# Integrating An Automated Diabetes Management System Into The Family Management Of Children With Type 1 Diabetes

Results from a 12-month randomized controlled technology trial – Tammy R. Toscos, Stephen W. Ponder, Barbara J. Anderson, Mayer B. Davidson, Martin L. Lee, Elaine Montemayor-Gonzalez, Patricia Reyes, Eric Link, and Kevin L. McMahon
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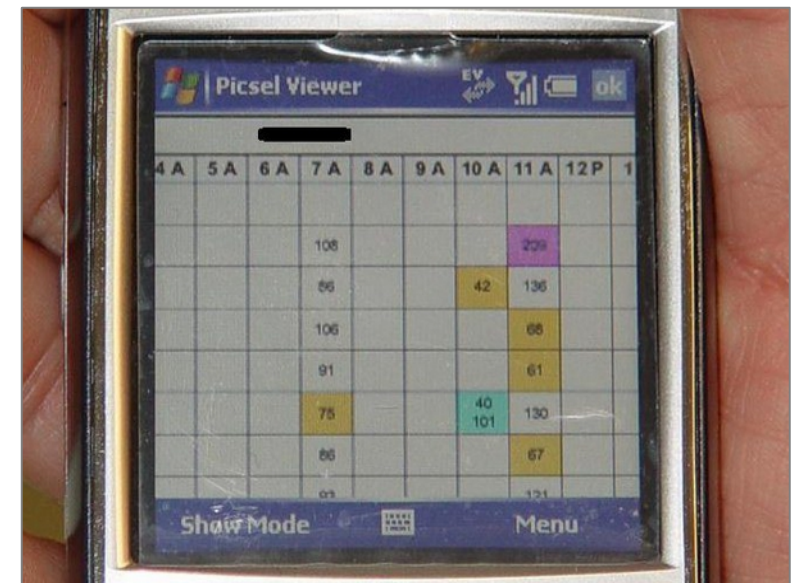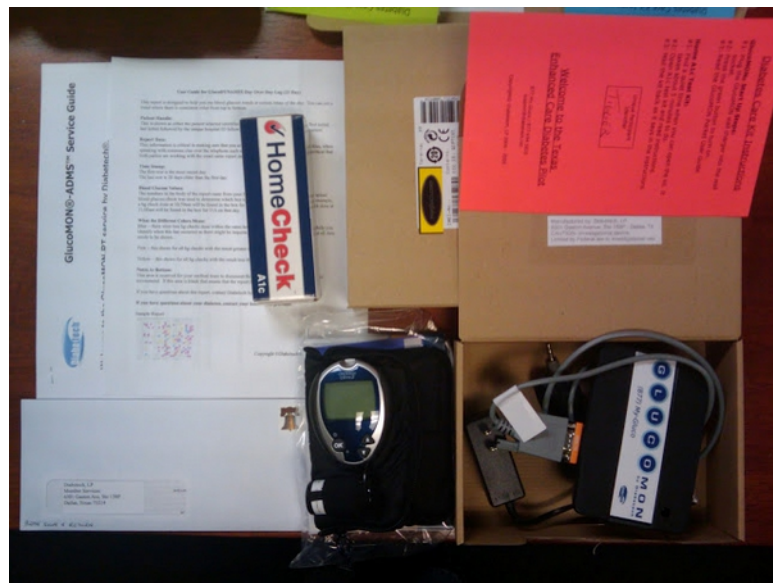
OBJECTIVE: The study objective was to evaluate how the use of a blood glucose monitoring (BGM) technology relates to glycemic control, report of self-care behavior, and emotional response to BGM of children with type 1 diabetes and their parents.

RESEARCH DESIGN AND METHODS: Forty-eight children aged less than 12 years (mean 8.8 years) with type 1 diabetes were randomly assigned to one of two study groups, a control group (conventional care without technology) or an experimental group (conventional care with technology), and followed for 12 months. Families in the experimental group were given the Automated Diabetes Management System (ADMS), which automatically collects meter blood glucose (SMBG) values and sends to parent(s) a 21-day BG trending report via e-mail each night. Measures of glycemic control (HbA1c) were collected at baseline and at quarterly diabetes clinic visits. 'BGM Effect' (measuring anxiety) and diabetes self-care behavior measures were obtained by survey at baseline, 6-month, and 12-month visits. No patients used continuous glucose monitoring.

