# Technology-enabled Type 1 Diabetes Education and Support (T1DES) system







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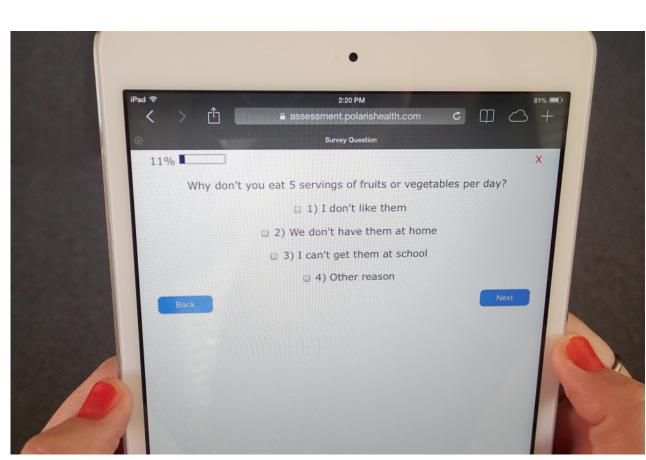
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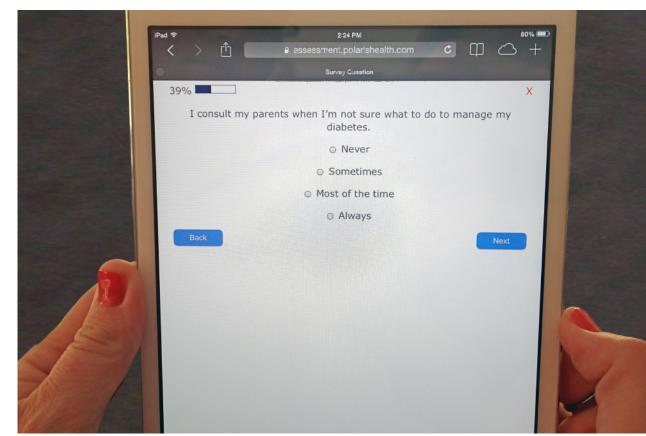
# **Background and Objectives**

The American Diabetes Association reports that about 15,600 youth are newly diagnosed with Type 1 diabetes (T1D) annually. Intensive diabetes management is essential to optimize health and prevent short and long term diabetes complications, but requires constant vigilance. Even with a multidisciplinary clinical support team, non-adherence to the diabetes treatment regimen is high. Diabetes management is particularly challenging during adolescence. Furthermore, diabetes healthcare providers often have limited time with patients to address psychosocial and behavioral issues that impact self-management. The purpose of this Phase 1 study was to develop a web-based, diabetes management interface between patients and providers that would obtain thorough self reported assessments, support diabetes management and provide patients and clinicians with real time reports highlighting patient knowledge deficits, psychosocial issues, and barriers to successful diabetes management.

## Sample and Methods

End-user focus groups and discussions with adolescents, parents and diabetes providers were conducted to guide to develop of the system. Forty patients (13-18 yr) with T1D and 40 caregivers were enrolled in the pilot study to test the system.





The T1DES system was built on the HIPAA compliant Polaris Health Directions software platform. The system provided a computerized assessment (Table 1), completed by patients on an Internet-connected iPAD device before their diabetes visits with their providers.

#### **Table 1: T1DES Assessment Measures**

**Diet:** Carb goal; insulin to carb ratio; carb ratio use; dietary habits; barriers to health eating.

**Exercise:** Activity level; time on electronics; barriers to exercise.

Blood glucose monitoring: Frequency, barriers to frequent monitoring

Insulin administration- injections or Pump: Correction factor and use; sites used; missed injections or bolus doses; barriers to taking needed insulin.

**Treatment of Diabetes Emergencies- Ketones & Hypoglycemia**: Monitors blood glucose and ketones; dose; glucagon; medic alert; frequency of sugar <70 & when.

Knowledge: Knowledge questions related to monitoring, insulin, diet, exercise, emergencies

