in our hospital with secondary diabetes between 1997 and 2005. However, during this period, the percentage of patients coded with secondary diabetes increased from 11.1% to 21.6%. This was accomplished by bringing most patients with diabetes not formerly recognized into the group with recognized secondary diabetes. This previously unrecognized group had a GMLOS of 10.6 days before being formally recognized and treated. From this comparison, it appears that our unchanged GMLOS actually represents a significant reduction in length of stay.

ence of 3 days. By FY 2005, the gap was reduced to only 1.2 days (3.2 days for patients with no diabetes, 4.4 days for those with primary diabetes) (Fig. 5).

- Readmission of patients with secondary diabetes decreased from 10.5% to 7.3% as emphasis was placed on improved treatment of hyperglycemia (Fig. 6).

SUMMARY AND DISCUSSION

These results indicate that hospitals must look beyond traditional outpatient education to measure the financial impact of diabetes care in their facilities. Hospitals, physicians who are diabetes experts, and other healthcare professionals can work together to:

- enhance quality of care and improve outcomes
- increase revenues, with appropriate payment for the care provided and resources expended
- control costs by helping patients heal, return home, and reduce the need for readmission

The collaboration between ediba and INTEGRIS Health has shown positive results in terms of care and

return on investment. More patients with unrecognized diabetes are being identified and the care managed effectively, which has yielded improved quality of care, reduced lengths of stay, and increased revenues (from the increase in volume of patients and the improved accuracy in coding).

CONCLUSION

As the incidence of diabetes continues to increase, health systems must evaluate how to provide the highest quality of care for these patients while maintaining a stable financial status. This can be achieved by creating a hospital-wide focus on the disease, identifying patients with diabetes/hyperglycemia earlier in their stays, providing care through effective inpatient protocols, and accurately coding for the complexity of care needed.

Healthcare systems must take this issue seriously and take action. Hospitals “have diabetes”—and it’s not “borderline.” The remarkable results are clear: quality diabetes care can become the example of how doing the right thing for the patient’s well-being is also the right thing for the hospital’s financial well-being.

