EXECUTIVE SUMMARY

Texas Children’s Hospital is improving the care delivery of its diabetic patients, one of the most common diseases in school-aged children. How? Powered by analytics, they have focused on order utilization, timeliness of IV insulin administration, length of stay, establishing a diabetic care unit (DCU), educating core diabetic nurses (CDNs), frontline staff adoption, and more.

Care delivery improvements include the following:

- 81 percent of diabetic ketoacidosis (DKA) patients assigned to diabetic care unit and CDN
- 17 percent relative increase in DKA patients receiving an evidence-based evaluation and order sets
- 19 percent relative increase in DKA patients receiving IV insulin within one hour of order
- 33 percent relative decrease in LOS for DKA patients

WHY DIABETES?

Diabetes mellitus is one of the most common diseases in school-aged children. In fact, in 2012, more than 200,000 young people in the United States under age 20 suffered from the disease.\(^1\) Unfortunately, the number of children and adolescents in the U.S. with type 1 or type 2 diabetes is increasing.\(^2\)

This growing incidence of diabetes has significant ramifications for children’s long-term health, since the disease at least doubles a person’s risk of death.\(^3\) It also poses a real quality and cost challenge for hospitals. Diabetes can be difficult to manage in the hospital because acute illness, surgery, and changes in daily routines can affect blood glucose levels.\(^4\) Furthermore, diabetes patients are at risk for serious complications, longer hospital stays, and poorer outcomes.\(^5\)

A particularly complex and serious complication of diabetes is diabetic ketoacidosis (DKA). A condition that can result in diabetic coma or even death, DKA is a leading cause of morbidity and mortality in
Managing complex DKA patients requires a dedicated effort on the part of health systems to ensure that caregivers have the best possible skills, knowledge, and resources.

One health system committed to improving care for diabetic (and particularly DKA) patients is Texas Children’s Hospital. Internationally renowned for excellence in pediatric care, Texas Children’s provides primary and tertiary care for children through hospitals, affiliated practices, and a health plan.

In 2009 and 2010, Texas Children’s clinical and operational leaders noted a measurable degree of variation in its management of DKA patients. This variation had been increasing over several years, leading to gaps in quality of care for patients admitted with DKA. Texas Children’s determined to reverse this trend by launching an enterprise-wide campaign to drive diabetes care improvement.

A HUNGER FOR DIABETES CARE IMPROVEMENT

As Texas Children’s leaders assessed quality and cost outcomes, it became clear that diabetes care met the major criteria for a focused improvement effort: A large enough population of patients, a high degree of variation in care, measurable gaps in the consistency and quality of care, and organizational readiness. This last criterion was perhaps the most important. Not only were staff and faculty trained in quality improvement, they were also hungry for change that would lead to better diabetes care. The health system had the physician experts required to treat DKA patients effectively; it simply needed to standardize and expand the scope of care to provide the comprehensive treatment that DKA patients needed.

In 2010, Texas Children’s kicked off its improvement initiative with an effort to standardize care through a set of evidence-based care guidelines for the management of DKA. Multidisciplinary teams developed these standard, evidence-based order sets designed to promote greater consistency in care from patient to patient. Unfortunately, with no implementation team to ensure their adoption, leaders quickly discovered that clinicians were not using these order sets consistently. Adoption of the new order sets was too dependent on “passive uptake”; therefore, too many disparate order sets remained in use.

Texas Children’s also found that a lack of data hampered its efforts to measure progress and implement continuous improvement. Data was available, but data extraction was too dependent on time-consuming manual processes that were not nimble enough to support rapid cycle process improvement, and the data was not...
making it back to the providers or frontline staff who were capable of making changes to care delivery. The health system also lacked established, agreed-upon metrics for DKA care, which were needed to guide the improvement effort. In short, despite interest and collaboration among caregivers, Texas Children’s did not have a systematic way to implement and sustain improvements in the care of diabetic patients.

**SYSTEMATIC DIABETES IMPROVEMENT INFORMED BY DATA**

Texas Children’s leaders established a diabetes care process improvement team in 2013 to lead its diabetes improvement initiative. To establish a foundation for systematic, sustainable improvements in diabetes care, Texas Children’s implemented a late-binding enterprise data warehouse (EDW) and analytics platform from Health Catalyst®. The EDW integrates data from internal sources like the electronic health record (EHR), financial systems, operational systems, and more.

Texas Children’s also implemented a pediatrics diabetes analytics application, which pulls near real-time data from the EDW. The application makes accurate, timely data available to the Texas Children’s team to support continuous diabetes care improvement. It allows the diabetes team to analyze performance, discover the root cause of problems, and identify opportunities for improvement.

Team members recognized that incremental change would not suffice to achieve this far-reaching goal. Instead, they would have to transform completely diabetes care throughout Texas Children’s facilities. Such transformation would require changes in two veins:

1. **The care infrastructure** *(where diabetes care was delivered)*
2. **The care process** *(how and what kind of care was delivered)*

### 1. Transforming the care infrastructure

The team developed a diabetic care unit (DCU) for the care of its DKA patients. The DCU ensures that DKA patients receive comprehensive, evidence-based care and education based on their acuity and support needs. Providers that specialize in diabetes care staff the DCU. Particularly important among the staff of this new specialty unit are Core Diabetic Nurses (CDNs) with extensive training in diabetes management. The CDNs lead efforts on Texas Children’s main campus to deliver care and education 24/7 to meet the needs of patients and families.