RESULTS: Children in the experimental group had significantly (P = 0.01) lower HbA1c at 12 months (7.44 ± 0.94, −0.35 from baseline) than controls (8.31 ± 1.24, +0.15 from baseline). Improvement in HbA1c was more profound in families using the ADMS more at least weekly. Additionally, the parents in these families showed a significant improvement in BGM Effect (P = 0.03) and children became more meticulous in diabetes self-care (P = 0.04). Children in both experimental and control groups experienced no change in their emotional response to BGM.
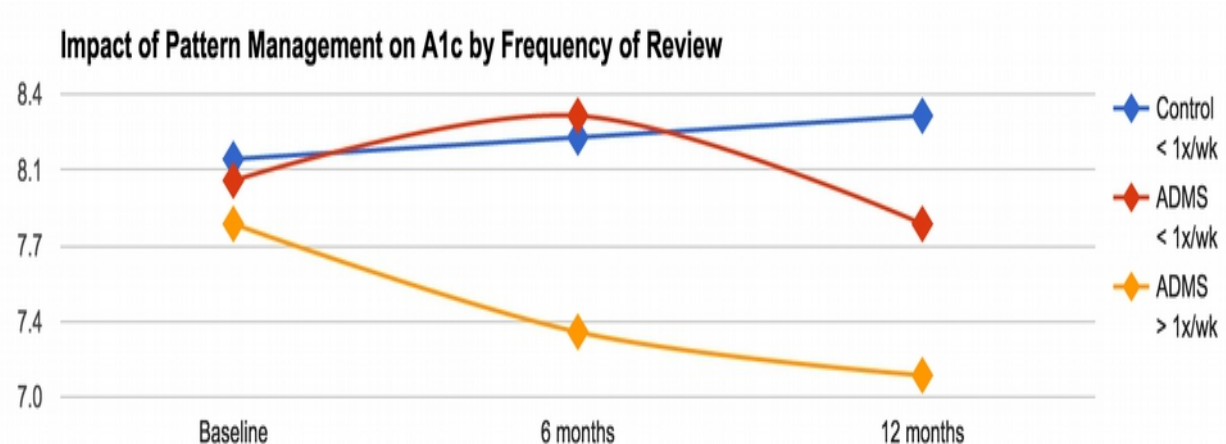
CONCLUSIONS: Using the ADMS 1- 3 times/week may help children with type 1 diabetes improve glycemic control and gain diabetes self-management skills, as well as improve the BGM effect of parents.

OBSERVATIONS: Pattern management has been widely taught as a cornerstone of diabetes self-care. The study ADMS required less than 1 minute per week by the family to perform pattern management. **The medical team was blind to ADMS generated data.** While reviewing prior research, no studies were found measuring efficacy of pattern management[1]. This study may be the first to measure the impact of pattern management in an IDDM population based on no other data than SMBG.

We identified a subset of treatment arm participants who reviewed blood sugar trends at least 1 x per week. This group was responsible for all of the A1c improvement. Treatment arm participants reviewing SMBG < 1 x per week fared no better than the control arm participants.

PRACTICAL TRANSLATION: Simply teaching pattern management _without_ providing the patient with an easy way to perform review of blood sugar logs at least weekly may be unrealistic and unnecessary in light of study observations. Adherence to human factors design principles, when it comes to type 1 diabetes technology and self-care, should stress ease of use and reports in a format similar to ADMS in order to promote **Frequent Pattern Management** (FPM); patient review at least weekly.

Impact of Pattern Management on A1c by Frequency of Review

Legend:
- Control
- ADMS < 1x/wk
- ADMS > 1x/wk

X-axis: Baseline, 6 months, 12 months
Y-axis: 7.0, 7.4, 7.7, 8.1, 8.4

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[1] Choudhary, J. C., Genovese, S., & Reach, G. (2013). Blood Glucose Pattern Management in Diabetes: Creating Order from Disorder. Journal of Diabetes Science and Technology, 7(6), 1575–1584.