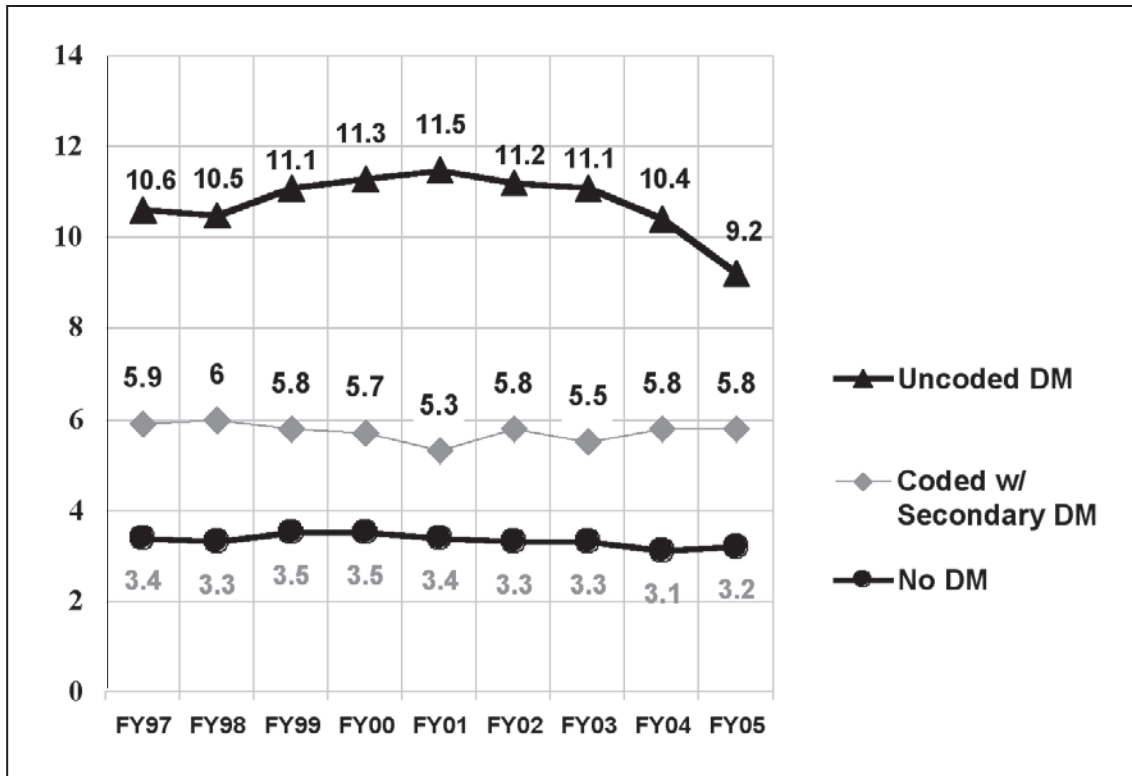


Fig. 4. The GMLOS gap between patients with and without diabetes has been reduced, demonstrating the effectiveness of earlier identification and effective treatment. The GMLOS for patients coded with secondary diabetes also has remained consistent, despite the significant increase in number of identified patients—from 11.1% to 21.6% of patient encounters. Failure to recognize and address hyperglycemia is associated with a longer length of stay.

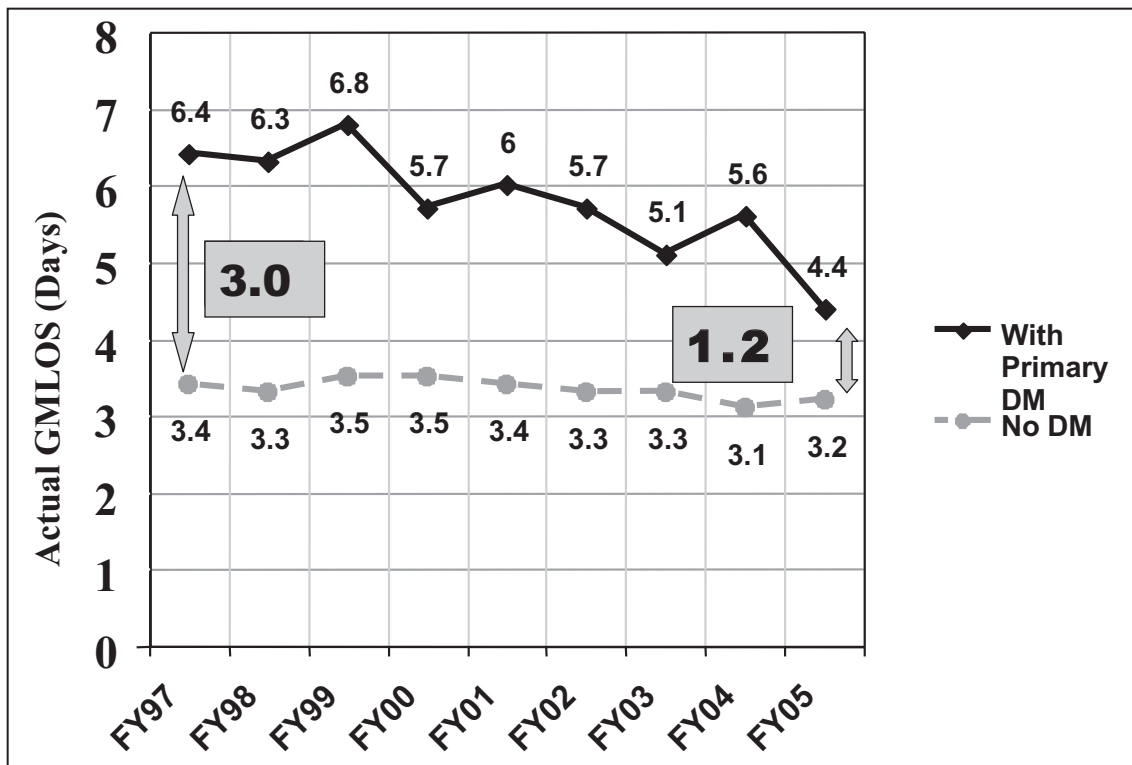


Fig. 5. Decreasing the length-of-stay gap from 3.0 days to 1.2 days showed improvement in care and resulted in cost savings.