Depression (PHQ8): Items are scored

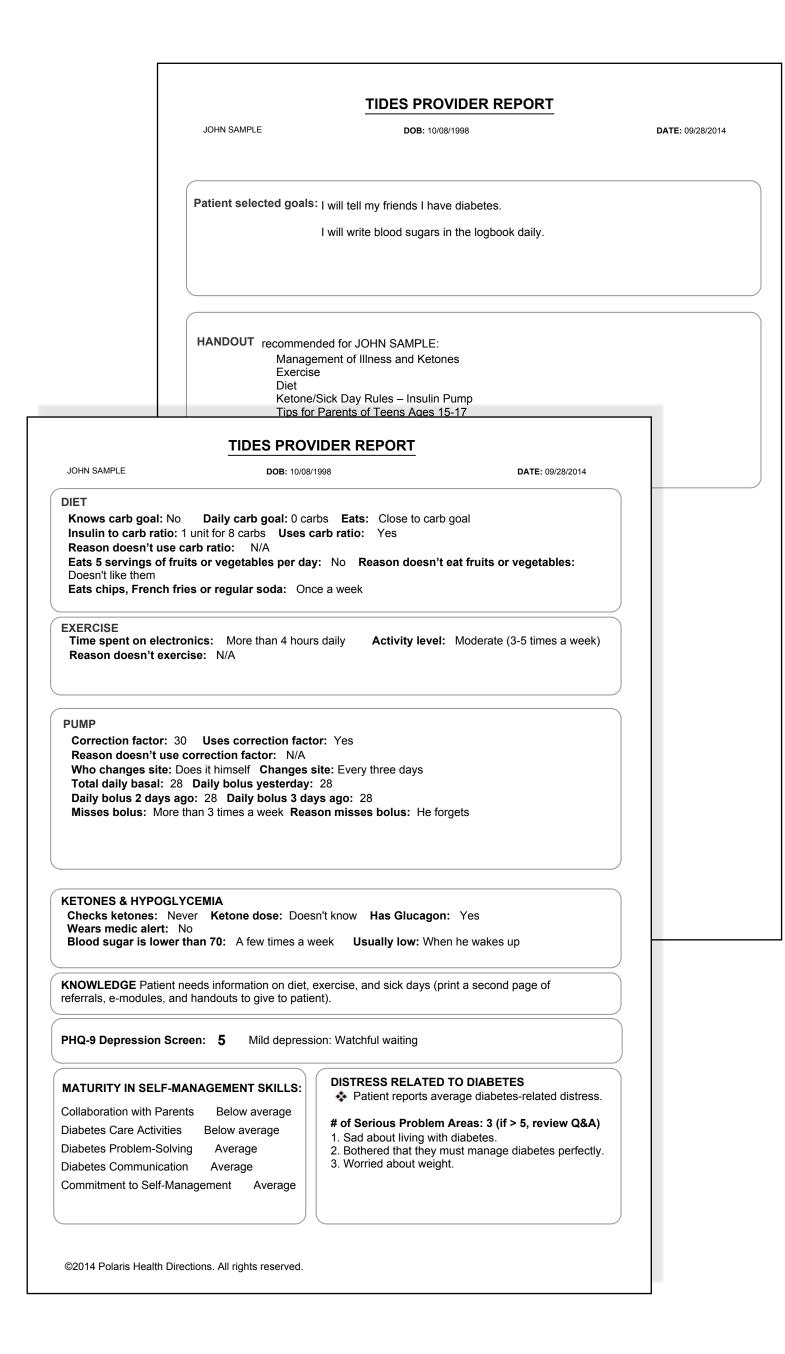
Maturity in Self-Management (SMOD-A): subscales are shown & scored as "average" or "above average"

Diabetes-specific Distress (PAID-T): Items related to diabetes related stress are scored

Patient-selected Goals (ADA goals): Patient goals are listed.

Handouts were recommended based on the patient's responses to the assessment.

- \* A summary of the assessment measures was printed for the healthcare provider to discuss with the patient. Results were also sent to a database alleviating the need for data entry.
- Patients chose 2 ADA goals to achieve by their next appointment.
- Patients received a report with their identified goals.
- \* Knowledge deficits were highlighted and educational material was provided specific to the deficits.
- ❖ E-messages were sent to the patient daily to support the patient's goals for 2 months.
- ❖ E-learning tools were available on the Diabetes Center website and patients and caregivers had access to an interactive webinar on nutrition.
- Caregivers received weekly emails regarding how to support their children's T1D.
- ❖ Patient, parent, and providers were asked to rate satisfaction and importance of the T1DES at the end of the study period in order to enhance the development of Phase 2 T1DES.



### Results

40 Subjects- Mean age 15.6 yr; 58% male; 53% white, 25% African American, 12% Hispanic; 10% other

Phase 1 Study Results for Standard Measures				
Measure	Mean (sd)	T1DES sample comparison to Standard Measure's norm		
PHQ8 Depression	4.7 (5.0)	T1DES mean indicates no or mild depression  13% had score > 10 indicating depression likely to warrant treatment		
PAID-T Diabetes Distress	62.8 (27.7)	Mean is in the high-normal range >65 is considered abnormal 33% of the adolescents had high distress		
SMODA				
Collaboration with Parents	19.1 (7.2)	Better than norm		
Diabetes Care Activities	22.6 (4.3)	Lower than norm		
Diabetes Communication	16.9 (6.1)	Same as norm		
Diabetes Problem Solving	14.7 (4.0)	Lower than norm		