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Rona Sonabend, MD
Pediatric endocrinologist

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Rona Sonabend, MD
Pediatric endocrinologist
2. Transforming the care process

Reengineering the care process required Texas Children’s to standardize care on evidence-based guidelines. As a means to guide effective implementation of these changes and to manage, monitor, and measure progress toward its goal, the team created a series of aim statements. The principal aim statements focused on the following:

- **Order set utilization**: The team reduced its 10-15 existing order sets down to a standard group of four evidence-based order sets (DKA ER, DKA non-ER, non-DKA ER, and non-DKA non-ER) that are continuously evaluated and refined. The streamlined order sets simplify the care process for the clinicians, making it easier to navigate the complexity of inpatient care for diabetes. Importantly, because of the way the order sets are built into the EHR, it is hard—and, indeed, almost impossible—for care providers not to use them. For example, it is now difficult to order insulin without using the standard order sets.

- **Timeliness of IV insulin administration**: Clinical evidence indicates that timely administration of IV insulin significantly raises the quality of care for DKA patients. Therefore, the Texas Children’s team developed and built into the EHR a standard, evidence-based protocol for the dose, method, and approach to ordering and administering IV insulin. The EDW and analytics application would enable the team to measure compliance with this protocol and any subsequent quality gains.

- **Length of stay**: Variation in treatment of DKA patients had resulted in variable LOS for those patients. Therefore, the team set goals focused on improving LOS for patients admitted with DKA to compete with national benchmarks at peer institutions.

- **Patient risk stratification**: In 2015, the team also created a risk predictor model to identify high-risk patients in the existing population of diabetes patients. Texas Children’s based its risk profile on a series of evidence-based risk identifiers and markers for diabetic patients. The entire cohort of diabetes patients is stratified according to low, medium, or high risk. With risk assessed in this manner, clinicians can apply the appropriate care to any given patient based on their risk profile.
MEASURABLE OUTCOMES IMPROVEMENT FOR DKA PATIENTS

With analytics, a care improvement team, and measurable goals in place, Texas Children’s has made significant strides in improving diabetes care, especially for DKA patients. Major results to date include the following:

81 percent of DKA patients assigned to DCU and CDN

As seen in Figure 1 below, currently 81 percent of diabetes patients receive their care in the DCU and are under the expert supervision of a Core Diabetic Nurse (CDN).

Creation of a specialty unit staffed by CDNs has resulted in a highly supportive environment for DKA patients and their families. All CDNs receive standard, evidence-based education to assure competency in treating and educating diabetes patients. Clinicians document education in the EHR, giving everyone involved in the patient’s care visibility into what education has been completed during the patient’s admission. TCH believes these educational materials could become an international standard and benefit patients worldwide.

17 percent relative increase in DKA patients receiving an evidence-based evaluation and order sets

As just one example of improved order set utilization, 96 percent of diabetes patients at Texas Children’s emergency center now receive the appropriate evidence-based evaluation (a relative increase of 17 percent and absolute increase of 14 percent from FY2013 to
Before we formed the DCU, we had diabetes patients going to a variety of areas within the inpatient space staffed by clinicians with varying levels of diabetes training. By developing a diabetes center of excellence, we ensure that patients receive education and management by the same group of highly trained providers in a consistent, individualized, patient-centric manner.

Rhonda Wolfe, RN
Assistant Clinical Director of Nursing

FY2015). The health system has successfully carried this rate over into the DCU environment. The team attributes much of this success to the fact that the evidence-based order sets and plans of care have been well received by clinicians. The team put considerable effort into educating clinicians as to how and why it developed the protocols, and why clinicians should use them.

19 percent relative increase in DKA patients receiving IV insulin within one hour of order

Today, 72 percent of DKA patients receive the appropriate dose of IV insulin within one hour of it being ordered. This increased from 59 percent in FY2013 to 70 percent in FY2015, representing a relative increase of 19 percent and absolute increase of 11 percent. Texas Children’s expects adoption of this best practice to continue to increase, despite the difficulty of changing processes in complex environments like the emergency center.

33 percent relative decrease in LOS for DKA patients

LOS for new inpatient encounters who received care in the EC from triage to discharge has decreased from 3.9 days to 2.6 days, a 33 percent relative decrease in LOS for type 1 and type 2 diabetes (see Figure 2).

FIGURE 2: LOS FROM TRIAGE TO DISCHARGE

- Blue= Hospital accounts
- Orange= LOST

Figure 2: LOS from triage to discharge
Now that we’ve made such strides in improving inpatient diabetes care, we’ve turned our attention to other care venues. Watching improved care spread across the continuum is incredibly exciting.

Maxine Keller
Clinical Data Specialist

WHAT’S NEXT

Texas Children’s is turning its attention to replicating this new care model in additional inpatient units across the system for other clinical conditions. The health system is also working to spread diabetic care coordination and clinical improvement across the continuum. To address the entire continuum, it has launched four additional initiatives:

1. Extending the improvement effort to care in subspecialty (endocrine) clinics
2. Using risk stratification to better identify and manage high-risk populations of diabetic patients across the continuum
3. Developing population management for diabetes patients in the community
4. Extending education to include providers, staff, patients, and families in the community
5. Expanding diabetes care improvement efforts from DKA to all diabetes patients

The health system has formed care process teams to address these areas. Each team has established its own set of aim statements with accompanying metrics to guide efforts and assess subsequent improvements.

REFERENCES


The staff were very caring and understanding through the whole process and taught us what we needed to go home and to care for our child. They really took their time with us. We are so grateful for that.

Patient family member speaking about care on the diabetes care unit
ABOUT HEALTH CATALYST®

Health Catalyst® is a mission-driven data warehousing, analytics, and outcomes improvement company that helps healthcare organizations of all sizes perform the clinical, financial, and operational reporting and analysis needed for population health and accountable care. Our proven enterprise data warehouse (EDW) and analytics platform helps improve quality, add efficiency and lower costs in support of more than 50 million patients for organizations ranging from the largest US health system to forward-thinking physician practices.

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