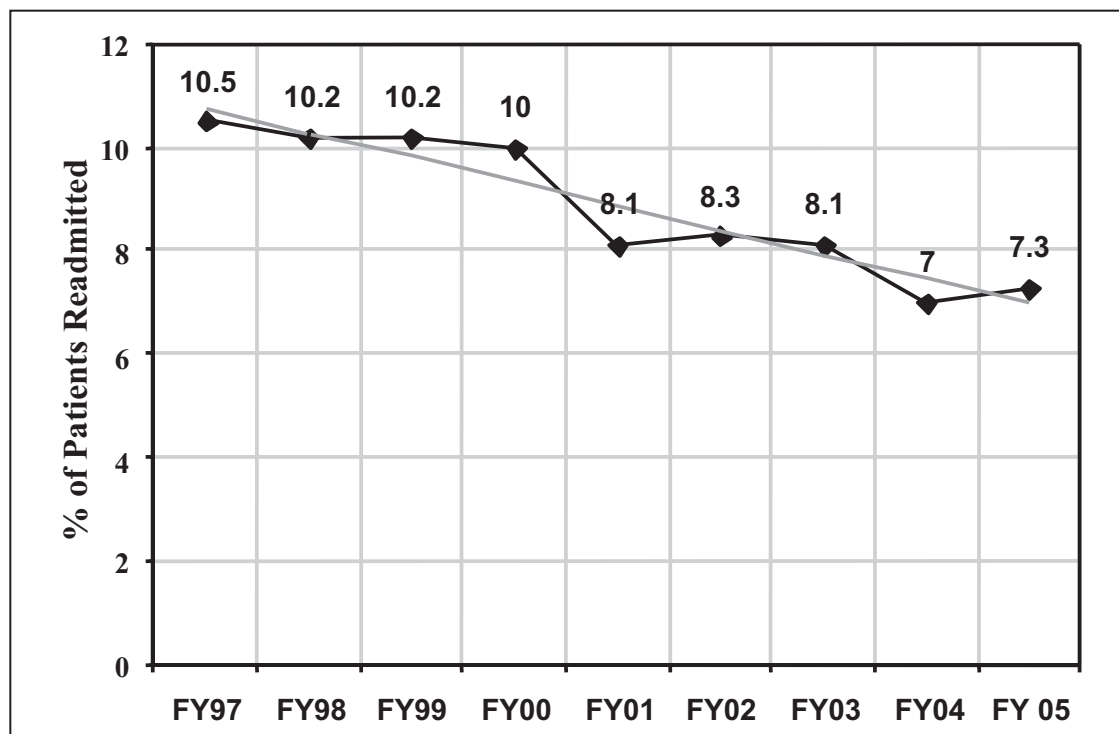


Fig. 6. The readmission rate decreased significantly during the period in which improved treatment of hyperglycemia was emphasized.

- Diabetes is adversely affecting our healthcare systems and our national health. An intentional focus within the walls of our hospitals can improve diabetes care. Proven treatment modalities and protocols are now widely available.
- Educating health professionals is the first step to changing the culture; this facilitates better acceptance of protocols as well as their effective implementation.
- Hospital systems can benefit from the resulting improvement in quality of care, improved average LOS, decreased readmissions, and the increased margins and cost savings.

The goal of all hospitals is quality—and by providing excellence in glucose control, quality will be improved (7,8,16). Studies are needed to examine the difference in GMLOS and costs between patients with stress-induced hyperglycemia and those with actual diabetes. Other research topics include the long-term follow-up of patients with hyperglycemia and future diagnosis of diabetes. It will also be important to show that results from the present study can be repeated successfully in other healthcare facilities.

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