PAID-T = Problem Areas in Diabetes-Teens

SMODA= Self-management of Type 1 Diabetes in Adolescents

#### **Barriers to Diabetes Management**

Diabetes Management Issues	<b>Percent Reporting Issue</b>	<b>Most Common Reported Barriers</b>
Missing injections at least 1/wk	23%- injections 36%- bolus pump doses	I forget
Not using correction factor	7%	I don't know how to figure it out
Not exercising 30-60 minutes/day	77%	I don't like exercise
Not eating 5 servings of fruits /vegetables / day	65%	We don't have healthy foods at home

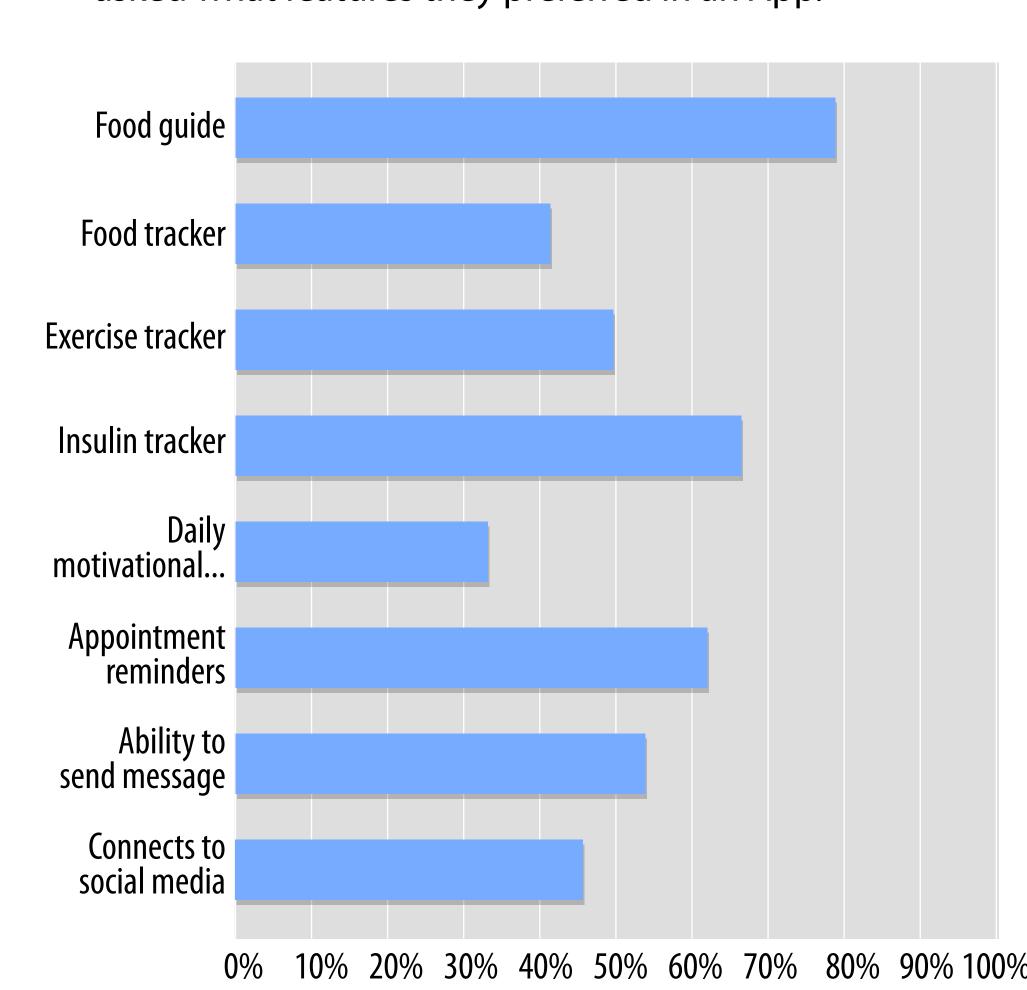
#### Patient and Caregiver Feedback on T1DES Features

#### Patient Feedback

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Assessment
78% iPad easy to use
93% Questions easy to understand
67% Right amount of questions
100% Felt they could answer honestly
73% Questions were important for diabetes mgt.
Text Messages
88% Easy to understand
52% Helped them manage diabetes
40% Felt the messages were motivating
54% Want to be able to communicate with diabetes provide
Caregiver Feedback
Email Messages
92% Easy to read and understand
68% Useful

52% prefer email; 28% prefer text; 20% prefer both

In the future, there are plans for the development of a mobile application (App). Adolescent participants were asked what features they preferred in an App.



# Conclusions

The T1DES system was well accepted by patients, caregivers, and healthcare providers, and demonstrated the ability to identify psychosocial issues and barriers to diabetes management.

Clinicians noted that the reports helped them focus on patient needs and providing support during the patient visit rather than just recording patient data.

Future versions of the T1DES system will include electronic health records (EHR) integration via HL7 interface. Additionally, Polaris is developing a mobile application for diabetes management using a virtual private wireless network with Verizon wireless that will connect mobile devices to the Polaris platform.